When I Think Back...

by Neville Williams

Samuel Morse: pioneer of telegraphy, born 200 years ago this month

Few devotees of electronics would show any hesitation in identifying Samuel Morse as a pioneer in telegraphic communication and the inventor of the time-honoured Morse code. What is not so well known is that initially, he set out to make a name for himself in the realm of painting and sculpture.

My venerable *Chambers' Biographical Dictionary* (London, 1926) records that Samuel Finley Breese Morse was born on April 27, 1791 at Charlestown, Mass., USA — just 200 years ago this month. He was the eldest son of Rev. Dr. Jedidiah Morse and his wife — described elsewhere as 'highly educated and cultured parents'.

In his article 'The Genius of Samuel Morse' *(Readers Digest,* 1945, condensed from *Esquire)* writer Kurt Steel adds that Pastor Jedidiah was a personal friend of Presidents Washington and Adams.

As a geographer, as well as a cleric, he was the author of *The American Universal Geography* and *The American Gazeteer,* books which served to create a public awareness of the family name, and to provide the funds necessary to send Samuel and his two younger brothers to college.

Samuel graduated from Yale in 1810, with a passion for art and a keen hobby-level interest in electricity, which he attributed to `Mr Day's lectures' on the subject, supplemented by other information which he sought from academics working with the new 'fluid'.

Significantly, also, he studied chemistry under Professor Silliman — later, editor of *American Journal of Science and Arts* — and witnessed practical experiments with voltaic cells.

While at college, however, Samuel Morse spent much of his spare time painting miniatures of his friends on ivory, at five dollars apiece. It seemed only logical that, following graduation, he should apply his obvious talent on a full-time basis.

At first, his parents had reservations about him taking up art as a career but, when his work was praised by the famous Gilbert Stuart — portrait

painter for presidents Washington, Jefferson, Madison and Adams — they consented to their 19- year-old son visiting England to study English and European painting styles under American ex-patriot artist Washington Allston. This was in 1811.

Two years later, at the tender age of 22, he gained international recognition when one of his pictures was ranked in the first nine out of two thousand exhibited at Somerset House by the Royal Academy in London.

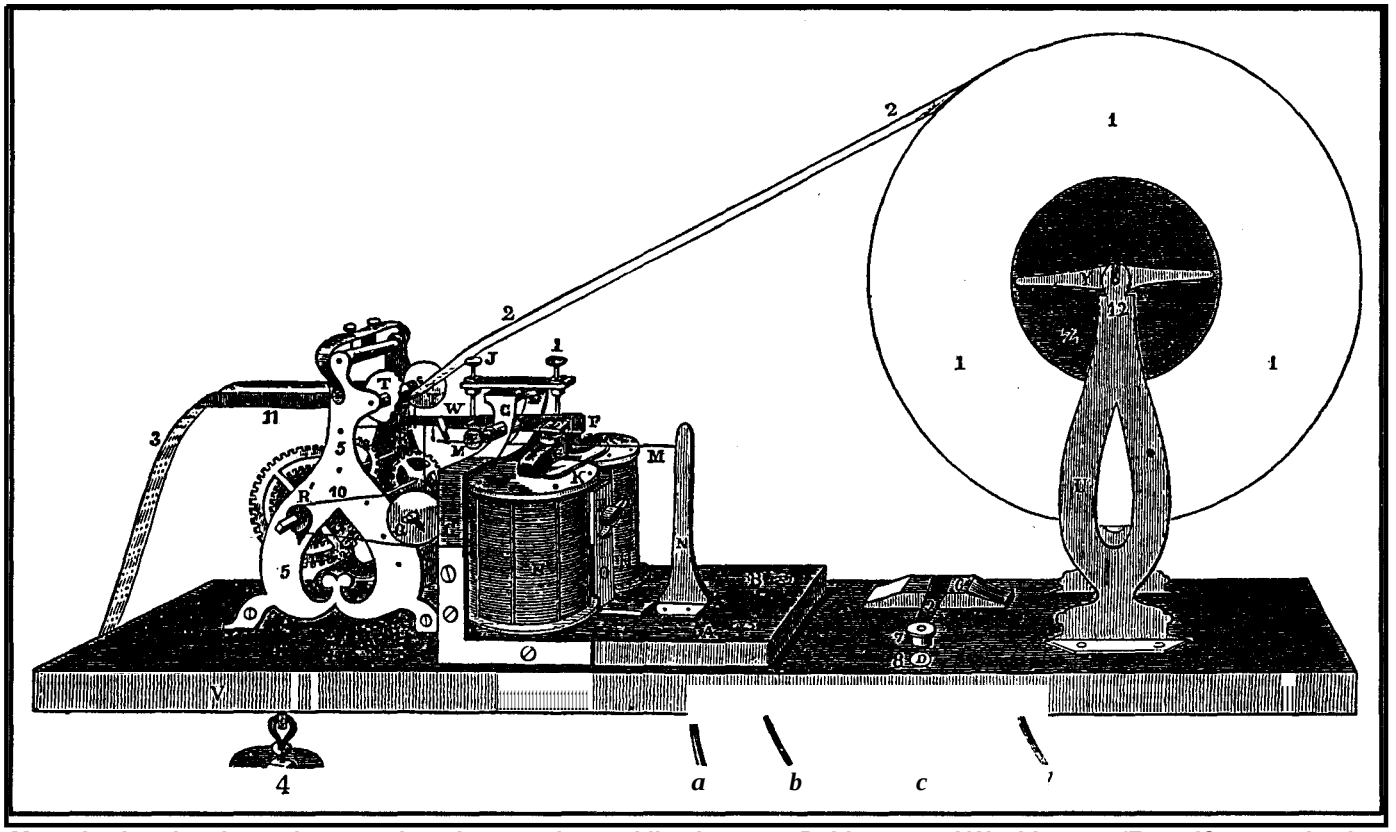
Having also won a gold medal award in 1813 for his statue of 'The Dying Hercules', Morse returned to America in 1815 with high hopes of winning similar acceptance in his own country to that available in Europe. It was not to be, however, and he had to eke out a living painting portraits for a totally inadequate return. His most famous, that of the veteran American General Lafayette, was hung in the New York City Hall.

Unfortunately, demand for his work was further affected by a national economic downturn and, while his ability was never in dispute, he experienced a considerable degree of financial hardship over several years, which he was at some pains to conceal.

Fate intervenes

Despite the financial setback, he was a foundation member of the National Academy of Design in New York and served as its first president during the years 1826-42. It was during this period that Morse's career was diverted by a quirk of fate, which effectively transformed Morse the artist into Morse the inventor.

In October 1832, he was returning home from a second visit to Europe — in the role of an artist. One evening, on the voyage from Le Havre to New York, shipboard conversation turned to electricity and Morse startled his fellow passengers by speculating



Morse's electric telegraph as used on the experimental line between Baltimore and Washington. (From 'Communication Through the Ages' by Alfred Still. Murray Hill Books, New York, 1946).

whether information could be 'instantaneously transported by electricity to any distance'.

To Morse, it was by no means a new idea. When the USA had declared war on England in 1812, the US administration had no way of knowing that, two days before, the British Parliament had taken conciliatory steps that could well have averted the conflict altogether. In London at the time, and acutely aware of the tragic irony of the situation, Morse had written to his parents in Boston lamenting the fact that there lacked the means to transport messages across the Atlantic 'with the rapidity of thought — in an instant'.

Coming across the document years later, Morse scribbled in the margin: 'Longing for a telegraph, even in this letter'.

Now, in mid-Atlantic, some 20 years later, he became totally obsessed with the idea. He sought to recollect and apply facts about the electric fluid which he had absorbed in the pursuit of a secondary interest dating all the way back to Mr Day's lectures at Yale.

By the time he landed in New York his artist's sketch book, which might otherwise have been taken up with shipboard images, was occupied instead by technical sketches, said to be notable for their perception and clarity.

In his book ***Guglielmo Marconi*** (Heron Books, UK, 1970) David Gunstan quotes a remark by Morse to the Captain as he disembarked: "Should you hear of the telegraph, one of these days as the wonder of the world, remember the discovery was made on the good ship ***Sully"***.

Inventor or visionary?

Translated into 'hardware', Morse's sketches became primitive prototypes for practical communications equipment.

But while he is regarded, especially in America, as the inventor of the electric telegraph, his true genius invites comparison with that of Marconi, some 60 years later: a special talent for developing and applying the ideas of others to create practical equipment.

To quote Gunstan again:

Morse was not a scientist. His contribution to science was more his vision of the possibilities of long-distance communication, and his ability to get people to support him in his attempts to build a communication system.

It is a matter of record that the shipboard debate was initiated by a certain Dr Charles Thomas Jackson, who presented a lecture on the subject of electricity to while away a couple of tedious hours at sea. During the lecture, he demonstrated the principle of the electromagnet — as conceived by William Sturgeon and the physicist Professor Joseph Henry.

It was Morse, rather than Jackson, who saw in the electromagnet a `terminal' device, which could respond physically to an electric current fed to it along a wire line from a remote source. More precisely, a device that could actuate a pen to imprint meaningful marks on a narrow, moving strip of paper. To quote Gunstan, mentioned above:

This, of course, was the ancestor of the reliable Morse inker, used so much by Marconi in his own experiments, years later.

It is reasonable to assume that, in the debate aboard the ***SS Sully,*** mention would have been made of earlier suggestions or attempts ***at signalling*** by means of electricity. For example:

Earlier suggestions

As early as 1753, a writer **'C.M.'** (possibly Dr Charles Morrison of Greenock, Scotland) had suggested stringing 30-odd lines between distant points, with provision to apply a

`frictional' electric charge to each one at will. At the receiving end, pith balls attached to the respective wires one would attract a paper flap, marked to signify a particular letter or punctuation mark. This would allow an 'emanuensis' to write down the message, letter by letter, as it arrived. Nothing came of the idea.

Fifty-odd years later, a Bavarian doctor Samuel Thomas von Sommering and Baron Pawel Lwowitch Schilling were credited with developing an electromagnetic telegraph — but, again, the idea appears not to have been pursued.

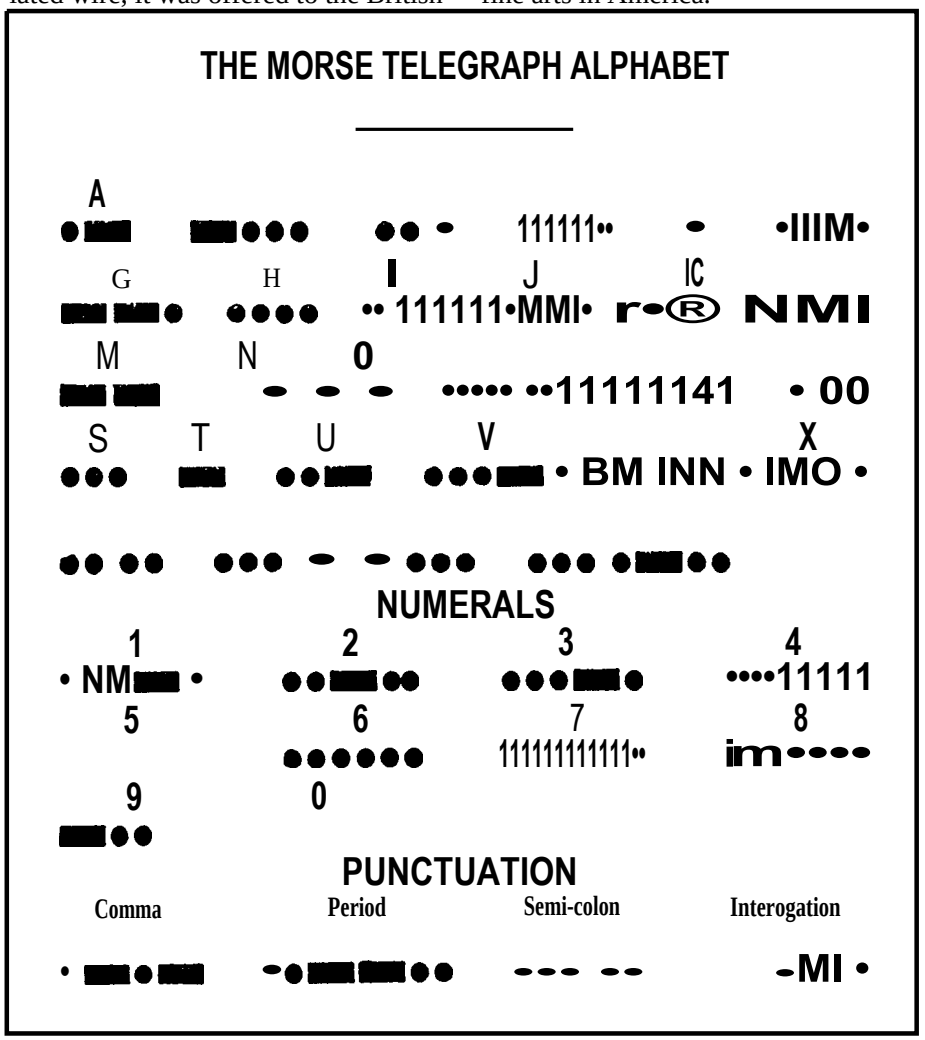
As recently as 1816, British scientist Sir Francis Ronalds had set up a telegraphic system on his property at Hammersmith using 'frictional' rather than 'flowing' electricity.

Involving some eight miles of insulated wire, it was offered to the British Admiralty without response. Ronalds published a description of the system in 1823 — nine years before Morse's historic voyage on the *SS Sully*.

Indeed, only one year before, in 1831, Joseph Henry had demonstrated electromagnetic signalling equipment which caused a bell to be struck by a magnetised iron bar on a pivot.

He had also directed considerable effort to the development of electromagnetic relays, with the ability to replicate signal pulses which had been seriously attenuated by line losses. In later years, and despite some clash of interests, Henry was to offer considerable assistance to Morse in the commercialisation of his Telegraph.

But back in New York, Morse embarked upon a veritable double life. A few months before, the newly established New York University had appointed him Professor of Sculpture and Painting — the first such post in fine arts in America.



The original Morse code or 'alphabet, as shown In the 'Manual of Wireless Telegraphy' published circa 1912. It evolved into the present-day 'continental' or 'international' telegraph code which is still commonly referred to as 'Morse'.

Artist or inventor?

By day, Professor Morse worked in his university studio on a huge and ambitious canvas, originally begun in France and showing the exhibition gallery at the Louvre bedecked with 37 world famous masterpieces. His ambition was to stimulate American interest in fine art. On subsequent exhibition, the finished painting attracted only limited audience support and had to be sold privately, yielding the artist scant return for the materials and the effort that had gone into it.

When he was denied the distinction of painting a panel in the rotunda of the Capitol at Washington, Morse set aside his life-long dedication to art and turned his attention more than ever to the completion of his `Telegraph' (which he preferred to spell with a capital-T).

He spent his evenings in the studio working on his brainchild and denying himself everyday comforts to fund his experiments. Much of what he needed had to be contrived from oddments — a paper ribbon recorder, for example, from the works of a discarded clock; inductors from silk-covered wire produced at the time for high-class milliners, making ladies' hats.

In his book *Amber to Amperes* (New York and London, 1931) Ernest Greenwood quotes from Morse's own notes to indicate the problems which he faced at this *time:*

Up to the autumn of 1837, my telegraphic apparatus existed in so crude a form that I felt a reluctance to have it seen. My means were very limited — so limited as to preclude the possibility of constructing an apparatus of such mechanical finish as to warrant my success in venturing upon its public exhibition. I had no wish to expose to ridicule the representative of so many years of laborious thought.

To conceal from my friends the stinted manner in which I lived, I was in the habit of bringing food into my room in the evenings and this was my mode of life for many years.

Limited as his means may have been, the overall system envisaged by Morse made undeniably good sense:

- It relied on a single circuit, involving normally one pair of wires or, conceivably, a single wire with the earth itself providing a return path for the current.
- For the actual code, alphabetical characters, numerals and essential punctuation marks would all be

represented by discrete combinations of short and long pulses — dots and dashes — with the simpler combinations reserved for the most commonly used characters. Devised in collaboration with a friend, Alfred Vail, the 'Morse' code was patented in 1840.

- A relay, modified to operate as an inker, would record the dots and dashes on moving paper tape, creating a permanent and readily readable record of all messages.
- By providing a sending key, an inker and current source at each end of the line, two-way working would be readily possible.
- The system provided scope for higher speed with skilled operators, with the ultimate possibility of attaining even higher speed with mechanical sending aids (e.g., prepunched tape).

Morse's first successful demonstration, circa 1840, was over a distance of 10 miles (16km), but his troubles were not over by any means. Despite early support from Leonard Gale, the Vail family (of Morristown Iron Works) and Congressman F.O.J. Smith of Maine, Morse was left largely to battle on his own — not an easy task for someone better known at the time as an artist than a scientist.

There were arguments, too, between Morse and his supporters, such that he wrote: 'The condition of an inventor is, indeed, not enviable'. At this low point in his morale, Morse appears almost to have given up, turning his attention temporarily to photography. (See panel).

In 1843, Congress finally voted $30,000 to build a 40-mile (64km) experimental telegraph line between Washington and Baltimore — a far from unanimous decision, with some of the legislators proclaiming the whole idea so 'silly' that they framed a cynical amendment suggesting that some of the allocation should be diverted to the support of mesmerism!

The public at large showed little interest in the idea. Landowners commonly refused permission for lines to cross their property, and one group of farmers even destroyed a section of overhead line because it was allegedly 'taking electricity from the air and spoiling the weather'.

Morse's original plan had been to run the wires underground in lead pipe, and Ezra Cornell, who later founded the Cornell University, devised an ingenious plough which in one operation trenched, laid and covered the cable. Unfortunately, $23,000 down the track Morse discovered that the cable insulation was not equal to the task and he was faced with the problem of somehow abandoning the procedure without bringing the whole project into disrepute and triggering a major political scandal.

A very resourceful Cornell solved his problem by assembling an eight-yoke team of oxen and deliberately driving his beloved plough into a boulder, wrecking the plough completely.

The unfortunate 'accident' gave Morse the excuse he needed to string the wires on poles, instead!

First US telegraph

The line was not actually completed until 1844 and on the morning of May 24 in that year, it carried the historic phrase 'What God hath wrought' — received by Alfred Vail in Baltimore during a ceremony in the Supreme Court Chambers.

Given his family background, Samuel Morse presumably considered it appropriate to accord the ultimate credit for the invention to' the Almighty, a sentiment that would not have seemed out of place in contemporary American society.

The first functional use of the cable was to provide Washington with progress reports of the Democratic convention in Baltimore. Its reputation was made when the delegates responded to the call: "Three cheers for James K. Polk, and three cheers for the Telegraph!"

The Washington-Baltimore link became the first of many telegraph lines in the USA, all of them installed by private enterprise and most of them using Morse's technology.

It was also taken up by the governments of several European nations, and representatives of 10 such met in Paris in 1858 'as an honorary testimony to the good he (Samuel Morse) had conferred upon mankind'. This unusual tribute — for an inventor — was supported by an honorarium of 4000 francs, which were no doubt more than welcome.

At the same time, Morse was not without his detractors, who insisted that the adulation bestowed on Morse was out of proportion to his real achievement; that it failed to recognise the contribution of other pioneers, including that of Joseph Henry. They also recalled that, in 1846, Alexander Bain, a Scottish academic had been granted an English patent for a printing telegraph that relied on electrochemical rather than electromagnetic technology.

Incoming electric pulses were recorded by applying them to a paper ribbon which had been sensitised with potassium cyanide. It proved capable of working over considerable distan-

Samuel Morse photographer!

Thoroughly discouraged by the lack of official support for his telegraphic research, Morse turned for a *hire to the new science of photography.

In Paris, he met and became friendly with Louis and, in April 1839, described Daguerre's work to the American public. In the process, he proba built the first- camera in America and with his help, Professor J.W. Draper, scientist and author, Made the world's first photographic portrait on roof of Morse's studio at the New York University. This was in 1839.

By 1841, Morse and Draper had reduced exposure time from five minutes to a few seconds, and Morse was conducting classes in what had become the new art,

Morse the family man

Encouraged tance in Europe, Samuel Morse: married Lucrecia Walker, a beautiful young woman who was interested in art and fully supportive of. her husband's efforts to win recognation as .an artist in his own country. In due course she bore three children Susan, Charles and Finley.

They were a devoted couple, but: Sam Morse's lifestyle as •an itinerant artist um-inventor took him away from home for periods separation that was heightened by the apalling travel communication facilities in a new, large and sparsely populated country.

Sadly, just when Morse was able to plan realistically for a new home in the E . for the hole-family he' received word that his wife had died suddenly from a heart attack. •In his absence, his children had been placed in the care of

Morse was devastated, but: answer to grief was to provide for his children and then to apply interests: his art and the Te graph

ces without the use of relays as, for example between Boston and Buffalo via New York.

International overtones

Despite this, Bain was denied an American patent in 1849 on the grounds that it infringed the Morse patent — a refusal that was subsequently overturned by the US High Court. Some maintained that the real motivation was a payback for British reluctance to recognise the work of Morse. It is also a fact that, in 1828, New York inventor Harrison Gray Dyar had put forward the idea of an electrochemical printing telegraph in which spark electricity would be applied across a moving strip of litmus paper.

In the UK, attention tended to focus on William Fothergill Cooke and Professor Charles Wheatstone, who formed a somewhat uncomfortable partnership in 1837 with the aim of developing ways of communicating over a distance by means of electrical circuits.

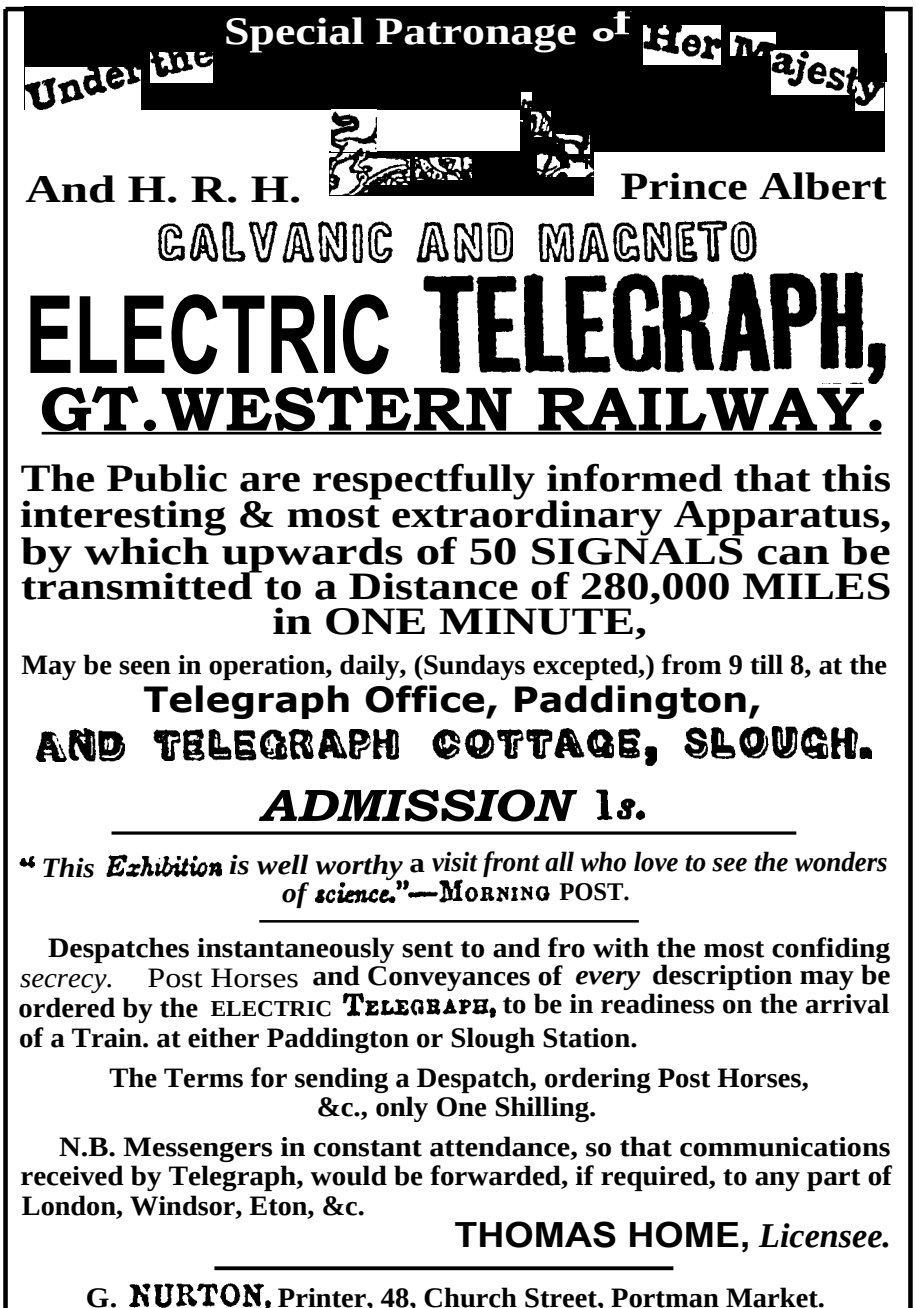
Who contributed most to the partnership is a matter for argument, but *Chambers' Biographical Dictionary* credits them jointly with laying the foundation for the telegraph system of the UK — such that they were for the Old World what Morse was for the new. Shown here is a facsimile of a handbill issued in 1845, announcing the public exhibition of a telegraph system operating between Paddington and Slough.

With Morse having been honoured in Paris, Wheatstone and Cooke ultimately received the Albert Gold Medal in the UK in 1867. Wheatstone was knighted in 1868 and Cooke in 1869. International rivalry and court disputed patents aside, the electric telegraph was adopted widely during the latter half of the nineteenth century, with a cross-Channel link being set up in 1858 — only to break after three week's operation.

Sorry about that!

Failure of the Channel link must have brought bitter memories to Morse, who had begun to explore the the possibility of undersea cables as early as 1842.

In that year, from a rowboat, he had personally laid a cable between the Battery and Governor's Island in



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Facsimile of a handbill issued in Britain in 1845. Early telegraph systems in Britain were a monopoly controlled by a company established by Cooke In 1846. They were acquired by the British Post Office in 1872 and became a public service.

New York Bay. Early in the morning of the very day on which the cable was to have been publicly demonstrated, Morse watched in dismay as the skipper of a fishing smack hauled up the strange wire on his anchor and casually chopped it through, leaving the two ends to fall back into the water!

In *The Electronic Revolution* (Penguin, London, 1967), S. Handel notes that the most obvious and urgent applications for the electric telegraph had to do with railway systems, and the transmission of financial informa-tion to do with goods and shares, especially between London and New York. He also notes that the first successful trans-Atlantic cable linking London and Wall Street was laid in 1866, thereby fulfilling Morse's earliest dreams. Regarded at the time as a high point in applied science, it required all the experience and ingenuity of the great physicist Lord Kelvin and the resources of the Anglo-American Telegraph Company, of which Kelvin was a director.

By the turn of the century, the world was criss-crossed by infra- and inter-

continental telegraph circuits. Companies like Anglo-American and Western Union were so entrenched and so smug that they were more interested in frustrating rather than investigating the telephone and wireless communication systems being championed independently by Bell, Marconi and others.

In the meantime, telegraphic systems had gravitated largely to Samuel Morse's technology and code or derivatives thereof, with Wheatstone most commonly credited with pioneering a sub-revolution in code transmission speed.

High speed telegraphy

With manual operator sending, the transmission rate was limited to about 30-35 words per minute.

The Wheatstone system involved pre-recording all messages on a machine, which punched a pattern of holes in paper tape. The punched tape would then be fed into the system at high speed and the characters recorded at the same speed by the distant inker.

No longer dependent on the dexterity of the operators, the sending speed was limited mainly by the performance of the terminal equipment, with 600 words per minute being typical.

His dreams fulfilled, Samuel Morse eventually returned to Yale as Professor of Natural History, by then accepted and honoured as a scientist rather than an artist. He died in New York in 1872, having spent the last years of his life as a philanthropist and an 'armchair' politician — with a record of supporting lost causes. In his day, he had nominated unsuccessfully as mayor of New York, had been stubbornly opposed to the Civil War and had campaigned furiously against the re-election of Lincoln.

But Morse the artist had not been completely forgotten. In 1932, 60 years after his death, the Metropolitan Museum in New York honoured his memory with a one-man exhibition of his work.

In the *Esquire/Reader's Digest article* Kurt Steel, mentioned earlier, remembers him as 'primarily an artist — and a very fine one'. He observes, furthermore, that whereas his telegraphic system has become progressively less relevant in the face of modern communications technology, his paintings and in particular his portraits grow more valuable with every passing year. ■