27th Congress, 3d Session. Rep. No. 17. Ho. of Reps.

ELECTRO-MAGNETIC TELEGRAPHS.

[To accompany bill H. R. No. 641.]

December 30, 1842.

Five thousand extra copies ordered to be printed.

Mr. Ferris, from the Committee on Commerce, made the following

REPORT:

That they regard the question, as to the general utility of the telegraphic system, settled by its adoption by the most civilized nations; and experience has fully demonstrated the great advantages which may be derived from its use. Its capability of speedily transmitting intelligence to great distances, for national defence, and for other purposes, where celerity is desirable, is decidedly superior to any of the ordinary modes of communication in use. By it, the first warning of approaching danger, and the appearance of hostile fleets and armies on our coasts and borders, may be announced simultaneously at the most distant points of our widely-extended empire, thus affording time and opportunity for concentrating the military force of the country, for facilitating military and naval movements, and for transmitting orders suitable to the emergency.

In the commercial and social affairs of the community, occasions frequently arise, in which the speedy transmission of intelligence may be of the highest importance for the regulation of business transactions, and in relieving the anxious solicitude of friends, as to the health and condition of those in whose fortunes they feel an interest.

The practicability of establishing telegraphs on the electric principle is no longer a question. Wheatstone, of London, and his associates, have been more fortunate than our American inventor, in procuring the means to put his ingenious system into practical use for two or three hundred miles, in Great Britain; and the movements of the cars on the Blackwall railroad are at this time directed with great economy, and perfect safety to life and property, by means of his magnetic needle telegraph. If a system more complicated and less efficient than the American telegraph is operated for great distances in England, with such eminent success and advantage, there can be no reasonable doubt that, if the means be furnished for putting in operation the system of Professor Samuel F. B. Morse, of New York, the original inventor of the electro-magnetic telegraph, the same, if not greater success, will be the result. Your committee are of opinion that it is but justice to Professor Morse, who is alike distinguished for his attainments in science and excellence in the arts of design, and who has patiently devoted many years of unremitting study, and freely spent his private fortune, in inventing and bringing to perfection a system of telegraphs which is calculated to advance the scientific reputation of the country, and to be emi-

nently useful, both to the Government and the people, that he should be furnished with the means of competing with his European rivals.

Professor Morse bases his system upon the two following facts in science:

First. That a current of electricity will pass to any distance along a conductor connecting the two poles of a voltaic battery or generator of electricity, and produce visible effects at any desired points on that conductor.

Second. That magnetism is produced in a piece of soft iron (around which the conductor, in its progress, is made to pass) when the electric current is permitted to flow, and that the magnetism ceases when the current of electricity is prevented from flowing. This current of electricity is produced and destroyed by breaking and closing the galvanic circuit at the pleasure of the operator of the telegraph, who in this manner directs and controls the operation of a simple and compact piece of mechanism, styled the register, which, at the will of the operator at the point of communication, is made to record, at the point of reception, legible characters, on a roll of paper put in motion at the same time with the writing instrument. These characters the inventor has arranged into a conventional *alphabet*, which is contained in the letter appended to this report, and which is capable of being learned and used with very little practice.

Professor Morse has submitted his telegraphic plan to the severe scrutiny of European criticism; and the Academy of Sciences, of Paris, the highest scientific tribunal in the world, hailed it with enthusiasm and approbation, when its operation was exhibited, and its principles explained by their distinguished perpetual secretary, M. Arago.

It appears, from documents produced by Professor Morse, that the thanks of several learned bodies in France were voted to him for his invention, and the large medal of honor was awarded to him by the Academy of Industry. It further appears, that several other systems of telegraphs on the electric plan (among which were Wheatstone's, of London, Steinheil's, of Munich, and Masson's, of Caen) had been submitted at various times for the consideration of the French Government, who appointed a commision to examine and report on them all, at the head of which commission was placed the administrator-in-chief of the telegraphs of France, (M. Foy,) who, in a note to Professor Morse, thus writes:

"I take a true pleasure in confirming to you in writing that which I have already had the honor to say to you viva voce—that I have prominently presented to Monsieur the Minister of the Interior your electro-magnetic telegraph, as being the system which presents the best chance of a practical application; and I have declared to him that, if some trials are to be made with electric telegraphs, I do not hesitate to recommend that they should be made with your apparatus."

Your committee, in producing further evidence of the approbation by the scientific world of the system of Professor Morse, would cite the letter of Professor Henry, of Princeton College, well known for his eminent attainments in electrical science, (marked A,) in the appendix of this report.

More recently, a committee, consisting of some of our most distinguished scientific citizens, was appointed by the American Institute of New York to examine and report upon this telegraph, who made the report (B) in the appendix. In compliance with the recommendation of this report, the Institute awarded to Professor Morse the gold medal.

Besides the evidence these testimonials furnish of the excellence of Professor Morse's system, your committee, as well as the greater part of the

members of both Houses of Congress, have had a practical demonstration of the operation of the electro-magnetic telegraph, and have witnessed the perfect facility and extraordinary rapidity with which a message can be sent by means of it from one extremity of the Capitol to the other. This rapidity is not confined in its effects to a few hundred feet, but science makes it certain that the same effects can be produced, at any distance on the globe, between any two given points connected by the conductors.

Your committee have alluded to other electric telegraphs; for, as is not uncommon in the birth of great inventions, scientific minds have, at nearly the same period of time, in various parts of Europe, conceived and planned electric telegraphs; but it is a matter of national pride, that the invention of the *first electro-magnetic telegraph*, by Professor Morse, as well as the *first conception* of using electricity as the means of transmitting intelligence, by Doctor Franklin, is the offspring of American genius.

Your committee beg leave to refer to the letter of Professor Morse, (marked C,) in the appendix, to C. G. Ferris, one of the committee, giving, at his request, a brief history of the telegraph since it was before Congress, in 1838, for some interesting information concerning it, and for Professor Morse's estimate of the probable expense of establishing his system of telegraphs for thirty or forty miles.

They would also refer to the House document No. 15, (December 6, 1837,) and to House report No. 753, (April 6, 1838,) for valuable information on the subject of telegraphs.

Your committee invite special attention to that part of Professor Morse's letter which details the plan of a *revenue* which may be derived from his telegraphic system, when established to an extent sufficient for the purposes of commercial and general intelligence. From these calculations, made upon safe data, it is probable that an income would be derived from its use by merchants and citizens more than sufficient to defray the interest of the capital expended in its establishment. So inviting, indeed, are the prospects of profit to individual enterprise, that it is a matter of serious consideration, whether the Government should not, on this account alone, seize the present opportunity of securing to itself the regulation of a system which, if monopolized by a private company, might be used to the serious injury of the Post Office Department, and which could not be prevented without such an interference with the rights of the inventor and of the stockholders as could not be sustained by justice or public opinion.

After the ordeal to which the electro-magnetic telegraph system has been subjected, both in Europe and in America, and the voice of the scientific world in its favor, it is scarcely necessary for your committee to say that they have the fullest confidence in Professor Morse's plan, and they earnestly recommend the adoption of it by the Government of the United States. They deem it most fortunate that no definite system of telegraphs should hitherto have been adopted by the Government, since it enables them to establish this improved system, which, in the opinion of your committee, is decidedly superior to any other now in use, possessing an advantage over telegraphs depending on vision, inasmuch as it may be used both by night and day, in all weathers, and in all seasons of the year, with equal convenience; and, also, possessing an advantage over electric telegraphs heretofore in use, inasmuch as it records, in permanent legible characters on paper, any communication which may be made by it, without the aid of any agent at the place of recording, except the apparatus which is put in mo-

tion at the point of communication. Thus, the recording apparatus, called the register, may be left in a closed chamber, where it will give notice of its commencing to write by a bell, and the communication may be found on opening the apartment. Possessing these great advantages, and the means of communication not being liable to interruption by the ordinary contingencies which may impede or prevent the successful action of other telegraphs, the advantages to be derived from it will soon be apparent to the community, and it will become the successful rival of the Post Office, when celerity of communication is desired, and create a revenue from which this system of telegraphs may be extended and ramified through all parts of the country, without imposing any burden upon the people or draughts on the Treasury, beyond the outlay for its first establishment.

As a first step towards the adoption of this system of telegraphy by the Government, your committee recommend the appropriation of thirty thousand dollars, to be expended under the direction of the Postmaster General, in constructing a line of electro-magnetic telegraphs, under the superintendence of Professor Samuel F. B. Morse, of such length and between such points as shall fully test its practicability and utility; and for this purpose they respectfully submit the following bill:

A BILL to test the practicability of establishing a system of electro magnetic telegraphs by the United States.

Be it enacted by the Senate and House of Representatives of the United States in Congress assembled, That the sum of thirty thousand dollars be, and is hereby, appropriated, out of any moneys in the Treasury not otherwise appropriated, for testing the capacity and usefulness of the system of electro-magnetic telegraphs invented by Samuel F. B. Morse, of New York, for the use of the Government of the United States, by constructing a line of said electro-magnetic telegraphs, under the superintendence of Professor Samuel F. B. Morse, of such length and between such points as shall fully test its practicability and utility; and that the same shall be expended under the direction of the Postmaster General, upon the application of said Morse.

Sec. 2. *And be it further enacted*, That the Postmaster General be, and he is hereby, authorized to pay, out of the aforesaid thirty thousand dollars, to the said Samuel F. B. Morse, and the persons employed under him, such sums of money as he may deem to be a fair compensation for the services of the said Samuel F. B. Morse, and the persons employed under him, in constructing and in superintending the construction of the said line of telegraphs authorized by this bill.

A.

Princeton College, *February* 24, 1842.

My Dear Sir: I am pleased to learn that you have again petitioned Congress in reference to your telegraph, and I most sincerely hope that you will succeed in convincing our Representatives of the importance of the invention. In this you may, perhaps, find some difficulty, since, in the minds of many, the electro-magnetic telegraph is associated with the vari-

ous chimerical projects constantly presented to the public, and particularly with the schemes, so popular a year or two ago, for the application of electricity as a moving power in the arts. I have asserted, from the first, that all attempts of this kind are premature, and made without a proper knowledge of scientific principles. The case is, however, entirely different in regard to the electro-magnetic telegraph. *Science is now fully ripe for this application*, and I have not the least doubt, if proper means be afforded, of the perfect success of the invention.

The idea of transmitting intelligence to a distance by means of electrical action has been suggested by various persons, from the time of Franklin to the present; but until within the last few years, or since the principal discoveries in electro-magnetism, all attempts to reduce it to practice were necessarily unsuccessful. The mere suggestion, however, of a scheme of this kind is a matter for which little credit can be claimed, since it is one which would naturally arise in the mind of almost any person familiar with the phenomena of electricity; but the bringing it forward at the proper moment, when the developments of science are able to furnish the means of certain success, and the devising a plan for carrying it into practical operation, are the grounds of a just claim to scientific reputation as well as to public patronage.

About the same time with yourself, Professor Wheatstone, of London, and Dr. Steinheil, of Germany, proposed plans of the electro-magnetic telegraph, but these differ as much from yours as the nature of the common principle would well permit; and unless some essential improvements have lately been made in these European plans, I should prefer the one invented by yourself.

With my best wishes for your success, I remain, with much esteem, yours, truly,

JOSEPH HENRY.

Professor Morse.

B.

ELECTRO-MAGNETIC TELEGRAPH.

New York, *September* 12, 1842.

The undersigned, the committee of arts and sciences of the American Institute, respectfully report:

That, by virtue of the power of adding to their numbers, they called to their aid the gentlemen whose names are hereunto annexed, with those of the original members of the committee, and proceeded to examine Professor Morse's electro-magnetic telegraph.

Having investigated the scientific principles on which it is founded, inspected the mechanism by which these principles are brought into practical operation, and seen the instruments in use in the transmission and return of various messages, they have come to the conclusion that it is admirably adapted to the purposes for which it is intended, being capable of forming words, numbers, and sentences, nearly as fast as they can be written in ordinary characters, and of transmitting them to great distances with a velocity equal to that of light. They therefore beg leave to recommend the telegraph of Professor Morse for such testimonials of the approbation

of the American Institute as may in its judgment be due to a most important practical application of high science, brought into successful operation by the exercise of much mechanical skill and ingenuity.

All which is respectfully submitted.

JAMES RENWICK, *L. L. D.*,
Prof. Chem. and Nat Phil., Columbia Coll., N. Y.
JOHN W. DRAPER, *M. D.*,
Prof. Chem. and Min., University, city of New York.
WILLIAM H. ELLET, *M. D.*,
Prof. Chem., &c., Coll. of Columbia, S. C.
JAMES R. CHILTON, *M. D.*,
Chem., &c., New York.
G. C. SCHAEFFER,
Associate Prof. Chem., Columbia Coll., N. Y.
EDWARD CLARK.
CHARLES A. LEE, *M. D.*

Extract from the minutes of the Institute:

Resolved, That the report be accepted, adopted, and referred to the premium committee, and that the recording secretary be directed to publish the same, at the expense of the Institute.

C.

NEW YORK, *December* 6, 1842.

DEAR SIR: In compliance with your request, I give you a slight history of my electro-magnetic telegraph, since it was presented for the consideration of Congress, in the year 1838.

During the session of the 25th Congress, a report was made by the Committee on Commerce of the House, which concluded by unanimously submitting a bill appropriating $30,000 for the purpose of testing my system of electro-magnetic telegraphs. The pressure of business at the close of that session prevented any action being taken upon it.

Before the session closed, I visited England and France, for the double purpose of submitting my invention to the test of European criticism, and to secure to myself some remuneration for my large expenditures of time and money in elaborating my invention. In France, after a patent had been secured in that country, my telegraph first attracted the attention of the Academy of Sciences, and its operation was shown, and its principles were explained, by the celebrated philosopher, Arago, in the session of that distinguished body of learned men on September 10, 1838. Its reception was of the most enthusiastic character. Several other societies, among which were the Academy of Industry and the Philotechnic Society, appointed committees to examine and report upon the invention, from all which I received votes of thanks, and from the former the large medal of honor. The French Government at this time had its attention drawn to the subject of electric telegraphs, several systems having been presented for its consideration, from England, Germany, and France. Through the kind offices of our

minister at the French Court, General Cass, my telegraph was also submitted; and the Minister of the Interior (M. Montalivet) appointed a commission, at the head of which was placed M. Alphonse Foy, the administrator-in-chief of the telegraphs of France, with directions to examine and report upon all the various systems which had been presented. The result of this examination (in which the ingenious systems of Professor Wheatstone, of London, of Professor Steinheil, of Munich, and Professor Masson, of Caen, passed in review) was a report to the Minister in favor of mine. In a note addressed to me by M. Foy, who had expressed his warmest admiration of my telegraph in my presence, he thus writes:

"I take a true pleasure in confirming to you in writing that which I have already had the honor to say to you viva voce, that I have prominently presented (signalé) to Monsieur the Minister of the Interior your electro-magnetic telegraph, as being the system which presents the best chance of a practical application; and I have stated to him that if some trials are to be made with electric telegraphs, I hesitate not to recommend that they should be made with your apparatus."

In England, my application for a patent for my invention was opposed before the Attorney General by Professor Wheatstone and Mr. Davy, each of whom had systems already patented, essentially like each other, but very different from mine. A patent was denied me by the Attorney General, Sir John Campbell, on a plea which I am confident will not bear a legal examination. But there being no appeal from the Attorney General's decision, nor remedy, except at enormous expense, I am deprived of all benefit from my invention in England. Other causes than impartial justice evidently operated against me. An interest for my invention, however, sprung up voluntarily, and quite unexpectedly, among the English nobility and gentry in Paris, and, had I possessed the requisite funds to prosecute my rights before the British Parliament, I could scarcely have failed to secure them, so powerfully was I supported by this interest in my favor; and I should be ungrateful did I not take every opportunity to acknowledge the kindness of the several noblemen and gentlemen who volunteered to aid me in obtaining my rights in England, among the foremost of whom were the Earl of Lincoln, the late celebrated Earl of Elgin, and the Hon. Henry Drummond.

I returned to the United States in the spring of 1839, under an engagement entered into in Paris with the Russian Counsellor of State, the Baron Alexandre de Meyendorff, to visit St. Petersburg with a distinguished French savan, M. Amyot, for the purpose of establishing my telegraphic system in that country. The contract, formally entered into, was transmitted to St. Petersburg, for the signature of the Emperor, which I was led to believe would be given without a doubt; and, that no time should be lost in my preparations, the contract, duly signed, was to be transmitted to me in New York, through the Russian ambassador in the United States, in four or five weeks, at farthest, after my arrival home.

After waiting, in anxious suspense, for as many months, without any intelligence, I learned *indirectly* that the Emperor, from causes not satisfactorily explained, refused to sign the contract.

These disappointments, (not at all affecting the scientific or practical character of my invention,) combined with the financial depression of the

country, compelled me to rest a while from further prosecuting my enterprise. For the last two years, however, under many discouraging circumstances, from want of the requisite funds for more thoroughly investigating some of the principles involved in the invention, I have, nevertheless, been able to resolve all the doubts that lingered in my own mind, in regard to the perfect practicability of establishing my telegraphic system to any extent on the globe. I say, "doubts that lingered in my own mind;" th principal, and, indeed, only one of a scientific character, which at all troubled me, I will state, and the manner in which it has been resolved:

At an early stage of my experiments, I found that the magnetic power produced in an electro-magnet, by a single galvanic pair, diminished rapidly as the length of the conductors increased. Ordinary reasoning on this fact would lead to a conclusion fatal to the whole invention, since at a great distance I could not operate at all, or, in order to operate, I should be compelled to make use of a battery of such a size as would render the whole plan in effect impracticable. I was, indeed, aware that by multiplying the pairs in the battery—that is, increasing the intensity or its propulsive power—certain effects could be produced at great distances, such as the decomposition of water, a visible spark, and the deflection of the magnetic needle. But as magnetic effects, except in the latter case, had not to my knowledge been made the subject of careful experiment, and as these various effects of electrical action seemed, in some respects, to be obedient to different laws, I did not feel entirely assured that magnetism could be produced by a multiplication of pairs sufficiently powerful at a great distance to effect my purpose. From a series of experiments which I made, in conjunction with Professor Fisher, during the last summer, upon 33 miles of wire, the interesting fact, so favorable to my telegraphic system, was fully verified, that *while the distance increased in an arithmetical ratio, an addition to the series of galvanic pairs of plates increased the magnetic power in a geometric ratio.* Fifty pairs of plates were used as a constant power. Two miles of conductors at a time, from two to thirty-three, were successively added to the distance. The weight upheld by the magnet from the magnetism produced by 50 pairs gradually diminished up to the distance of 10 miles; after which, *the addition of miles of wire up to 33 miles* (the extent to which we were able to try it) *caused no further visible diminution of power.* The weight then sustained was a constant quantity. The practical deduction from these experiments is the fact that with a very small battery all the effects I desire, and at any distance, can be produced. In the experiments alluded to, the fifty pairs did not occupy a space of more than 8 cubic inches, and they comprised but 50 square inches of active surface.

The practicability of establishing my telegraphic system is thus relieved from all scientific objections.

Let me now turn your attention, sir, one moment to a consideration of the telegraph as a source of revenue. The imperfections of the common systems, particularly their uselessness, on account of the weather, three-quarters of the time, have concealed from view so natural a fruit of a perfected telegraphic system. So uncertain are the common telegraphs as to time, and so meager in the quantity of intelligence they can transmit under the most favorable circumstances, that the idea of making them a source of revenue would not be likely to occur. So far, indeed, from being a source

of revenue, the systems in common use in Europe are sustained at great expense; an expense which, imperfect as they are, is justified, in the view of the Government, by the great political advantages which they produce. Telegraphs with them are a Government monopoly, and used only for Government purposes. They are in harmony with the genius of those Governments. The people have no advantage from them, except indirectly as the Government is benefited. Were our mails used solely for the purposes of the Government, and private individuals forbidden to correspond by them, they would furnish a good illustration of the operation of the common European telegraphic systems.

The electro-magnetic telegraph, I would fain think, is more in consonance with the political institutions under which we live, and is fitted, like the mail system, to diffuse its benefits alike to the Government and to the people at large.

As a source of *revenue*, then, to the Government, few, I believe, have seriously computed the great profits to be derived from such a system of telegraphs as I propose; and yet there are sure data already obtained by which they can be demonstrated.

The first fact is, that every minute of the 24 hours is available to send intelligence.

The second fact is, that 12 signs, at least, can be sent in a minute, instantaneously, as any one may have proof by actual demonstration of the fact on the instrument now operating in the Capitol.

There can be no doubt that the cases, where such speedy transmission of intelligence from one distant city to another is desirable, are so numerous, that when once the line is made for such transmission, it will be in constant use, and a demand made for a greater number of lines.

The paramount convenience, to commercial agents and others, of thus corresponding at a distance, will authorize *a rate of postage proportionate to the distance*, on the principle of rating postage by the mails.

To illustrate the operation of the telegraph in increasing the revenue, let us suppose that but 18 hours of the 24 are efficiently used for the actual purposes of revenue; that 6 hours are allowed for repetitions and other purposes, which is a large allowance. This would give, upon a single circuit, 12,960 signs per day, upon which a rate of postage is to be charged. Intelligence of great extent may be comprised in a few signs. Suppose the following commercial communication is to be transmitted from New York to New Orleans.

Yrs., Dec. 21, rec. Buy 25 bales c., at 9, and 300 pork, at 8.

Here are 36 signs, which take three minutes in the transmission from New York to New Orleans, and which informs the New York merchant's correspondent at New Orleans of the receipt of a certain document, and gives him orders to purchase 25 bales of cotton at 9 cents per pound, and 300 barrels of pork at 8 cents per pound. Thus may be completed, in three minutes, a transaction in business which now would take at least four or five weeks to accomplish.

Suppose that one cent per sign be charged for the first 100 miles, increasing the charge at the rate of half a cent each additional 100 miles, the postage of the above communication would be $2 88 for a distance of 1,500 miles. It would be sent 100 miles for 36 cents. Would any merchant grudge so small a sum for sending such an amount of information in so

short a time to such a distance? If time is money, and to save time is to save money, surely such an immense saving of time is the saving of an immense sum of money. A telegraphic line of a single circuit only, from New York to New Orleans, would realize, then, to the Government, *daily*, in the correspondence between those two cities alone, over *one thousand dollars* gross receipts, or over $300,000 per annum.

But it is a well-established fact, that, as facilities of intercourse increase between different parts of the country, the greater is that intercourse. Thousands travel, in this day of railroads and steamboats, who never thought of leaving their homes before. Establish, then, the means of instantaneous communication between the most distant places, and the telegraphic line of a single circuit will very soon be insufficient to supply the demands of the public—they will require more.

Two circuits will of course *double the facilities, and double the revenue;* but it is an important fact, that the expense of afterwards establishing a second, or any number of circuits, does not proceed on the *doubling* principle. If a channel for conveying a single circuit be made in the first instance of sufficient capacity to contain many more circuits, which can easily be done, additional circuits can be laid as fast as they are called for, at but little more than the cost of the prepared wire. The recent discovery of Professor Fisher and myself shows that a single wire may be made the common conductor for at least six circuits. How many more we have not yet ascertained. So that, to add another circuit is but to add another wire. Fifty dollars per mile, under these circumstances, would therefore add the means of doubling the facilities and the revenue.

Between New York and Philadelphia, for example, the whole cost of laying such an additional circuit would be but $5,000, which would be more than defrayed by *two months'* receipts only from the telegraphs between those two cities.

There are two modes of establishing the line of conductors.

The first and cheapest is doubtless that of erecting spars about 30 feet in height and 350 feet apart, extending the conductors along the tops of the spars. This method has some obvious disadvantages. The expense would be from $350 to $400 per mile.

The second method is that of enclosing the conductors in leaden tubes, and laying them in the earth. I have made the following estimate of the cost of this method:

Wire, prepared, per mile - - - - -	$150 00
Lead pipe, with solderings - - - - -	250 00
Delivery of the pipe and wire - - - -	25 00
Passing wire into the pipes - - - - -	5 00
Excavations and filling in about 1,000 yards per mile, or 3 feet deep, at 15 cents per square yard - - -	150 00
Laying down the pipe - - - - -	3 00
	583 00

One register, with its machinery, comprising a galvanic battery of four pairs of my double-cup battery - - -	$100 00
One battery of 200 pairs - - - - -	100 00

Expense for thirty-nine miles - - - -	$22,737 00
Two registers - - - - - -	200 00
Two batteries - - - - - -	200 00
Services of chief superintendent of construction, per annum -	2,000 00
Services of three assistants, at $1,500 each per annum -	4,500 00
	29,637 00

As experience alone can determine the best mode of securing the conductors, I should wish the means and opportunity of trying various modes, to such an extent as will demonstrate the best.

Before closing my letter, sir, I ought to give you the proofs I possess that the American telegraph has the *priority in the time of its invention.*

The two European telegraphs in practical operation are Professor Steinheil's, of Munich, and Professor Wheatstone's, of London. The former is adopted by the Bavarian Government; the latter is established about 200 miles in England, under the direction of a company in London. In a highly interesting paper on the subject of telegraphs, translated and inserted in the London Annals of Electricity, March and April, 1839, Professor Steinheil gives a brief sketch of all the various projects of electric telegraphs, from the time of Franklin's electrical experiments to the present day. Until the birth of the science of electro-magnetism, generated by the important discovery of Oersted, in 1820, of the action of electric currents upon the magnetic needle, the electric telegraph was but a philosophic toy, complicated and practically useless. Let it be here noticed, that, after this discovery of Oersted, the *deflection of the needle* became the principle upon which the savans of Europe based all their attempts to construct an electric telegraph. The celebrated Ampère, in the same year of Oersted's discovery, suggested a plan of telegraphs, to consist of a magnetic needle, and a circuit for each letter of the alphabet and the numerals—making it necessary to have some 60 or 70 wires between the two termini of the telegraphic line.

This suggestion of Ampère is doubtless the parent of all the attempts in Europe, both abortive and successful, for constructing an electric telegraph.

Under this head may be arranged the Baron Schilling's, at St. Petersburg, consisting of 36 magnetic needles, and upwards of 60 metallic conductors, and invented, it seems, at the same date with my electro-magnetic telegraph, in the autumn of 1832. Under the same head comes that of Professors Gauss and Weber, of Gottingen, in 1833, who simplified the plan by using but a single needle and a single circuit. Professor Wheatstone's, of London, invented in 1837, comes under the same category; he employs five needles and six conductors. Professor Steinheil's, also invented in 1837, employs two needles and two conductors.

But there was another discovery, in the infancy of the science of electro-magnetism, by Ampère and Arago, immediately consequent on that of Oersted, namely: the *electro-magnet*, which none of the savans of Europe who have planned electric telegraphs ever thought of applying, until within two years past, for the purpose of signals. My telegraph is essentially based on this latter discovery.

Supposing my telegraph to be based on the same principle with the European electric telegraphs, which it is not, mine, having been invented in 1832, would still have the precedence, by some months at least, of Gauss and

Weber's, to whom Steinheil gives the credit of being the first to simplify and make practicable the electric telegraph. But when it is considered that all the European telegraphs make use of the deflection of the needle to accomplish their results, and that none use *the attractive power of the electro-magnet to write in legible characters*, I think I can claim, without injustice to others, to be the first inventor of the *electro-magnet telegraph*.

In 1839, I visited London, on my return from France, and, through the polite solicitations of the Earl of Lincoln, showed and explained its operation at his house, on the 19th of March, 1839, to a large company, which he had expressly invited for the purpose, composed of Lords of the Admiralty, members of the Royal Society, and members of both Houses of Parliament.

Professor Wheatstone has announced that he has recently (in 1840) also invented and patented an *electro-magnetic telegraph*, differing altogether from his invention of 1837, which he calls his *magnetic needle telegraph*. His is, therefore, the first European electro-magnetic telegraph, and was invented, as is perceived, eight years subsequent to mine, and one year after my telegraph was exhibited in the public manner described at the Earl of Lincoln's residence in London.

I am the more minute in adducing this evidence of priority of invention to you, sir, since I have frequently been charged by Europeans in my own country with merely imitating long-known European inventions. It is therefore due to my own country, as well as to myself, that in this matter the facts should be known.

Professor Steinheil's telegraph is the only European telegraph that professes to *write* the intelligence. He records, however, by the delicate touch of the needle in its deflections, with what practical effect I am unable to say; but I should think that it was too delicate and uncertain, especially as compared with the strong and efficient power which may be produced in any degree by the electro-magnet.

I have devoted many years of my life to this invention, sustained in many disappointments by the belief that it is destined eventually to confer immense benefits upon my country and the world.

I am persuaded that whatever facilitates intercourse between the different portions of the human family will have the effect, under the guidance of sound moral principles, to promote the best interests of man. I ask of Congress the means of demonstrating its efficiency.

I remain, sir, with great respect, your most obedient servant,

SAM. F. B. MORSE.

Hon. CHARLES G. FERRIS,

Member of the House of Representatives from the city of New York, and one of the Committee on Commerce, to whom was referred the subject of the expediency of adopting a system of electro-magnetic telegraphs for the United States.

The following is the alphabet for Morse's electro-magnetic telegraph:

ALPHABET.

A	· —
B	— · · ·
C	— · — ·
D	— · ·
E	·
F	· · — ·
GJ	— — — ·
H	· · · ·
IY	· ·
K	— · —
L	· — · ·
M	— —
N	— ·
O	— — —
P	· — — ·
Q	— — · —
R	· — ·
SZ	· · ·
T	—
U	· · —
V	· · · —
W	· — —
X	— · · —

NUMERALS.

1	· — — — —
2	· · — — —
3	· · · — —
4	· · · · —
5	· · · · ·
6	— · · · · ·
7	— — · · ·
8	— — — · ·
9	— — — — ·
0	— — — — —