subtle agent in sending communications below the surface of the water. As early as the 10th of August, 1843, we find him addressing a letter to the Secretary of the Treasury of the United States, in which he makes use of the following language speaking of an experiment which he had made the year previous to test the practicability of transmitting the electric current through a conductor submerged in water:—

117-1

The inference from this law is that a telegraphic communication on my plan may with certainty be established across the Atlantic. Startling as this may now seem, the time will come when this project will be realized.

In the HERALD of October 18, 1842, the following notice appeared in regard to the first experiment made in subaqueous te[illegible]aphing:—

MOR[illegible]S ELECTRO MAGNETIC TELEGRAPH.

This important invention is to be exhibited in operation at Castle Garden between the hours of 12 and 1 o'clock to-day. One telegraph will be erected on Governor's Island and one at the Castle, and messages will be interchanged and orders transmitted during the day. Many have been incredulous as to the powers of this wonderful triumph of science and art. All such may now have an opportunity of fairly testing it. *It is destined to work a complete revolution in the mode of transmitting intelligence throughout the civilized world.*

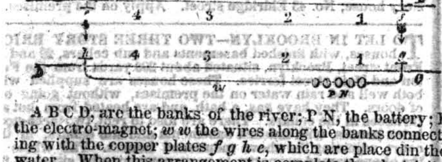
About 8 o'clock on the evening of the same day Professor Morse, with one assistant, commenced laying the f[illegible] submarine telegraph ever constructed. The cable, [illegible] may be allowed the expression, was not more than the twelfth of an inch in diameter, as may be seen from the annexed engraving of the lateral and end sections:—

117-2

The copper wire which is represented by the white space in the end section was insulated by means of a hempen strand which was protected from the action of the water by a coating of tar, pitch and india rubber. About two miles of this wound on a reel was placed in a small row boat, and with one man at the oars and Professor Morse at the stern the work of paying out the cable was commenced. It was a beautiful moonlight night, and those who had prolonged their evening rambles on the Battery wondered as they gazed at the proceedings in the boa what kind of fishing the two men could be engaged in tha required so long a line. In somewhat less than two hours on that eventful evening of the 18th of October, 1842, "the cable" was laid. Professor Morse returned to his home and waited with some anxiety the time when he should be able to test the experiment fully and fairly. The following morning at daybreak he was on the Battery, and had just established its success by the transmission o three or four characters between the termini of the line, when the communication was suddenly interrupted, and it was found impossible to send any messages through the conductor. The cause of this was explained by his observing no less than seven vessels lying along the line of the submerged cable, one of which, in getting under way, had raised it on her anchor. The sailors unable to divine its meaning, hauled in about two hundred feet of it on deck, and finding no end, cut off that portion, and carried it away with them. Thus ended the first attempt at submarine telegraphing. Then a small boat was employed in the operation, but such has been the progress in fifteen years that the prediction of Professor Morse is on the eve of being fulfilled. Now we behold four magnificent naval vessels employed in the great work of uniting two worlds by a telegraph line stretched across the bed of the Atlantic ocean, and connecting points which are between sixteen and seventeen hundred miles distant from each other.

In 1844 he wrote another letter to the Secretary of the Treasury in which he refers to his experiment at Castle Garden, and speaks of a new mode of telegraphing across rivers or other bodies of water without wires. The following extract from his letter is peculiarly interesting at this time:—

In the autumn of 1842, at the request of the American Institute, I undertook to give to the people in New York a demonstration of the practicability of my telegraph by connecting Governor's Island with Castle Garden, a distance of a mile; and for this purpose I laid my wires properly insulated beneath the water. I had scarcely begun to operate, and had received but two or three characters when my intentions were frustrated by the accidental destruction of a part of my conductors by a vessel which drew them up on her anchor and cut them off. In the moments of mortification I immediately devised a plan for avoiding such an accident in future by so arranging my wires along the banks of the river as to cause the water itself to conduct the electricity across. The experiment, however, was deferred till I arrived in Washington, and on December 16, 1842, I tested my arrangement across the canal and with success. The simple fact was ascertained that electricity could be made to cross a river without other conductors than the water itself, but it was not till the last autumn that I had the leisure to make a series of experiments to ascertain the law of its passage. The following diagram will serve to explain the experiment:—



A B C D, are the banks of the river; P N, the battery; E the electro-magnet; *w w* the wires along the banks connecting with the copper plates *f g h e*, which are place din the water. When this arrangement is complete the electricity generated by the battery passes through the positive pole to the plate *h*, across the river through the water to plate *e*, and thence around the coil of the magnet E to plate *f*, and across the river again to plate *g*, and thence to the other pole of the battery N. The numbers 1 2 3 4 indicate distances along the bank measured by the number of times of the distance across the river. The distance across the canal is eighty feet.

On August 24 the following were the results of the experiment:—

No. of Experiments.	No. of Cups in Battery.	Length of Conductors w. w.	Degree of Motion of Galvanometre.	Size of the Copper Plates f. g. h. e.
1	14	400 feet.	32 & 24	5 by 2½ ft.
2	14	400 "	13½ & 4½	16 by 13 in.
3	14	400 "	1 & 1	6 by 5 in.
4	7	400 "	24 & 13	5 by 2½ ft.
5	7	300 "	29 & 21	5 by 2½ ft.
6	7	300 "	21½ & 15	5 by 2½ ft.

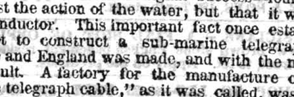
—Showing that electricity crosses the river and in quantity in proportion to the size of the plates in the water. The distance of the plates on the same side of the river from each other also affects the result. Having ascertained the general effect, I was desirous of discovering the best practical distance at which to place my copper plates, and not having the leisure myself, I requested my friend Professor Gale to make the experiments.

117-3

These experiments were made, and with the most satisfactory results. While engaged in testing this mode of communicating by electricity, a gentleman who was interested in the subject asked Professor Morse if he could apply it to such a vast body of water as the Atlantic, and thus establish a connection between Europe and our own continent. "Yes," said the Professor, "but in theory only, as I should require at least nine miles of coast on either side to bring it into practical operation."

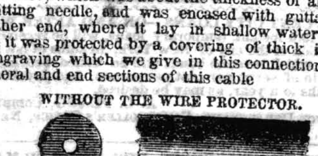
We have described the first attempt at manufacturing a submarine cable, and the circumstances which attended its submersion between Governor's Island and Castle Garden, fifteen years ago. From that time up to about the year 1849 no successful attempt was made to attain this important object. In that year it was proposed to lay a telegraph between Dover and Calais, but so many difficulties were presented in the way of such an undertaking that it was considered almost impossible. The wire, it was proved by frequent attempts, could not be wholly insulated, and the electric fluid, as it passed along the exposed portions, was so diffused by contact with the water as to lose its efficiency. Hemp, saturated with tar, was employed; but in course of time it was found that the water penetrated through that covering, and the project was about being abandoned as hopeless when a new material was discovered, which was found to answer the purpose when everything else had failed. Fortunately, at this very time, when it was most needed, *the valuable properties of gutta percha and its entire adaptability to this purpose were made known.* It was tested with the most signal success—found not only to resist the action of the water, but that it was a perfect non-conductor. This important fact once established, the attempt to construct a sub-marine telegraph between France and England was made, and with the most gratifying result. A factory for the manufacture of "the submarine telegraph cable," as it was called, was erected in England in 1850, and by September of that year twenty-four miles of it were made and ready to be laid down from Calais to Dover. This cable consisted simply of the copper wire, which was about the thickness of an ordinary knitting needle, and was encased with gutta percha. At either end, where it lay in shallow water near the shore, it was protected by a covering of thick iron wire. The engraving which we give in this connection present the lateral and end sections of this cable

WITHOUT THE WIRE PROTECTOR.



In the following engravings it will be observed that the inner core, or conductor, with its gutta percha coating, is preserved from the action of the water and from attrition by

THE WIRE PROTECTOR.



This cable was laid in the latter part of August, 1850, between Dover and Calais. Two small steamers were employed in laying it, and the work was accomplished in from six to seven hours. For the purpose of sinking the cable chunks or weights of from fourteen to twenty-four pounds each were fastened to it at distances of the sixteenth of a mile apart. This was an easy matter, the greatest depth not exceeding two hundred feet along the course of the line. In the whole length not more than twenty-four miles of cable were paid out, which was only three more than the actual distance between the two points. It was found, however, a short time after it was laid, that a portion of it had given way, and the communication was interrupted. Under these circumstances it was deemed advisable to manufacture a cable which would be able to resist all the straining it might be subjected to, and in a comparatively brief period the required article was produced and successfully laid down between the points already named. This cable was composed of four copper wires or conductors, each insulated with gutta percha, and afterwards bound together with hemp steeped in a solution of tar and tallow. In this condition it had the appearance of a rope about an inch in diameter. Outside of the hemp was the iron wire protector, which increased the diameter to nearly an inch and a half. Nine miles of this cable were manufactured every day.

In the latter part of May, 1852, Great Britain and Ireland were brought into instant communication through the same wonderful agent, the submarine telegraph. The distance between the points of connection—Holyhead and Howth—is sixty-five miles, and the greatest depth five hundred and four feet. There was only one wire in this cable, with the indispensable coating of gutta percha, which was protected and strengthened by the iron wire covering the outside. It was laid at the rate of four miles per hour, and fell so evenly that only three miles more than the actual distance traversed was required.

117-4

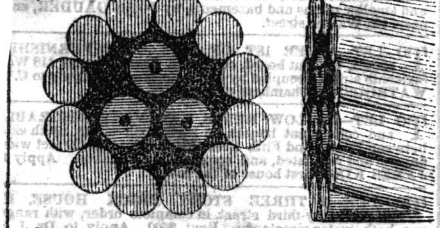
Scotland and Ireland were connected by a cable of six wires in May, 1853. The distance is about thirty miles, and was traversed by the steamer in not more than ten hours. The following June a cable was laid from Orfordness, in England, to the Hague, in Holland, a distance of one hundred and fifteen miles. This task was accomplished in thirty-four hours, and only four and a half miles of cable were required in the paying out over the actual length from point to point, making hardly one hundred and twenty miles altogether. Another cable connects Dover with Ostend, making the third between England and the continent.

In the summer of 1854 a telegraphic union was effected between Corsica and Sardinia, in Italy, the Sardinian government having granted three vessels of war to assist in the undertaking. This work was attended with much difficulty in consequence of the breaking of a part of the wire. The submerging of a cable between Corsica and the Island of Sardinia was successfully accomplished shortly after; but the a[illegible]tempt which was subsequently made to connect the island of Sardinia and Algeria, and thus establish immediate communication between the continents of Europe and Africa, was unsuccessful, and has not since been attempted. That it will be effected, and at no distant day, there is no reason to doubt; as the obstacles are not of an insurmountable character.

The New York, Newfoundland and London Telegraph Company made an attempt in August of 1855, to unite the islands of Newfoundland and Cape Breton, but the vessels employed in the work were caught in a gale, the cable was obliged to be cut, and the undertaking abandoned for that time. The cable, as may be seen from the accompanying engravings, which show the exact size, had three conductors; and was protected in the same manner, by iron wire, as those already described:—

117-5

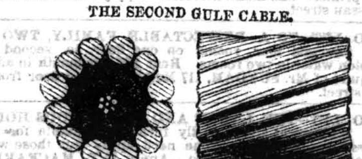
THE FIRST GULF CABLE.



Last year the company succeeded in making the desired telegraphic connection between the opposite shores of Newfoundland and Cape Breton. This time they rejected the three wire cable and procured a much lighter one, with a single wire, consisting of seven strands. The object of this arrangement, instead of a single wire of the same thickness, is to provide against the possibility of any break of continuity taking place in the metal. This strand will stretch twenty per cent of its own length, and is covered with three layers of the purest gutta percha, separately applied. In the subjoined engraving our readers have a correct representation of this cable and of its exact size.

The cable weighs somewhat less than a ton to the mile, and is one of the lightest and strongest of its thickness yet manufactured.

THE SECOND GULF CABLE.

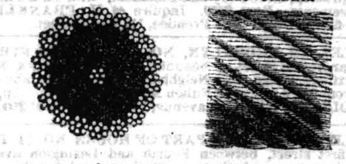


A few weeks after the allied army entered the Crimea a single wire cable was laid across the Black Sea, a distance of three hundred and seventy-four miles, between Varna and Balaklava, and it was through this that the English and French governments were apprised every day of the movements of the belligerent forces on either side. This is the longest submarine cable which has yet been laid, and the operation of submerging it would have been regarded ten or twelve years ago as an utter impossibility. Surprising, however, as this and all the other enterprises which we have noticed may appear, they dwindle into insignificance with that in which the New York, Newfoundland and London Telegraph Company are now engaged.

This work will probably be completed, as we have already stated, within two months, and will be performed by two American and two English war steamers. The Niagara will take one half the cable, or one thousand two hundred and fifty miles of it, on board at London, while one of the English steamers will receive the other half at Birkenhead, near Liverpool. The four vessels will then proceed to a point in the Atlantic as nearly equi-distant as possible from the termini of the line in Ireland and Newfoundland. Joining the separate ends of the line by an ingeniously contrived connector, they will drop it in mid ocean and take their way to their separate places of destination, paying out the cable as they go, and keeping up the telegraphic communication with each other as they progress by the transmission of despatches from ship to ship. Each of the vessels having the line will be accompanied by one of the other two as an escort to assist in any way that may be required. On the arrival of the Niagara at Newfoundland with her end of the line, she will have it conveyed on shore, and this accomplished, will go back to England before her return to the United States. The distance between Valentia Bay, in the southwest of Ireland, and St. Johns, Newfoundland—the two points of connection—is sixteen hundred and fifty miles.

From the accompanying engravings it will be seen that the transatlantic submarine cable is somewhat differently made from any previously manufactured:—

THE GREAT ATLANTIC CABLE.



The core, or conductor, is composed like that of the gulf cable, of seven copper wires wound together in the same manner. The cable will be two thousand five hundred miles in length, the surplus over the actual distance to be traversed being considered necessary in case of emergency to make up for the inequalities in the bed of the ocean and the variations that may be caused by the winds and currents. The protecting wires are made into strands, each composed of seven of the best charcoal iron wires. The aggregate length of the smaller wires required in the manufacture of one mile of the cable is one hundred and twenty-six miles, and the *whole cable will require three hundred and fifteen thousand miles of this wire.*

The flexibility of this cable is so great that it can be made as manageable as a small rope, and it is capable of being tied around the arm without injury. Its weight is but 1,800 pounds to the mile, and its strength such that it will bear in water over six miles of its own length if suspended vertically. Some doubts being entertained as to its sinking to the bottom, it is enough to know that it is heavier than those shells which have been taken up from the bed of the ocean by Commander Berryman, while engaged in sounding along the line of the telegraph plateau. It has been asserted, too, that the strands of slender iron wire by which it is protected, will suffer corrosion or decomposition in a short time after their submersion, but in doing so the material of which they consist will enter into chemical union with the soft mud in which the cable is imbedded, and will thus form a concrete mass of calcareous or saliceous substance, affording the very best possible protection.

As the time selected for the laying of the cable will be at that period when the days are longest, there will be comparatively little night to cause interruption to the work. The whole operation it is calculated will not take more than eight days in its completion. On approaching the land at each end a much thicker cable will be used, and of sufficient