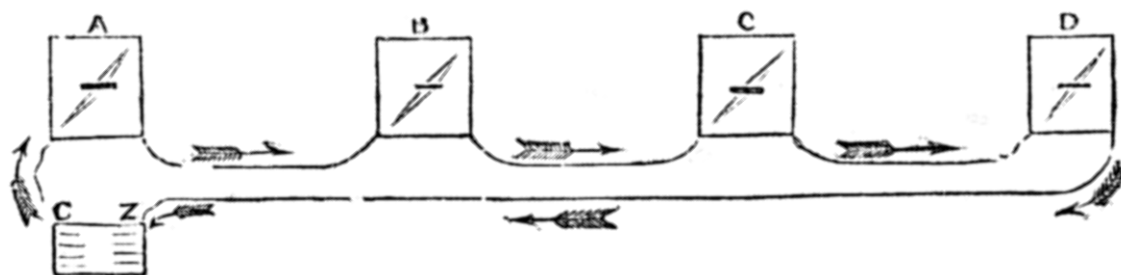


The text below is an abridgement of a chapter in *Home Teachings in Science* by Professor Cowper, published by Frederick Warne & Co. in 1869. Within the story of a father taking his son to a telegraph office, many details of the needle telegraph and its use are explained. The telegraph is introduced to the generation of Victorians who will grow up taking it for granted that this technology is part of daily life. I have omitted a few pages of the original where the superintendent explains how a battery is made and how a current in the wire activates the telegraph needles. The spelling and punctuation follow the original.



THE ELECTRIC TELEGRAPH.

“HERE is good news,” said Mr. Robson to his wife, upon receiving a message by electric telegraph; “my agent in Scotland says that my presence will not be required in Edinburgh before next month.”

“Oh! papa,” said James Robson, a lad of thirteen, “how very glad I am that you will not leave home until the holidays are over: what a capital invention the electric telegraph is, to bring us such famous news! “

“Yes,” replied his father; “had my agent written by post, the letter would not have reached this house before to-morrow evening, when I should have been nearly at Edinburgh. But, by means of the telegraph, the news I have just received, which left Edinburgh at thirty minutes past five o'clock this afternoon, reached the telegraph office at our railway station at twenty-seven minutes to six; so that the message has travelled more than four hundred miles in *three minutes*.”

“How very wonderful!” said Mrs. Robson. “Oh! papa, is it possible ?” cried James.

“Yes; and I am told that still greater feats have been accomplished. But, James, should you like to see and understand the apparatus which works these wonders? “

“Beyond everything, papa; I should be more delighted than I can tell you.”

“Then put on your hat and gloves at once, and we will walk to the railway station, where we shall find my friend Mr. Carr, the superintendent of the telegraph office, who has often told me that he would show me the telegraphic instruments.”

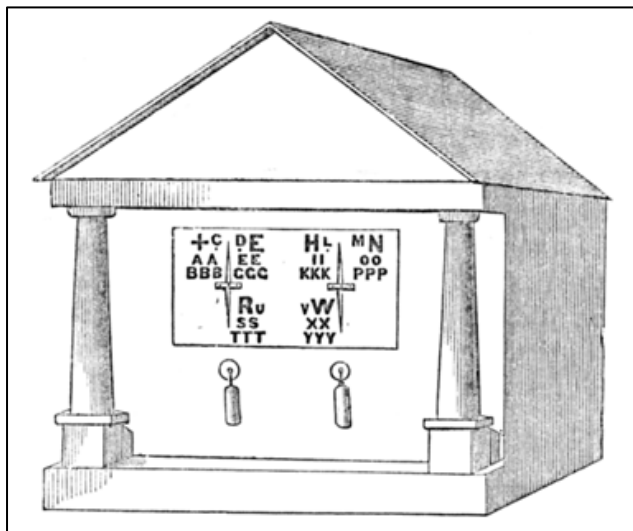
James was ready so quickly, that his father smiled at his impatience; and in a few minutes they set out for the station. The superintendent was in his private office when they arrived, and, after a short delay, gave orders for their admittance.

“You have chosen the best time for your visit,” said Mr. Carr; “my clerks have just received the foreign intelligence for the evening newspapers; so that it was only necessary to keep you waiting a few minutes. You see,” he added; with a smile - “as we have all kinds of secrets passing through the office, from the nomination of a Prime Minister down to the price of potatoes, we cannot admit any strangers until the business of the day is nearly over.

[...Mr. Carr then used a sketch-pad to explain how a battery works and then how a needle in the instrument that is suspended between coils is moved when a current passes through the coil....]

“There is a very simple mechanical contrivance,” replied Mr. Carr, “attached to each instrument, by which the battery can be brought into use at the various stations when required; but otherwise the wires are left free for the passage of signals along the whole line, which could not be the case if the battery at any intermediate station was kept in constant connection with the wires. All the needles along the line would perpetually point in one direction, and the communication would, of course, be stopped.”

Mr. Carr then led them into a room in which, ranged upon long tables, were a great many curious *clock-like* instruments, with mahogany cases, brass fittings, and square dial-plates, bearing the letters of the alphabet, and two upright pointers or needles. Clerks were in attendance, and some were employed in rapidly moving to and fro two handles, which James observed were in front of each instrument, immediately under the pointers.



Above the instruments, on the walls of the office, were cards bearing the words, “To Carlisle, Edinburgh, and Glasgow;” “To Manchester and Liverpool;” “To Derby, Leeds, York, and Hull,” &c., apparently indicating the towns with which the instruments were respectively in communication.

“You may be surprised, my young friend,” said Mr. Carr, “to see two pointers, although I have hitherto spoken only of one. *One* pointer with its inner needle and coil of wire is sufficient, but two sets are generally employed, to get through the work faster. Each set is quite separate from the other.”

“This,” continued the superintendent, pointing to the principal instrument, “is our Edinburgh line. By moving the handles you see in front, either to the right or left, the battery, till that moment unconnected with the instrument, becomes connected with the wires of the main line; and the electricity flowing through the coil, causes the needle to move to the right or left.”

At this moment the needles or pointers on the dial commenced a variety of movements, which followed each other so quickly that James found the rapidity quite bewildering.

“That,” said the superintendent, when the motion ceased, “was a message from the Charing Cross station to Birmingham.”

“But how did you know it was not for you, since you could also read the message here?” asked James. “Because, before a message is commenced, a signal is given to show for which station on this set of wires it is intended, and from which office it is about to be sent. But now I will ask the clerk in Worcester to go through the alphabet very slowly, that you may see how we communicate by signs.”

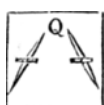
In less than a minute, to James's astonishment, the request was made and agreed to, although the distance between the offices was more than 150 miles.

“But, before he commences,” said Mr. Carr,” let me give you a word of explanation. As many times as each of the capital letters is engraved to the right or left of the needles, so many times will the needle beat or tap in that direction, to indicate the particular letter. All letters in the upper half of the dial, with the exception of Q, are represented by movements of *one* needle only; those in the lower half by simultaneous motions of *both* needles.”

With this preface, Mr. Carr gave the signal to Worcester, “Go on;” and, to James's delight, he saw first the left-hand needle beat twice to the left (A) ; then thrice (B); then towards the large E, and back to the + (C) ; the reverse (D).

James observed that he thought the letters C and D must puzzle the clerks, as the movements seemed so difficult. But Mr. Carr said the eye soon became accustomed to such movements, however difficult they might appear.

Meanwhile the alphabet went on: one beat to the right (E); two (F); three (G); then similar movements of the right-hand needle for H, I (no J), K, L, M, N, O, P; for the letter Q both needles pointed thus:



both needles once to the right (R); twice (S), and so on; the letter Z being shown by both needles pointing in the reverse of Q, thus:



When the alphabet was completed, Mr. Carr thanked the Worcester clerk for his attention, and the clerk replied that he was happy to do anything that Mr. Carr wished.

“Will you be so kind as to explain,” asked James, “the meaning of the cross at the left of the left-hand needle?”

“Ah! that is one of our most useful signals,” replied Mr. Carr; “it is represented by a single beat of the needle to the left, and is sent at the completion of every word to ask if the word is understood. If such be the case, the clerk at the distant office sends back E, meaning thereby, ‘I understand, -go on;’ but if he feels a doubt about the word just signalled, he repeats the +, meaning, ‘Spell the word again, I do not understand it.’”

“Then do you spell every word in full?” inquired Mr. Robson.

“Every word: but such is the rapidity with which experienced clerks can read the signals, that my chief clerk, Mr. Evans, has deciphered, upon extraordinary occasions, 600 beats of the needle per minute, or at about three times the rate of ordinary writing.”

“Do not the telegraph clerks often mistake one signal for another?” asked James.

“Not often. Of course, at times, an act of carelessness may occasion a mistake; but with careful and experienced clerks, errors are of rare occurrence. I recollect a very amusing blunder (if we may ever consider telegraphic errors as amusing), which once happened: A few years ago, a barrister on the northern circuit, starting upon his journey, forgot to take with him his wig. Upon his arrival at the town where the judges held their court, he discovered his omission; and, therefore, at once telegraphed to his clerk that he had, by mistake, left his wig locked up in the strong-room packed in a box, and that the package was to be forwarded immediately. Now you will recollect that, while one beat of the needle to the right signifies E and two beats F, the two letters if allowed to follow each other without a pause represent G; so that three beats will denote either E and F, or G. Well, as ill-luck would have it, the letter was imperfectly signalled, and the word ‘wig’ read of ‘wife!’

You may imagine the horror and perplexity of the lawyer's clerk to whom the message was delivered, who thought, no doubt, until the ludicrous blunder was cleared up, that either his master had taken leave of his senses, or that there was some dreadful domestic mystery to be unravelled.”

James and his father laughed at this anecdote.

“I am afraid,” said James, “I should never understand the movements, either slowly or quickly.”

Mr. Carr replied, “We will try your powers. I will ask our obliging friend what weather they have in Worcester; and I will request him to work very slowly, so that you may read his answer.”

James coloured: he thought Mr. Carr perhaps intended to make fun of him; but a moment's reflection told him that the kind-hearted superintendent could not wish to do so. Mr. Carr placed him on the chair in front of the instrument, and asked the following question of Worcester:- “How is the weather with you?”

“Now look out, James,” cried he.

“An instant afterwards, the left needle gave two distinct taps or beats to the right.

“F,” cried James, breathlessly. “Bravo!” said Mr. Carr.

Right needle, two beats to the right hand.

“O.”

“Excellent!”

Left needle, thrice to the right.

“G.”

Again, thrice to the right.

“G. F, O, G, G; what does that mean?” asked James. “You are too impatient, my young friend: see!

Both needles thrice to the left. “Y. FOGGY!” shouted James.

“Quite right,” said Mr. Carr; “but see! he points once to the +: do you understand the word? If so, point to E, which will show him that you do understand his signals.”

James declared that he understood what he had read, and so sent the “understand” signal.

“But how is it that you do not use a bell?” he asked. “I thought you always rang a bell to draw attention.”

“Except at very small stations, we have discontinued the bell. We found that if the bells got out of order, the clerks who trusted to them for attracting their attention were apt to become careless. We therefore rely solely upon their keeping a sharp look-out on the instruments; and the plan answers very well.”

“And pray,” asked Mr. Robson, “can you forward communications from this office to Paris, Brussels, Vienna, or any Continental city?”

“We can,” was the reply. “Of course, we are not always able to hold *direct* conversation with those cities from this office, because our wires terminate at the central office at Lothbury; and therefore we must first telegraph there, - whence the message is re-telegraphed to its destination. But were it not that our own arrangements make this plan preferable, we could, without doubt, ‘speak’ direct with the Continent from this room. Very distant cities are sometimes spoken with from London.”

“Have you ever sent a telegraphic message to Russia, without its stopping on the way?” inquired Mr. Robson.

“Oh, yes. I was present on the very first occasion of an unbroken telegraphic communication being held between England and Russia. It occurred one evening very shortly after the termination of the war, that one of the best linguists in the London office suddenly exclaimed, ‘Suppose we stir up Russia!’ A very queerly worded proposal, was it not? But, however, odd as it was, we agreed to it. We increased the number of our batteries (not by charging them with bomb-shells or cannon-balls), and at once ‘opened fire’ upon the Muscovite. First we signalled Hanover; then Hanover turned us on to the Berlin line; and so on, until some station, I forget which, said, ‘Call St. Petersburg.’ We did so, and were well rewarded for our trouble; for, after a few seconds had elapsed, appeared the signals, faint at first, and uncertain, as if the fog and mist of Russia were reluctantly allowing the electric current to escape them:- ‘I-am-St.-Petersburgh;-who-are-you?’ ‘London,’ was the prompt reply; ‘hope you're quite well.’ And so the conversation went on.”

“How long were you in obtaining a reply from Russia?” asked Mr. Robson.

“The words ‘I am St. Petersburg’” said the superintendent, “could not have occupied more than twenty or thirty seconds - say half a minute, in travelling the great distance between the city of the Neva and London; and our own reply was as swift. In that brief period the fire-tipped syllables had rushed over miles and miles of our own country - under the sea - over mountains, rocks, and valleys - across rivers - through kingdoms and principalities - now pursuing for great distances a subterranean path, now a course high in the air - over vast tracts of land; and finally reached, with one vast leap of some thousand miles, the heart of a great empire.”

“Truth is certainly at times stranger than fiction,” said Mr. Robson. “I think we have fairly outdone the ‘Arabian Nights’ with their marvels. But at the risk of exhausting your good-nature, let me ask one more question. Can you give us an instance of an unusually rapid transaction of business between merchants by means of the telegraph?”

“Yes,” said the superintendent, “I can. A sharebroker in London one day gave in a message at the Central Telegraph Station, at twenty-five minutes past twelve, addressed to his correspondent at Leeds, in Yorkshire, 200 miles distant. The message, instructing the agent to buy several thousand pounds' worth of railway shares, was transmitted to Leeds in three-quarters of a minute: it was delivered instantly to the gentleman for whom it was intended, the shares were bought, and the reply, announcing the completion of the purchase, was telegraphed into London at thirty-one minutes past twelve, in fact, before the ink on the original message paper had become thoroughly dry!”

“And so messages have been actually sent over a total distance of 400 miles and several thousand pounds laid out in six minutes?” exclaimed Mr. Robson.

“Precisely so. And although this does not occur every day, still it shows of what the telegraph is capable. We have received messages from abroad actually before the time at which they were stated to have been written. But, this, of course, was owing to a difference in the clocks caused by a difference of longitude. Now, I must tell you a very wonderful fact,” said the superintendent, “which is of the utmost importance to us. The electricity that conveyed the signals which you have just deciphered, performed half its journey *through the earth*, and the other half by wire.”

“Is it possible?” cried both Mr. Robson and his son. “Yes,” was the reply; “instead of having in reality one wire to convey the electricity to the distant stations and a separate wire for its return - i.e., two wires for each needle - we bury the ends of the line wires in the earth

at the terminal stations, say, for instance, at London and at Liverpool; so that while one wire conveys the electricity in one direction, the earth itself supplies the place of the second wire, thus forming half the circuit. Under the application of this discovery, a signal passing from London to Liverpool or Edinburgh along the line wire, *returns through the earth to London*, and *vice versa*. I did not tell you this at first, because I wished my explanation to be as simple as possible.”

James declared that this was the most extraordinary part of the invention. “But,” inquired he, “why do we see so many wires on the railway? I counted eight one day.”

“We seldom allow more than six stations to be in communication with one pair of wires, or else our business would be delayed by several offices wishing to telegraph at once. But,” continued Mr. Carr, “there is a great deal yet to be explained respecting the submarine and subterranean telegraphs, and various forms of telegraphic apparatus; and I have a collection of anecdotes to relate that would interest you. But I must reserve these for another day, as the office is about to close. I recollect, however, once saving a woman's life by telegraph, but--”

“Oh! pray tell us that story!” exclaimed James.

“One dark winter's morning,” replied the superintendent, “a woman gave her daughter, who was on the point of starting for a distant town by railway, a strong dose of laudanum in mistake for a cordial mixture. Some time after the daughter's departure, the mother, to her horror, found out the mistake she had committed. In her terrible distress some relatives proposed the use of the telegraph. It was then too early to find the office open, and the relations came in the greatest haste and distress to me. Not a moment was to be lost, or the girl's life might pay the penalty. I came immediately to this office, and ascertained that the train was then in sight of the S-- station. I telegraphed instantly to the station-master, describing the girl and explaining the case, and requested him to take the young woman out of the train, and send for a medical man.”

“Was she saved?” anxiously asked James.

“Yes,” replied Mr. Carr; “the message was just in time. The young woman was found in a most critical state; but, by the prompt measures taken by the medical man, she was, to the great joy of her mother, restored to consciousness, and she ultimately recovered her usual health.”

“Oh!” said James, “how proud you must have felt at having saved her life.”

“It was certainly a happy result,” said Mr. Carr; “and I felt grateful at having been, in the discharge of my duty, the means, in some degree, of bringing it about.”

Robson thanked the superintendent for the kindness which he had shown in explaining the wonders of his office; and he and his son returned home very much interested and gratified with what they had seen and heard of the Electric Telegraph.

JSR

*[By the 1870s, when this account was being read, the Morse telegraph was rendering Cooke and Wheatstone's needle telegraph obsolete. Changing technology is not just a phenomenon of recent times.]*