

The Origins of Morse

Tony Smith G4FAI takes a look at the life of the "father" of telegraph

Samuel F. B. Morse was a painter of ability. He studied art in England and exhibited at the Royal Academy in 1813. Returning home in 1815, he took up portraiture as a profession, and painted many prominent people of his day.

He later studied and painted in France and Italy, returning again to America in 1832, when he was appointed Professor of Painting and Sculpture at the University of the City of New York.

During the voyage home, in 1832, on the packet ship *Sully*, discussions about recent electrical experiments in Paris aroused his interest. He had some knowledge of the subject, having attended lectures and assisted with laboratory experiments back home, and he spent the rest of the journey trying to devise a practical electro-magnetic telegraph system capable of carrying messages rapidly over great distances.

Earliest Code

His 1832 notes, setting out his first ideas, are of great interest, and were eventually reflected in his first successful system, i.e.

- a sending apparatus to transmit signals by the closing and opening of an electric circuit
- a receiving apparatus operated by an electro-magnet to record the signals as dots and spaces on a strip of paper moved by clockwork
- a code translating the dots and spaces into numbers and letters

His first code used figures only, coupled with a dictionary of numbered words. It was very simple, and his notebook spells out a message showing various numbers with their word equivalents underneath:

4030 141
 "... Wednesday 6th August
 322 32
 C u v i e r naturalist died."
 1.6.8.5.4.3.



The numbers and dots under "Cuvier" suggest that Morse intended to spell out unusual words or names letter by letter, and this assumption is strengthened by a reference in his caveat (i.e. specification of what he intended to patent) of 1837, to the dictionary having numbered words, "beginning with the letters of the alphabet".

Other matters took his attention over the next few years until his appointment to a new academic post in 1835. He was now given rooms at the university, where he renewed his experiments with home-made batteries and various primitive instruments.

His first successful receiver (register) was made from a canvas stretching frame, a hand wound electro-magnet, and a hanging lever, with pencil attached, to draw on a moving strip of paper. A dot could be read from the lower point of a V, and a dash from an extended V, shown in Fig. 1.



Fig. 1

Lack of funds, coupled with a need for practical assistance, led to a partnership with a colleague, Professor Leonard Gale; with Alfred Vail, who offered funds, and facilities at his family's ironworks to make proper instruments when required; and with F. O. J. Smith, a Congressman with business and legal experience. Working together the three main partners contributed to the subsequent development of the Morse telegraph and code, although it was finally patented in Morse's name alone.

First Alphabetic Code

All of the early experiments and demonstrations had used Morse's number code. On 24 January 1838, however, he demonstrated a new code, comprising letters instead of numbers,

Practical Wireless, February 1986

JOURNAL OF THE TELEGRAPH
 (June 26, 1887) D1

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 THE "SNAPPER KEY."
 PATENT APPLIED FOR

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 Nos. 5 & 7 DEY STREET, NEW YORK.

Selection of advertisements from the Journal of the Telegraph, 1886-7

achieving a transmission speed of 10 w.p.m., double that attained previously.

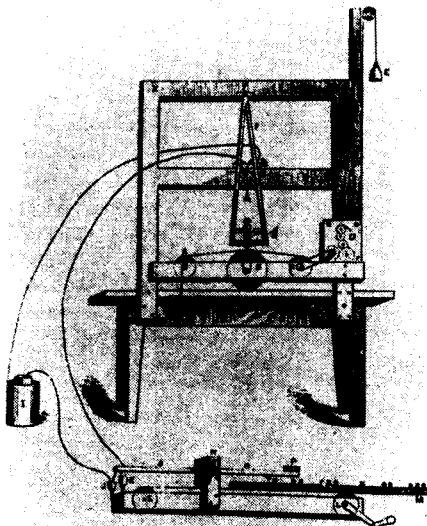
The transmitter (correspondent) had a printer's port-rule with cast type inserted in it as required, each type letter having saw-teeth to activate the circuit as it passed through the machine. This continued in use, until about 1840, when it was replaced by a simple hand key, the forerunner of today's Morse keys, which was later claimed by Vail to be his invention.

In 1843, with funds running out, Morse petitioned Congress for financial assistance, and was allocated \$30000 to evaluate the merits of his system. He planned an underground line, believing that Wheatstone's needle telegraph in England had successfully used buried conductors. After 14km had been laid, it was found that the pipe-encased wire had faulty insulation caused by heat in the manufacturing process. It was then discovered that the English underground wires had also been a failure, and had been replaced by overhead wires on poles.

By 1 May 1844, the wires, now overhead, had reached Annapolis Junction, 35km from Washington, in time to pick up news from the railway of the proceedings of the Whig National Convention at Baltimore, and its nominations for president and vice-president.

Sending Errors

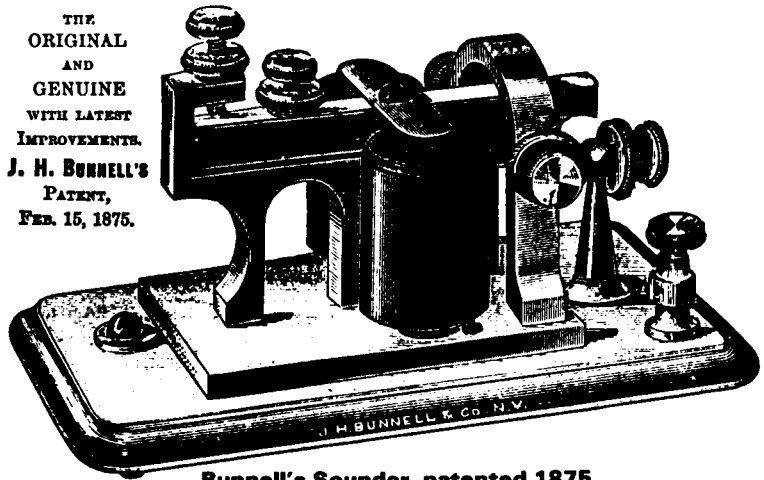
On the day before the convention Morse wrote to Vail from Washington, "Get everything ready in the morning . . . When you learn the name of the candidate see if you cannot give it to me . . . before the (rail) cars leave you . . ." Next day he wrote, "Things went well today. Your last writing was good. You did not correct your error of running your letters together until some time. Better be deliberate . . . I may have some of the Cabinet tomorrow . . ."



Morse's first sender. (From an illustration in *Les Merveilles de la Science*, about 1866)

Practical Wireless, February 1986

THE
ORIGINAL
AND
GENUINE
WITH LATEST
IMPROVEMENTS.
J. H. BUNNELL'S
PATENT,
FEB. 15, 1875.



Bunnell's Sounder, patented 1875



Reading from Morse's first self-recording register. (From *Samuel F. B. Morse, his Letters and Journals*. By E. L. Morse, 1914)

Finally, the line from Washington to Baltimore was completed, and, on 24 May 1844, the first official demonstration took place before invited observers. Annie Ellsworth, daughter of a friend, chose the first words to be transmitted, and the phrase, "What hath God wrought!", took its place in history.

Now the Democratic convention was gathering in Baltimore, and Morse had a wonderful opportunity to demonstrate the potential of his invention. Senator Silas Wright was nominated as candidate for vice-president. He was not at the convention, but in Washington. Vail telegraphed details to Morse who passed them to the Senator. Wright declined the nomination and Morse sent his reply to an incredulous convention only minutes later. They telegraphed again, received the same reply, and then sent a delegation by train to make sure they had received the message correctly.

"What Hath God Wrought"

Locust Grove, situated one mile south of the City of Poughkeepsie, in Dutchess County, NY, was the home of Samuel F.B. Morse, inventor of the electric telegraph and of the code which bears his name. On May 24, 1844, Morse sent from Baltimore to Washington the now famous message "What hath God wrought!" The estate was purchased by the Young family and was granted status as a national historic site in 1965. On May 18, 1980, the Poughkeepsie Amateur Radio Club celebrated the opening of the Young-Morse National Historic Site to the general public by operating station K2KN from Locust Grove.



**SAMUEL F.B. MORSE DAY
POUGHKEEPSIE AMATEUR
RADIO CLUB
SPECIAL EVENTS STATION
K2KN**

DATE	TO	GMT
RSI	BAND	MODE

DUTCHESS COUNTY

Annual Morse Day QSL card

American Morse

About this time Morse, probably with Vail's assistance, devised a new code alphabet, which became known as American Morse. The exact date is not known, although Morse's remarks to Vail about his sending on the new line suggest an unfamiliarity with the code which would not have existed had they still been using the 1837 version.

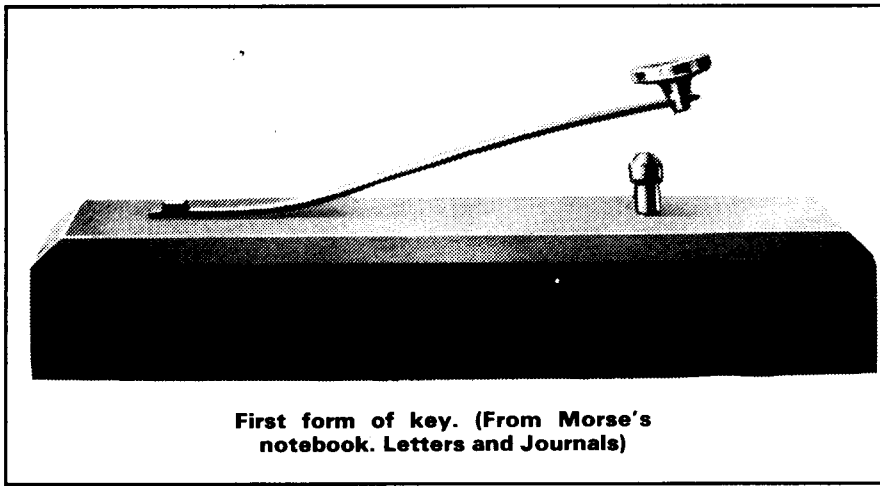
An undated note by Morse lists the different quantities of type found in a printing-office to determine which were the most frequently used letters of the alphabet. He gave every letter a separate symbol, unlike the previous code, which had the same symbol for phonetically similar letters. He weighted each symbol, to determine its length, counting a dot as 1, a space between groups of dots as 1, a dash as 2 and a long dash as 4.

The shortest symbols were allocated to the most commonly used letters, and longer ones to the less frequently used. In this early draft, no letter exceeded a count of 5, and, with one explicable exception, this became the code used throughout North America well into the twentieth century. The exception was the letter J. His notes show it as which counts as 5, fitting in with the pattern of symbols used for other letters. The symbol finally chosen, however, was - - - - , counting as 6 and contrasting strangely with the logical process used to select the rest of the alphabet.

Sounders

Morse's original "self-recording" instrument was soon replaced with improved versions, involving perforation of the moving tape, or the use of an inked wheel. About 1856 the recorder was replaced by the "sounder", when it was realised that telegraphists had developed an ability to read the messages coming off the instruments by listening to the clicks of the pen-lever.

Sounders were simple electro-magnetic devices which pulled a metal bar in one direction, striking a limiting screw, when the sending key was depressed, and another screw, in the



First form of key. (From Morse's notebook. Letters and Journals)

opposite direction, when the key was released. This re-created the sound of the clicks of the sending key, and the technique was to listen to the length of the spaces between the clicks.

Average operators achieved 20-25 w.p.m., exceptional ones, 30-35 w.p.m. and champions, up to 46 w.p.m. By the late 1850's the automatic sender was invented, necessitating the re-introduction of ink recorders and perforators, and speeds of up to 70 w.p.m. were then attained.

International Morse

When the Morse code was first used in Europe, it was not entirely satisfactory, not having symbols for the accented letters used in many European languages. An international conference in Berlin, in 1851, revised the code once again, taking symbols from American Morse and three other systems, to form Continental, or International Morse—the code which remains in use today.

As the years went on, the Morse telegraph became big business around the world, creating ever expanding work for those who manufactured or laid the lines, overland or undersea; those who made the equipment; and those who operated it—the telegraphists.

These were a new breed of men and women having, for the first time, the world at their fingertips. In 1887, the Journal of the Telegraph reported on the seventh annual re-union of the Old Time Telegraphers' Association. Many members looked back to the pioneering days of over 40 years earlier, and there was much discussion as to who had been the first "sound" reader.

A correspondent recalled that, in 1846-7, more and more operators were



Locust Grove

"picking up sound reading, but except for conversation, this was positively prohibited on all lines. Some of us did more than talk by sound. We drummed musical rhythm on the key, and set others to guessing what tunes they were".

All Lines Cleared

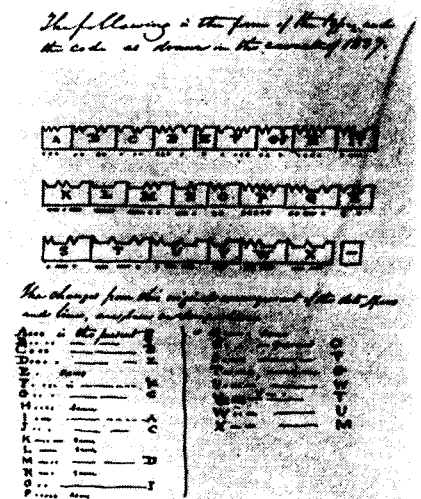
As Morse approached his 80th birthday, the telegraphists determined to honour him in a very special way. On 10 June 1871, two thousand of them converged on Central Park, New York, for the unveiling of his statue, paid for by contributions from telegraph offices throughout the US and Canada. Morse did not attend the ceremony, but that evening was present on the stage of the Academy of Music, in front of a packed audience, when, after speeches paying tribute to his achievements, the telegraph lines to all offices in North America, and many overseas, were cleared.

Using an original instrument from the Washington-Baltimore line, a young lady operator sent what was, in effect, Morse's farewell message to the telegraph fraternity. He was escorted to the table to key his name at the end of the message, becoming overcome with emotion as wild applause rose from the auditorium. Congratulatory messages from home and abroad flooded in, and he concluded the evening with a speech recalling his early struggles, and paying tribute, by name, to all those who had helped him bring his dream to reality.

He had not long to live. He spent the summer months on his estate at Locust Grove, Poughkeepsie, and had a telegraph line wired into his office there from the main route close by. In the winter he lived in New York, and there he died on 2 April 1872.

Father of the Telegraph

Although his fame as "father of the telegraph" was eclipsed by later developments in communications, the Morse code remains as his memorial, still alive and fulfilling its original purpose. It is also doing something



Top—Morse's saw-tooth type and first alphabetical code, 1837. Bottom—Changes made in compiling American Morse. (From Morse's notebook. Letters and Journals, as above)

which Morse could not have foreseen. It is enabling radio amateurs around the world to communicate with each other, whilst knowing little of each other's language, giving such pleasure and satisfaction that it will surely continue in use as long as amateur radio exists.

Once a year the Morse code can still be heard at Locust Grove. In honour of his memory, the Poughkeepsie Amateur Radio Club's special event station, K2KN, celebrates "Morse Day", when its signals are heard around the world. What better tribute can amateur radio give to a man to whom it owes so much? **PW**

	1837 code	American Morse (1844)	International Morse (1851)
A
B
C
D
E	.	.	.
F
G	...	---	---
H
I
J	...	----	----
K	---	---	---
L	---	---	---
M
N
O	---
P
Q
R
S	---	---	---
T	---	---	---
U	---	---	---
V	---
W	---	---	---
X	---
Y	---
Z	---

Changes in Morse over the years
Practical Wireless, February 1986