The Papers of Thomas A. Edison

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Edison's work in printing telegraphy was crowned with success during the first half of 1871. He was manufacturing cotton instruments at the American Telegraph Works for the Gold and Stock Telegraph Company, and at the end of May he signed a lucrative five-year contract with Gold and Stock that gave him a substantial lump-sum payment and an annual salary for his inventive work. During this period Edison also turned increasingly from improving George Little's automatic telegraph system to designing his own, and his backer in automatic telegraphy, George Harrington, enlisted several associates in purchasing a one-third interest in the American Telegraph Works. In May the Newark Telegraph Works moved from New Jersey Railroad Avenue to Ward Street in Newark and changed its name to Edison and Unger. Both shops were kept busy with Edison's inventive work—including a foray into sewing-machine design—and with Gold and Stock orders for printing telegraphs. However, in the midst of this activity came sad news; on 9 April, after a long illness, Edison's mother died.

In printing telegraphy Edison's inventive activity continued unabated in 1871. He continually modified the new ticker—his cotton instrument—while he labored on his universal private-line printer. He and Marshall Lefferts had discussed the value of the private-line printer the previous fall; in May, Edison completed a patent model, and Gold and Stock bought patent rights to the machine for $15,000 worth of stock. In the first six months of 1871, he filed ten caveats, at least five of which described improvements in printing telegraphs.
Meanwhile, Edison's relations with the men who ran Gold and Stock and Western Union grew closer. In January, Tracy Edson, a major stockholder and director of Gold and Stock, called Edison to New York and gave him a letter of introduction to William Orton, president of Western Union. Gold and Stock directors George Field and Elisha Andrews applied in May for a British patent (which they later received) covering what would eventually be three of Edison's U.S. patents, including that for the cotton instrument. In early June the men set out to introduce Edison's ticker on the London stock exchange. Lefferts also applied for a British patent describing Edison inventions, but he never completed the process, and the devices he specified were covered in a British patent Field and Andrews filed the next year.

Three related events occurred as May ended, the cumulative effect of which was to draw Edison closer to Western Union. First, on 25 May, Western Union assumed control of Gold and Stock. As Gold and Stock had become increasingly successful, Western Union had moved to enter the New York market for private telegraph lines and financial information by contracting with George Phelps to design a printer that was competitive with Calahan's. Tracy Edson had reacted to the threat, negotiating a deal that gave Western Union control of Gold and Stock. The agreement left intact Gold and Stock's corporate structure and ceded Western Union's increasingly important Commercial News Department to Gold and Stock. For Edison, the new arrangement meant closer contact with the powerful men in the Western Union organization and a wider sphere of operations for his machines.

The second event was the signing of a contract by Edison with Gold and Stock on the day after the Western Union–Gold and Stock agreement. Edison became a "Contract Electrician and Mechanician" for a period of five years, agreeing to assign to the company all of his patents in printing telegraphy. In return, he received company stock valued at $35,000 and an annual salary of $2,000, plus $1,000 each year Gold and Stock used any of his new inventions.

The last of the three events was Gold and Stock's purchase of the American Printing Telegraph Company. In addition to the Commercial News Department, Gold and Stock had taken over Western Union's private lines, and buying the American Printing Telegraph Company assured it complete control of all important patents covering private lines. On 27 May, the Telegrapher ran a paragraph in which Frank Pope and
James Ashley announced that they had “disposed of their interest in the business of the [American Printing Telegraph] company, resigned their official connection with, and retired from its service.” This marked the termination of their business association with Edison. Their personal relations with him seem to have been deteriorating for some time as well. Although the breach was not publicly mentioned at the time, many in the telegraph community knew of it. Edison later claimed Ashley tried to prevent him from getting his fair share of the 1870 Financial and Commercial Telegraph Company settlement, and—as is clear from subsequent invective—Ashley's opinion of Edison's talent was considerably lower than Edison's own. Edison's name virtually disappeared from the pages of Ashley's Telegrapher for three years, and when it reappeared (in connection with the labyrinthine patent struggle over the quadruplex telegraph) it was as the “professor of duplicity and quadruplicity.” Pope, who had been Edison's friend, became a willing supporter of claimants against Edison. One man later recalled, “Frank [Pope] took up Mr Edison when he (Edison) was poor and even ragged, and... Edison treated Frank with the grossest ingratitude.”

Originally hired by Daniel Craig and George Harrington to help solve problems with the Little system of automatic telegraphy, Edison increasingly turned his attention to designing his own system during the first months of 1871. Although the Automatic Telegraph Company acquired the rights to the Little system in January, company president Harrington saw great advantage in providing Edison with the necessary resources to design his own. Harrington's October 1870 agreement with Edison made Harrington a partner in Edison's inventions; between October 1870 and May 1871, Harrington advanced Edison $11,000 for expenses.

As 1871 began, Edison focused his attention in automatic telegraphy on the problem of perforator design, building prototype perforators throughout the winter and spring. Edison and his backers considered large perforators preferable because their typewriter-like keys required no special knowledge on the part of the operator. However, large perforators were complex, slow, and liable to get out of order, so Edison also designed small perforators, which had fewer keys but which required familiarity with the Morse code in order to punch combinations of dots, dashes, and spaces. He explored the possibility of electrically powered perforators and made numerous experiments to determine the best arrangement of...
perforations to differentiate dashes and dots. By early June, the Automatic Telegraph Company had begun to use his perforators, but their operation proved troublesome and Edison kept working to improve them.

Unfortunately, much less is known about the other automatic telegraph components Edison devised early in 1871. Account records indicate that he constructed prototypes of a number of devices used in automatic telegraph systems, including various forms of transmitters, an ink recorder, and a “chemical paper machine.” Edison's backers encouraged his work on a copying printer—a typewriter. They believed that an operator could transcribe a message from telegraphic code to roman letters much more rapidly with such a printer than by hand. Craig, who saw the printer as a key component in a successful automatic system, negotiated with inventor Christopher Sholes for the use of what became the first commercially successful typewriter and, at the same time, encouraged Edison to develop his own. By the end of March, Edison's various devices were far enough along that he and Harrington laid plans for a demonstration system. Delays in devising a working printer, however, caused them to postpone the demonstration until early June, when they decided to proceed without the printer.

The expenses of supporting Edison's inventive activities apparently led Harrington in May to invite five others to join him in an agreement that gave them half of his two-thirds interest in the American Telegraph Works and in Edison's automatic inventions in exchange for $19,500 cash and the agreement to provide 50 percent of any new funds required. The support of these new backers—particularly Josiah Reiff—enabled Edison to continue his work. Reiff, secretary of the Automatic Telegraph Company, later provided Edison with an annual salary of $2,000 to work on automatic telegraphy.

2. Brit. Pat. 1,400 (1871). Under British patent law, the importer of an invention could be granted a patent regardless of whether the importer was the inventor. Davenport 1979, 26.
4. Brit. Pats. 1,444 (1871) and 828 (1872).
6. U.S. Pat. 110,675.
7. Reid 1879, 621-22.
9. The only exception seems to be some entries in a Murray and Co. daybook on 25 May, 7 June, and 11 July 1872 indicating orders placed by Pope and Ashley for the manufacture of some of Pope’s Nonpareil telegraph apparatus. At that time Edison had not formally joined with Murray as a business associate. The entries are peculiar in that they are the only ones in the book without associated dollar amounts. Cat. 1214:18-19, 22, Accts. (TAEM 21:573, 575).
10. See Doc. 97, n. 14.
11. The vituperation began on 18 July 1874 ("‘The Dutch have Taken Holland!’" and "‘More Startling Inventions for Rapid Telegraphy,’" Telegr. 10 [1874]: 169, 172) and continued for years. Ashley first called Edison the "professor" on 16 February 1875 ("The Telegraphic Situation," ibid. 11 [1875]: 34).
12. For example, Pope 1889.
14. By 10 May 1871, Harrington had advanced $16,000 for tools, machinery, and property used in establishing the American Telegraph Works and another $11,000 for experiments. Doc. 159.
15. The "chemical paper machine" may have been a device for saturating paper with chemicals for use in Little’s automatic receiver. The surviving records for the first half of 1871 show that Edison worked on ink recorders rather than chemical receivers, although he did begin working on chemical receivers later in the year. See Doc. 153, n. 6; 70-015, DF (TAEM 12:577); and Cat. 30,108, Accts. (TAEM 20:188).

POCKET NOTEBOOK

Edison began making entries in this pocket-sized notebook about 1 January 1871 and continued to use it for some months. One entry considers the possibility of constructing a flying machine (Doc. 135B); several others concern the design of an electric sewing machine (Docs. 135D, 138A, and 139A-B). Also included are some of Edison's earliest technical drawings and notes regarding perforator designs for automatic telegraphy (Doc. 135C). Many of the miscellaneous sketches scattered throughout the book show components for the electric sewing machine or for perforators. Other designs include a paper feed for a printing telegraph (Doc. 135A), an ink recorder that was probably intended for the automatic telegraph system, a circuit diagram for testing magnets, a punch for cutting letters on printing-telegraph typewheels, and two sketches of what may be hand-cranked transmitters for automatic telegraphy.

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1. The notebook (PN-70-12-25, Lab. [TAEM Supp. III]) came to light as this volume was in press; hence the intercalary numeration of the documents. It will be filmed at the end of Part III of TAEM as a supplement.

2. The notebook is crudely constructed of folded sheets of blank white paper stitched together and may have been homemade. The final dated entry is from 15 January 1871, but one of the last entries—a list of the time required to construct Edison's new worm unison for printing telegraphs—was probably made in late winter or early spring. There is also a drawing that Edison appears to have retrospectively dated 25 December 1870 (he first wrote "1871" and then overwrote the second "1" with a "0").

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**Notebook Entry:**

**Printing Telegraphy**

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**Printing Telegraph Paper feed**

[Newark,] Jany 1st 71

AX, NjWOE, Lab., PN-70-12-25 (TAEM Supp. III).

1. See headnote above.

2. The arms at right are extensions of the printing lever. Their up-and-down motion will make the paper feed mechanism reciprocate.

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**Notebook Entry:**

**Flying Machine**

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A Paines engine can be so constructed of steel & with hollow magnets so as to obtain the requisite strength and still be of extreme lightness—and combined with suitable air propelling apparatus wings parchoutte etc. sof[-] as to produce a flying machine of extreme lightness & tremendous power—

AX, NjWOE, Lab., PN-70-12-25 (TAEM Supp. III).

1. See headnote, p. 228. No other contemporary references to this idea have been found.
2. Henry Paine, a Newark inventor, announced in early 1871 a new type of electric motor that aroused great interest. He was soon exposed as a fraud. The controversy can be followed in the 1871 *Scientific American* (11 [n.s.]: 167, 370–71, 375, 404; 12 [n.s.]: 21, 84, 101, 180).

Notebook Entry:  
*Automatic Telegraphy*

[Newark, c. January 1, 1871]

Perforating Apparatus made with peculiar ordinary punch & dies and knives upon these punches extending over the intermediate space between each punch hole so that if six punch & dies a suitably combined with proper mechanism six punch holes can be made thus

\[
\begin{array}{cccccc}
\text{Punch} \\
\end{array}
\]

but if it is desired to perforate a dash and 4 dots thus:

\[
\begin{array}{cccccc}
\text{Punch} \\
\end{array}
\]

it can be done by depressing the first two keys further than is necessary to perforate the dots but sufficient to bring the knife edges down to the little slot beat the ends of the blank space between the dots & cut out this space leaving a dash—

A perforator can be made by embossing paper by suitable mechanism & with Morse dots & dashes and after they are raised a revolving knife may be made to pass over the surface of the paper & cut the raised portion off, leaving a holes
either through the paper this paper will perform the same work as on perforated—


1. See headnote, p. 228.
2. Cf. Doc. 151A.

-135D-

[Newark, c. January 1, 1871]

Notebook Entry:
Sewing Machine

Positive Self Make and Break s is a square slide which runs in bearings n n′ are springs p p′ are pins upon the slide which the armature of the magnet hits & changes alternately as will be seen throwing the current through one magnet & then through the other = This break it will be seen prevents the armature from making strokes of unequal length the parts being so arranged that the armature must complete its full incursion before a change of current takes place etc etc—

AX, NjWOE, Lab., PN-70-12-25 (TAEM Supp. III).

1. See headnote, p. 228.
2. Edison used this mechanism to generate a reciprocating motion for his sewing machine. See Doc. 138A; and “Sewing Machine Break,” Cat. 298:43 (TAEM 5:83).
COTTON INSTRUMENT  Doc. 136

The cotton instrument was the telegraph printer employed by the Gold and Stock Telegraph Company to report prices from the New York Cotton Exchange and later from the New York Produce Exchange.¹ Although Edison did not begin manufacturing the instruments until the spring of 1871, the design was sufficiently complete by December 1870 that the company ordered 150 of them.² Edison executed a patent application that covered the new features of the device in January 1871 and patented several modifications during the next twelve months. By the end of the summer he had abandoned the cotton instrument in favor of a new basic design, which he incorporated into his universal stock printer.³

With the cotton instrument Edison solved the problem of manipulating two typewheels—one containing letters, the other numbers—without infringing Edward Calahan’s patent.⁴ Edison mounted both wheels on the same shaft and fitted a sliding cover over the paper strip that moved through the machine and a sliding platen under it. Activating the printing lever at one of two points in the typewheels’ revolution shifted the cover and platen to one side or the other, allowing either the numbers or the letters to print alone.⁵ Edison devised a unison stop, but this was soon superseded because it required an operator at the receiving end.⁶ Incorporating the polarized relay and other circuitry of the Boston instrument, the cotton
instrument originally worked on one wire. In practice, Edison abandoned the single wire for the two-wire circuitry of the universal stock printer. The general form of the cotton instrument followed that of the American printing telegraph and the Chicago instrument, both of which resembled the Calahan printer.

2. U.S. Pat. 113,034. The invoices for instruments made in April and May of 1871 by the American Telegraph Works for Gold and Stock reflect the fulfillment of this order. To judge by existing manufacturing records, these 150 were the only ones made. See Doc. 131, n. 2.
3. The photographs reproduced in Doc. 136 are the only extant record of a production model of a cotton instrument. The Edison Institute (Dearborn, Mich.) holds the patent models for each of the modifications patented (U.S. Pat. 123,006, 126,531, 126,534, and 126,535). The models are unpainted instruments altered to illustrate the patent claims. The universal stock printer incorporated improvements that made the cotton instrument obsolete. When Edison began manufacturing universal printers in the summer of 1871, he numbered them sequentially with the cotton instruments of the December Gold and Stock order (PN-71-09-06, Accts. [TAEM 20:974-83]). Edison made explicit the evolution of the instrument in the specifications for U.S. Patents 123,006 and 126,532.
5. Pierre Dujardin, a French physician and inventor, had in 1868 designed a shifting platen mechanism for a printing telegraph, but Edison's version was sufficiently different to be patentable. It is likely that Edison had seen Dujardin's patent. The first claim in Edison's patent application actually described Dujardin's device (covered by U.S. Patent 82,502), and Edison deleted it from his application on 15 February 1871. The application was examined the next day and allowed. James Reid denied Edison credit for this design and for the screw-thread unison (Doc. 158). In neither case, however, did the original design to which Reid referred bear much resemblance to Edison's. Gold and Stock purchased the rights to Dujardin's patent on 28 March 1876, rewrote the specifications, and obtained Reissue 7,627 on 24 April 1877. Pat. App. 113,034; Reid 1879, 617-18; Dujardin patent assignment to Gold and Stock, Edison Coll.
6. By May 1871 Edison had developed the screw-thread unison (Doc. 158).
7. See Doc. 136. On the shortcomings of the polarized relay, see Doc. 51 headnote.
Production Model: Printing Telegraphy

This artifact displays two important changes from the original cotton instrument design (U.S. Pat. 113,034). First, the polarized relay switch has been bypassed, converting the machine from a one-wire circuit to a two-wire circuit (note the four binding posts)—that is, one wire for advancing the typewheel and one for actuating the printer lever. Second, a screw-thread unison has replaced the original, manually operated unison.

1. See headnote above.
2. Edison executed the covering patent on this date. Pat. App. 113,034.
From Daniel Craig

New York Jan 12/71

Dear Mr. Edison

Hurrah for us!

Hurrah for we!

Your notes, like your confident face, always inspire us with new vim.1

I intend to see you Friday or Saturday.

I have recorded your perforations & you will see that your arrangement of dots, dashes and spaces areis not quite right, but of course you can easily, I hope, fix that.2 Yours, all the time

D H Craig

ALS, NjWOE, DF (TAEM 12:440).

1. The Edison notes that inspired this confidence are not extant. However, Craig may have been referring to Edison’s claim that he had reduced to paper his plans for an automatic printer. See Doc. 140.

2. The particular arrangement of holes used by Edison in these tests of automatic telegraph apparatus is unknown.

From Tracy Edson

New York Jan’y. 12th 18714

My Dear Sir,

I would like to see you the first time you come to New York, in regard to a matter that may be of interest to you. Yours

Very Truly

Tracy R. Edson1


1. Tracy Robinson Edson (1809–1881) began his career as an engraver of bank notes and eventually initiated the consolidation of major American engraving companies in order to maintain standards against counterfeiting. From 1858 to 1875 he served as president of the American Bank Note Co. He made a large part of his personal fortune from royalties on patent rights he purchased for a permanent green ink used to print U.S. currency.

Shortly after the formation of the Gold and Stock Telegraph Co. in 1867, Edson became a major shareholder. In 1869 he was elected a director and served as a member of the executive committee thereafter. He played a significant role in obtaining for Gold and Stock the printing telegraph patent rights held by Samuel Laws in August 1869 and in transacting the sale of Gold and Stock to Western Union in May 1871. NCAB 19:394; Reid 1879, 607–8, 612–13, 626, 632, 799, 807.
Notebook Entry:

Sewing Machine

[Newark,] Jany 12, 1871

Break for Sewing Machine Electric

1. See headnote, p. 228.

2. Both designs in this entry use the mechanism described in Doc. 135D. Edison is not known to have built any models of motor-driven

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Tracy Edson to William Orton

New-York, Jany. 13th, 1871

Dear sir,

I have the pleasure (with your permission) of introducing my ingenious friend Mr. Thos. A. Edison, the bearer of this, who is worthy of the kind consideration which I am sure you will accord to him.

Mr. Edison is prepared to confer with you on the subject to which I alluded on Thursday last. Very Respectfully sir, Your Obt. servant

Tracy R. Edson

1. William Orton (1826-1878) graduated from Albany Normal School in 1846 and taught for several years. He was successively a partner in a publishing firm, a member of the New York City Common Council (the city’s governing body), an Internal Revenue collector, and commissioner of Internal Revenue under President Andrew Johnson in 1865. That same year he left government service to become president of the United States Telegraph Co. When Western Union bought that company in 1866, Orton became Western Union’s vice-president. In July 1867 he succeeded to the presidency, a position he held until his death. He established the Journal of the Telegraph in 1871 to disseminate information throughout the Western Union system. One of Orton’s most notable accomplishments as Western Union’s president was his long, successful fight against a government takeover of American telegraph companies. DAB, s.v. “Orton, William”; Reid 1879, 520–38, 781–812.

2. Orton, Edson, and Marshall Lefferts (but not Edison) met several times during the following week to discuss the disposition of the local market reporting telegraph business. These negotiations led to the merger of Western Union and Gold and Stock. It is not known whether Edison subsequently met with Orton. Orton to Anson Stager, 24 Jan. 1871, LBO.
alternating apparatus\(^2\) Jany 13—71—

Have a differential-gear etc on Sewing Machine for alternating Battery in cellar = or use a Daniells\(^3\) big crocks—to get small Resistance & put a positive break on engine & neutralize the perm mag by winding last layer separate & throwing a quick current in

AXS, NJ WOE, Lab., PN-70-12-25 (TAEM Supp. III). \(^4\) Edison initialed each of the two pages of this entry.

1. See headnote, p. 228.
2. This mechanism uses a modification of the reciprocating break described in Doc. 1350. The short, wide electromagnet to the right of the escapement lever might have as its core the "perm mag" mentioned below. The circle at upper right is a breakwheel for transmitting intermittent electrical impulses.
3. See Doc. 336, n. 3.
Magnet with armature attached at its upper end to a projection of the attracting core of The Magnet =

This gives greater strength for the reason that the armature is magnetized by actual contact.

Edison

AXS, NJWOF, Lab., PN-70-12-25 (TAEM Supp. III).

1. See headnote, p. 228.

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New York, Jany 18/71

From Daniel Craig

Dear Mr. Edison

Yours of yesterday rec'd.¹

Two weeks ago you told me you had, in a rough way, reduced to paper, your ideas for an Automatic Printer that would transmit two or three hundred words per minute, and you promised to have the man make full drawings for your caveat or patent.²

I then told you that a friend had caveat an invention for the same idea, and that as he explained it to me, it seemed to me very likely to work, and that I had thought it best to arrange to control the invention—but that I did not want to have it developed until you had thought over the subject and completed your own drawings and that then I should want you to sit down with my friend³ and examine your plans with him and after making up your mind as to the best plan to build the machine go ahead & develop the same, and try, at least, to get ahead of Farmer and beat him, too.

There, I reckon, I have complied with your request and given you my ideas in a very "explicit" way.

I agree with you, fully as to "Dry Goods clerks [−]or Digger Indians," but you captivate my whole heart when you speak of making machines which will require "No Intelligence." That's the thing for Telegraphers.

I should say that, if possible, we ought to start with a Perforator that will punch any letter when the key is properly struck, and I would say that such a machine, that could be driven up to 25 words per minute, and costing $50, would be better for us than one which should require thought in the making of dots & dashes, & working even up to 40 words and costing $25⁴.

How soon can you give us, (to enable girls to begin to practice) two perfect Perforators, and what rate of speed may we hope for from experts?
When, in your best judgment, can we have all the necessary machinery for, say 4 offices (N.Y., Phila. Balto. & Wash'n)

When shall I go to Newark again? Yours truly

D H Craig

ALS, NjWOE, DF (TAEM 12:441). "P.O. Box 3237" written above.

1. Not found.
2. The "Automatic Printer" mentioned here is not the typewriter, but rather a printing receiver for the automatic telegraph system (see Doc. 143).
3. This may be Charles Jones. See Doc. 163.
4. See Chapter 7 introduction for a discussion of perforator designs.

[New York,] January 18, 1871

MEMORANDUM OF AN AGREEMENT made this eighteenth day of January, A.D. 1871, between the National Telegraph Company, a corporation created under the laws of the State of New York and duly organized pursuant thereto, and The Automatic Telegraph Company, also a corporation created under the laws of the State of New York and duly organized pursuant thereto;

WITNESSETH: that whereas the said National Telegraph Company has this day sold, transferred, assigned and set over unto the said Automatic Telegraph Company, its successors and assigns, an Agreement between the said National Telegraph Company and Daniel H. Craig and George Little, dated September 9, 1869, and all extensions and modifications thereof, together with all the property rights and interests of the said National Telegraph Company under the said contract or to arise therefrom subject to the performance by the said Automatic Telegraph Company of all the conditions, stipulations and undertakings in the said Contract contained which are to be hereafter performed by the said National Telegraph Company and liable to all damages and forfeitures for non-performance thereof, and placed the same in the hands of Erastus Corning in escrow—

AND WHEREAS the said transfer and assignment has been made in pursuance of an agreement between said Companies, that the Automatic Telegraph Company shall within two months from the 20th of December, 1870, unless prevented by circumstances beyond the control of said Automatic Telegraph Company, complete the line with at least two more wires between New York and Washington and prepare it with
offices, instruments and all things necessary to open it to the public for business; that it shall when so prepared be opened for business by the said Automatic Telegraph Company and the system covered by said Contract so assigned and transferred shall be thoroughly tested in practical telegraph work between New York and Washington and the intermediate principal cities, for such period of time not exceeding four months from and after the completion and opening for business as aforesaid as shall be sufficient to satisfy the said Automatic Telegraph Company as to the value of the said system; that if such test shall satisfy the said last named Company, that it will be justified in going on with the construction of lines connecting the principal cities, and applying thereto the said system, then the said Company shall, within six months from the expiration of the period of four months during which the system is to be tested as aforesaid, from among the first monies received from the further sale of its bonds and stock, pay to the said National Telegraph Company the sum of One Hundred and Five Thousand Dollars in cash, and the further sum of Four Hundred and Seventeen Thousand Dollars in the Capital Stock of the said Automatic Telegraph Company—

And upon the payment to Hon. Erastus Corning of Albany with whom said Instrument or Agreement has been deposited as a Trustee, of the sum hereinbefore mentioned and the delivery to him of the Stock, as aforesaid, he is hereby authorized and directed to deliver said Contract and the transfer and assignment thereof to the said Automatic Telegraph Company and deliver the money and Stock to the National Telegraph Company.

But it is expressly understood and agreed that in case the results of the said tests shall be unsatisfactory to the said Automatic Telegraph Company then it shall be under no obligation to receive the transfer and assignment of the said Contract nor to pay anything on account thereof, nor assume any of the liabilities or undertakings in the said Contract contained, but the said Contract shall remain the property of the National Telegraph Company.

In Witness Whereof the said National Telegraph Company has caused its corporate seal to be affixed hereto and these presents to be executed in triplicate by its President and Secretary on this eighteenth day of January, A.D. 1871.

Robert Squires, Vice Prst. National Tel. Co.

Signed, Sealed & delivered in the presence of Geo B Walter Secy Nat Tel Co
WHEREAS, by the terms of the foregoing agreement, the Automatic Telegraph Company stipulated to complete the line between New York and Washington with two more wires within two months from the 20th of December, 1870, and whereas, an unexpected delay has occurred and prevented the execution of the transfer papers at the date contemplated when the Agreement was made, and, therefore, the fulfillment of the said stipulation has become impossible within the period named, and, whereas, the snow, ice, and frost of the inclement season now upon us will prevent the resetting of the poles, and the making of other repairs necessary to enable the poles to sustain the strain of additional wires until the rigors of winter are passed.

Now THEREFORE, in order to remove any further causes of delay in making the necessary tests of the system, the foregoing Agreement is hereby modified so as to permit the Automatic Telegraph Company to acquire other lines or wires on and over which to make the test of the system; and the stringing of additional wires upon the poles of the present line is left to await the results of such tests over other lines or wires and to the discretion of the Automatic Telegraph Company.

IN WITNESS WHEREOF, the National Telegraph Company, has caused its corporate seal to be affixed hereto, and these presents to be signed by its President and Secretary on this eighteenth day of January, A.D. 1871.

ROBERT SQUIRES, Vice Prst. National Tel. Co.

GEO S. WALTER, Secy. Nat. Tel. Co.

The Automatic Telegraph Company hereby accents the within contract.

GEO HARRINGTON, President Aut. Tel. Co.

Signed sealed and delivered in presence of

Josiah C. Reiff, Secretary.


1. The Automatic Telegraph Co. was incorporated on 28 November 1870 by George Harrington, Daniel Craig, Josiah Reiff, William Meilen, and John Elliott. Harrington became president, and Reiff secretary, of the new company, which had a capital stock of $13 million divided into 130,000 shares valued at $100 each. Harrington held 129,960
shares, and each of the others held 10 shares. By this agreement Automatic Telegraph obtained the rights to George Little's system from National Telegraph. Certificates of incorporation of the Automatic Telegraph Co., 28 Nov. and 2 Dec. 1870, NNYCn.

2. Erastus Corning was a banker, iron manufacturer, and railroad president and promoter. A prominent figure in Albany politics, Corning served several terms as mayor and congressman. His son, Erastus Corning, Jr., also was involved in Automatic Telegraph. DAB, s.v. "Corning, Erastus"; Quad. 71.8, pp. 45, 49 (TAEM 9:786, 788).

3. Robert Squires was president of the Third Avenue Railroad in New York as well as vice-president of National Telegraph. N.Y. 371:782, RGD.

4. George Walter, secretary and one of the principal promoters of National Telegraph, was later involved with Marshall Lefferts in promoting Edison's electric pen in England. Electric Pen folder, Lefferts; N.Y. 350:1135, RGD.

5. That is, the agreement between the companies mentioned in the third paragraph.


7. Josiah C. Reiff (1838–1911), a railroad financier, became associated with William Palmer in the development of the Kansas Pacific Railroad in the late 1860s and then joined Palmer in supporting Automatic Telegraph. Reiff later claimed that he provided the principal financial support for the development of the automatic system (roughly $175,000). After Jay Gould and the Atlantic and Pacific Telegraph Co. acquired Automatic Telegraph in 1875, Reiff initiated a lawsuit, seeking reimbursement for the automatic telegraph interests of Edison, George Harrington, and himself. Reiff also held extensive interests in copper mining and was a partner in the banking firm of Charles Woerishoffer. New York Times, 2 Mar. 1911, 9; "Reiff Family History," BC; Reiff's testimony, 1:52, Box 17A, Harrington v. A&P.

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From Daniel Craig

 Peekskill, 1 Jan. 31/71

Dear Mr. Edison

I had your perforations (a & b) telegraphed today, and send you the result. At low speed (say, about 300 words per minute) the writing came pretty well, but even then, the dashes were too short for the dots. When run up to 6 or 7 hundred words per minute, many of the dashes were nearly in two parts, and the shortness of the dashes, as compared with the dots was even more apparent than when the speed was less.

Of course, you will know how best to remedy this trouble, but my way would be to increase the size of the dash holes about \( \frac{3}{4} \)ths and so arranging as to have the dash actually lengthened, say \( \frac{1}{4}'' \) or \( \frac{1}{4} \) and throwing the other fraction in to assure continuity thus \( \text{You now have it thus} \)
and the result, in rapid recording is you get it thus

which, I am sure, you will say is not exactly according to Gunter or Edison.

I hope that not a single hour is to be lost in giving us a complete Perforator for practice, and all possible speed should be applied to the completion of enough for the Washington line. I presume Mr. Harrington would agree with me that 15 Perforators would do nicely, and 10 might answer, & should, if the added 5 would prolong the completion of the 10 to any extent.

Please explain to Mr. Harrington that you can make a note form printer at short notice, and that (working print a type wheel it must print faster & much better than can possibly be done by the levers or arms plan of Sholes. My idea is that it is a decided object for us to have the control of the Sholes machine, provided it costs little or nothing—but if not, not—and of course, relying upon your inventive head to work us through when and as may be necessary.

I hope you will make sure that our friend Unger don't take the least amount of push off of the Puncher. That fully & successfully completed is a thousand fold more important, pecuniarily and in every other way, than all the Gold machines ever made or dreamed of.

The next big thing is the little automatic "Recorder" (I think that will do, "for high" till you find a better name) and pray don't fit out the opposition so nicely that we cannot do better. I rely upon you upon this point, and if you do not let us slip up, you will assure to yourself a big pile of profits every year—and a good deal more than the Callahan hounds would pay you for your brains through your natural life.

I have not yet had an opportunity to talk to Mr. Harrington, but I shall not forget nor neglect the point, as my heart and judgment is in the arrangement I suggested. It shall be Truly &

D. H. Craig

ALS, NiWOE, DF (TAEM 12:444). "P.O. Box 3237 = New York." written above. Interlined above.

1. Peekskill, N.Y., is located on the Hudson River 39 miles north of New York City.
2. The "perforations (a & b)" were probably two separate trial runs of Edison's perforated tape.
3. Edison later adopted a form of overlapping perforations similar to that suggested here by Craig.
4. Edmund Gunter was an English mathematician and inventor of
several mathematical instruments. The phrase “according to Gunter” meant that something was correctly done according to rule. *OED*, s.v. “Gunter”; Farmer and Henley 1970, s.v. “Cocker.”

5. “Note form” means a sheet of paper as opposed to a paper tape.

6. Christopher Sholes, Wisconsin printer and journalist, invented a typewriter in 1868. The Remington Arms Co. acquired the patent rights in 1873 and, after making improvements, introduced it as the Remington typewriter. In 1871 Craig proposed using Sholes typewriters with the automatic telegraph system and had a number of them made for that purpose. Doc. 186; *DAB*, s.v. “Sholes, Christopher”; Current 1954.

7. Craig here urges Edison to make one of his manufacturing partners, William Unger, spend more time working on the automatic system’s perforator (“Puncher”) and less time on the apparatus Edison and Unger were making for the Gold and Stock Co. (“the gold machines”).

8. See Doc. 143, n. 2.


10. That is, Gold and Stock and its superintendent, Edward Calahan.

Dear Mr. Edison—

I gave, a few days ago, a letter of introduction to you, and when my big-bellied (but none too big for his head) friend calls upon you, I shall feel personally obliged if you can devote a few moments to him.¹ He is a great admirer of good machines and good work, and I believe he has very few equals.

From Daniel Craig

Peekskill,² Feb. 13/71.

January–June 1871 245
in the iron foundry business. He carries into that business a good deal more Brains than would be necessary to run the White House in first class style and effect. If you should see fit to give him your casting business, I am sure he will do it to your satisfaction, so far as you may give him your wishes.

I do not want you to work, or think of work, over 10 hours out of the 24, but I do want to have my heart put at rest in the matter of the "Automatic Writer"? (How'll that do for a name?) desperately, and if you should ever feel as though you wanted to be prayed for, you can secure a first class journeyman if you will tell me you have done it—I fully believe you will do it, if you live long enough,—indeed, if you should tell me you could make babies by machinery, I shouldn't doubt it.

As the machine was invented and patented (at least, in part, I presume) years before you had your first dealings with L. or the G. & S. Co., and as we all want to be at peace with L., why would it not be legitimate for you to ante-date a bill of sale to some suitable person & then let him convey to Harrington for the Am. Tel. Works Co. Of course, you are to be paid specially for the invention.

If we could commence on the Domestic business in Competition with Ashley, very soon, I would like it very much.4

Will you write me as soon as you have anything to say, and on no account, I beg of you, delay the machines for the full test of Automatic Telegraphy. As we discard Sholes,5 we shall, of course feel a deep interest in your proposed Printer, and I beg you will consider whether it is possible to use the upper & lower case letters of about the size of Pica type, or a size larger. I would say that for general purposes a machine that would print thus, nicely, 35 words per minute would be more valuable than one printing all caps that worked up to 50 words per minute. Of course, caps alone will answer our immediate purposes nicely. Yours truly

D H Craig

ALS, NjWOE, DF (TAE M 12:447). *P.O. Box 3237 = New York.* written above.

1. Unidentified.
2. The following paragraph suggests that Edison had proposed using some printing telegraph as a receiver in the automatic system. See Doc. 151A, n. 4.; Doc. 194; and Cat. 1182:17-21, Accts. (TAEM 3:58-60).
4. James Ashley was the agent for a burglar alarm company. American Burglar Alarm Telegraph Co. advertisement, Telegr. 7 (1870-71): 118.
5. The Automatic Telegraph Co. was still using Sholes's printer at the end of July. See Doc. 186.

Daniel Craig to Marshall Lefferts

Dear General—

We spiked Bryan. Baldwin is played out—the dirty thief.1

A nice backer, you, truly, if you told Harrington, as he understood you, that we could not compete successfully with the W.U. Co. with the Little Perforator, which now averages over 600 words per hour, reliably. 25 Perforators, at 600, give 150,000 words per day.

-144- PEEKSKILL, Feb. 13/71.

25 Girl Perforators, at $400 pr. anm. $10,000
2 Telegraphers 400 " 800
5 Copyists (printers) 400 " 2,000
Total cost of Labor, yearly, $12,800

Now, for Morse—I give the Liars 800 ws. per hour, though they don't average 600.2

+938 Morse 1st class ops $1,200 $2800 45,600
19 2d class2 to attend Repeaters, in every circuit over 300 m. 15,200 $60,800

More than 4 to 1, in Labor, against the Morse people. How's that for high?

Harrington decided, against my judgment, that it was best to deal with the Corning party & avoid all differences.3 I am not sorry on one account, as it will render less doubtful my ability to raise money on our interests as soon as we can get a full test with regular offices at New York, Phila Balto & Washington—and when that happy time will come, now depends upon Edison, and he says you keep him stirred up all the time with a sharp stick—just as though your trumpery gold reporting was of any importance along side of our operations. I respectfully protest against your going over the North River,4 or sending a Letter in that direction for the next four weeks. I never have any trouble with Edison except when you stick in your oar—keep it out.

There will, I am satisfied, be no trouble in consolidating all outside lines upon a fair basis, within 60 days after we can make a regular business test between Wash'n & New York, & intermediate offices—and then, if not before, you must come over to us, boots & breeches.

January-June 1871 247
The Automatic Telh. Co. provide in their articles of Association for a News Department, & have elected me to manage it for five years. My idea is that the discredit of News-peddlers & News speculators, should not attach to the Automatic Telh. Co. directly or indirectly. What would you think of the idea of a News Co. who should arrange, in the way of a Lease with the Automatic Co. for the control of one and ultimately of two wires, to be used exclusively for News business—the Automatic Co. fixing its rates for this class of business so as to give the News Co. special advantages—and if this scheme should be thought wise, what Lease money should be paid to the Automatic Co., for one good compound (No 5) wire, & Brooks insulators—wire costing at factory about $80 per mile, & insulators about 35¢ each? including right to use automatic machines & system.

I should propose to let Editors in to the News Co. if they wished, as stockholders, and should expect to send a General News report as now, to the whole press, & then let the first class journals get over as many specials as they pleased, at a very low tariff—their reporters perforating & copying their own reports.

As I know we can send at least 30,000 words per hour, in any circuit, by the aid of the Edison Repeater, I think all the Press business can be well done over one wire, and the Commercial News Reporting can also be well done with the occasional use of a second wire between a few chief points.

Have you any objection to tell me, confidentially or otherwise, what arrangement we could probably make for the use of your Universal Printer (I believe that is what you call it) for the distribution of Commercial & General news in cities? I don't mean the exclusive use, as I don't care how many competitors I have of the Simonton & other jumping jack order.— Little says he has new ideas, and that he can beat Edison & the whole world—but you and I will only take that covered all over with salt.

Harrington having advanced over $20,000 to help along the main thing, at Newark, I am ashamed to ask him to now let Little go in, & if, as I suppose, you have personal rights in the Universal Printer, I should rather see you getting extra profits than Little or other parties.

Will you do me the favor to explain to Mr. Hoadley how impossible it is for Mrs. Craig to do more than pay the interest on what is due to him, till we get the Automatic system at work, and tell him how intensely advantageous has been the
delay in getting the improved machinery—about a month more will put us all right. I am sick Truly &c
D. H. Craig

ALS, NNHi, Lefferts. "P.O. Box 3237" written above. "Underlined twice. "A line separates "600." from the following column of numbers. Interlined above.

1. Bryan not identified. "Baldwin" may refer to A. J. Baldwin, a "well-known backer of opposition lines" competing with Western Union. He was an incorporator and president of the Pacific and Atlantic Telegraph Co. in 1866 and an incorporator of the Southern and Atlantic Telegraph Co. in 1869. Reid 1879, 451.

2. Telegraph companies had no clear criteria for separating first-class and second-class operators; however, first-class operators generally could send or receive about 40 words per minute without mistakes or breaks and could transcribe messages in neat, clear handwriting. Second-class operators possessed inferior skills and therefore often serviced way wires that ran through small towns and had only limited traffic. Gabler 1986, 69-71; Abernathy 1887, 38-41.

3. This may be a reference to Erastus Corning, Jr., and the National Telegraph Co. See Doc. 141, n. 2.

4. The Hudson River was sometimes referred to as the North River.

5. James Simonton replaced Daniel Craig as general agent of the Associated Press in 1867 and held that post for fourteen years. DAB, s.v. "Simonton, James William."

6. David Hoadley, president of the Panama Railroad, had financial dealings with Craig and Lefferts outside their interests in telegraphy. Material on these financial relationships can be found in the Lefferts Papers. Sterling 1922, 70–71.

Dear Mr. Edison:

As you have not given me your promised note I suppose you have not yet got out of the woods on the Automatic Writer—and the thought makes me feel very sad.

I have been quite sick with inflammation of the Lungs, and at one time thought I should have a very serious time—but I am pretty well, today, & hope to see you soon.

The Turkish Consul has talked to somebody, who thought it of sufficient interest to have it repeated to me, in a way to lead to the conclusion that some of the Gold and Stock people were using you to set the Gold, Exchange and Stock business in operation in Constantinople, London, Paris, &c &c

Of course, it is none of my business what you do for such a venture, but I would like to be kept posted. We of the Automatic Telegraph people, shall, as soon as we get fairly afloat,
here, go vigorously at work to utilize all we may have on the other side, and I only hope that as Harrington fully agrees with me that you are to be with us and of us, in all Telegraph engineering, you will keep us as carefully in your mind as we shall certainly keep you.

I think we shall want to patent your Repeater and your Perforator and Printer (note paper), in Europe.

If you are not fully posted as to what is going on by the Turkish Consul, Laws, &c I wish you would get booked up, & let me have the story. The Turk says the machine will record Chinese, Japan or any other Language. I take it there is no other machine that will do that, but yours. Yours truly

D H. Craig

ALS, NjWOE, DF (TAEM 12:450).

1. Elisha Andrews, George Field, Edward Calahan, and Marshall Lefferts were arranging to introduce Edison's cotton instrument, when finished, in a stock-reporting system for the London Exchange in 1871. See Chapter 7 introduction.

2. Probably Samuel Laws.

3. The machine Craig describes would most likely be a facsimile telegraph, such as the one Edison was devising for Field and Andrews under the terms of their 10 February 1870 agreement (Doc. 92).

New York, Feb 20, 1871

Dr. Sir:

I have just read Mr. Hubbard's Communication to the Speaker of the House of Representatives and your full & interesting Letter to the former, in relation to Telegraph matters.

I learn from Mr. Hubbard's statements, at p. p. 8, 9, that you are able to perforate your messages at the rate of about thirty words per minute—1,800 per hour—and that you transmit, by the Wheatstone Automatic System Press report, dropping at 5 stations, at the rate of about 2,000 words per hour, and that for 5 days' general business, from London, in circuits of about 200 miles, the Wheatstone machines averaged about 3,600 words per hour.

It seems to me that we could do a good deal better than this for you, if you felt inclined to give our new system a practical test.

Since you wrote me that you could Perforate 40 words per minute, and were kind enough to send me samples of your beautiful work, I have been quite disgusted with our slow process by which we could accomplish only 10 or 12 words. Im-
mmediately on receipt of your Letter, I set a very ingenious man to work, and since last July, he has invented and made the models of fourteen different Perforators, and out of the whole, we have selected two that seem to me to be perfect, in their way. One, very simple, reliable & inexpensive, perforates about 30 to 35 words per minute, and can be manufactured for about $20. The other is equally simple & reliable, fitted with piano-shaped keys, and may be worked up to 50 or 60 words per minute, and can be manufactured for about $30.

A girl of ordinary intelligence and a few hours or days of practice, works either machine with perfect accuracy.

We found that where a single wire was tumbling messages into the office at the rate of sixty thousand words per hour, that we must have something more rapid than the hand-pen to copy the messages—and as necessity is the mother of invention, we set to work to get up a hand key Printing machine, which is worked by a girl at the rate of about 3,000 words per hour, and prints as neatly as can be done with a regular press in a printing office. The messages are printed on note paper (that is, not on a paper ribbon) and thus one girl copies, in a very elegant manner, (and in manifold with, 10 copies, if you wish, for the Press) as many words in an hour as four or five girls could copy with a pen.

Now, then, I am satisfied, and now we will go on with our new system, which I laid on the shelf six months ago, with a feeling (for which I have, in the main, to thank you) that we had not done all that was possible to do. Meantime, our friend Orton, and hosts of other deeply interested parties,—not excepting Hubbard—have had months of the keenest delight in circulating reports that we had failed to develop anything that could compete with the Morse system.

The facts are as follows:

With 10 girls & 10 inexpensive and durable machines, we can perforate 30,000 words in one hour, and 300,000 words in 10 hours.

With 1 girl to transmit & 1 girl to receive, these 300,000 words can be transmitted, certainly 500, and we fully believe 2000 miles, over one wire, and still not have the wire fully employed, by from 25 to 50 per cent.

At the receiving end of the line, 10 more girls, with 10 inexpensive & durable printers, can copy, in plain Roman print, the 30,000 words per hour and the 300,000 words per day of 10 hours.

Now, this I know we can do with our new machinery, which we are driving ahead as fast as possible, & shall have enough
completed to stock the Wash'n Balto, Phila & New York offices within the ensuing month. Meantime, I like to have my opponents and enemies here believe that I have abandoned all hope of destroying the Western Union Co.

Orton and Morse have testified that 600 words per hour, for 10 hours per day, is the full average speed of the Morse system, but, of course, there are a few operators who can average 1000 words per hour—10,000 per day of 10 hours. Thirty of such operators (who, here, would command $1,200 or $1,500 per year) with 30 good wires, in a circuit of 200 or 250 miles, would transmit 300,000 words in 10 hours, and Thirty more, equally good, would record the same at the other end.

60 Morse operators, at $1,200 per an. $72,000
22 Automatic girls, at $400 " " 8,800
Difference against Morse $63,200

Now, if the circuit is 600 miles, Morse-people must use Repeaters half way & thus require 30 more 2d rate operators, at $800 per an. $24,000
Difference against Morse $87,200

Here, you see, we beat Orton in the matter of Labor alone, at the rate of about 10 to 1, and of course, in the matter of Capital, expense of Lines, battery, depreciation, &c we shall beat our opponents nearly 20 to 1, and yet they console themselves that we are of no account & their worthless stock has been run up from 29 to 47.

When we get fairly to work, I should be pleased if you would send some friend, in whose judgment you can rely, to me, & I will take pleasure in exhibiting our system to him, & I have no doubt his report will be even more favorable than this Letter. We can send 30,000 words per hour with absolute correctness, (by the aid of our Automatic Repeater) to every city in the union, direct & at one writing—dropping copy at every place, with one wire.† Truly &c

D. H. Craig.

ALS, UKLPO, ATF, item 21. "P.O. Box 3237" written at top.
*Underlined twice. "Repeater" underlined twice. "One wire" written in bottom right margin.

1. Frank Ives Scudamore (1823–1884) was at this time second secretary in the British Post Office. He was instrumental in the 1869 nationalization of the telegraph system and its subsequent management. *DNB*, s.v. "Scudamore, Frank Ives"; *Kieve* 1973, 128ff.
2. Gardiner Hubbard, a former lawyer from Cambridge, Mass., was a central figure in efforts to nationalize American telegraphy. His daughter later married Alexander Graham Bell. *DAB*, s.v. “Hubbard, Gardiner”; Lindley 1975, esp. chaps. 3–5.

3. Edison.
4. See Doc. 103.
5. These two perforators cannot be identified with certainty. The former probably resembles Doc. 255; the latter may be similar to an extant three-key perforator (Cat. 1523, NjWOE).
6. Typewriter.
7. William Orton.

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Dear Mr. Edison:

Mr. Grace¹ wrote me that Mr. Harrington was going to Washington yesterday, so I reckon you are having no bothering, & I shouldn’t wonder if you wished I might be sick a month longer and Harrington be put into the Washington Penitentiary for at least that length of time.

On Tuesday next, weather permitting, I propose to bring a townsman, Mr. Anderson,² to you for you to examine what seems to me (very poor authority) a good beginning for a first rate Perforator, for Merchants’ use. Harrington has been negotiating with Anderson for several weeks or months, & has got to a point where, if you think the machine of real merit, or that it could be made of any use to a party who should undertake to run opposition to us, we are to put it into your hands to develop, for our benefit & under our control. We shall try to get out in the 11 o’clock train, and will go direct to your shop, and if you think best to let Unger see the machine (a full working model, made very rough) let him call there on his way to dinner. Anderson is an artist (painter) but belongs to a family of very ingenious people—his father a machinist—and as he had never seen or even talked with any person knowing anything about Perforators, I think you will agree with me that he has produced a very creditable machine. No doubt you can greatly improve it, and as we shall get the benefit of whatever merits it possesses, I hope you will be able to find time to give it a careful examination, and tell Anderson kindly & moderately what you think of his invention. I hope you are getting along nicely. Truly &c

D H Craig.

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¹ Mr. Grace ² Mr. Anderson
1. Probably George Grace, superintendent of the Automatic Telegraph Co., who was assisting Craig in testing the Little system. Grace began his career as a telegraph messenger in 1851 and by 1860 worked as chief operator in the Springfield office of the American Telegraph Co. under his brother Frederick Grace. He then served as superintendent for the Franklin, the Bankers' and Brokers', and the National telegraph companies, before becoming superintendent of Automatic Telegraph. In 1874 Grace became general superintendent of the Southern and Atlantic Telegraph Co. Reid 1879, 454; “Automatic Telegraphy,” Teleg. 6 (1869-70): 408.

2. Frank Anderson was an artist who, like Craig, was from Peekskill, N.Y. Operation of Anderson's perforator (U.S. Pat. 122,098) required neither knowledge of the telegraph code nor an external power source. By 1888 Anderson had developed a system of automatic telegraphy capable of clearly transmitting 3,000 words per minute. The perforator of this system had the capacity to punch 60 words per minute. Craig established the Machine Telegraph Co. to exploit the Anderson automatic system. Elec. W. 17 (1891): 183; Mavers 1892, 291-94; Craig 1888.

Dear General—

You are indebted to my inflamed Lungs and a fearful Cold, for your undisturbed serenity during the past three or four weeks.

I write you now to say that since Mr. Harrington got all the papers, executed, from that dirty Scallowag, Walter, all has been going along as nicely as anything ever goes without my push; and Harrington seems to expect to be in full operation this month, but, of course, he cannot be until Edison says the word. Nothing could look better than the future does, and if nothing breaks, we (you and I) will soon be in clover—that is, we will be able to pay our debts.

I suspect you have not said a word to Mr. Hoadley for if you had, and had told him, as you might, that I was going to bring Automatic Telegraphy out and make it the top of the heap, very soon, he would not have written me as he did, the other day, a very sharp dun for his money.

Will you not go and tell Mr. Hoadley the situation of things, and tell him that it is utterly impossible for him to get his money until we get Automatic Telegraphy born. Mrs. Craig has paid & will pay the interest, and with that, on her side, you must aid me in keeping that old Christian quiet, and the sooner you get to work on this line the better it will be for your digestion.

I was told by Edison that Orton had seduced that drunken loafer—[I]Edison’s late foreman—who bullied your 150 ma-
chines, and it is surmised that Orton, Prescott and Phelps are going to “see,” now, through a very dark lantern, all there is in your machines and in ours. Orton must be getting desperate.

In a private talk with Bennett the other day, he intimated to me that he had a good understanding with Vanderbilt, in Telegraph matters, and he said, with considerable emphasis—“all your old enemies will be out of the W.U. Co. within six months, and then if you and Lefferts have really got anything of value in your new system, I don’t see why you should object to let the control fall into Vanderbilt’s & his friends hands any more now than two years ago.

To my mind, this signifies that Bennett and the Vanderbilt people are one in Telegraph aspirations, and that there is to be a clean sweep, from Orton down, and that you are the coming man. Now, tell me, on the square, is not this conjecture substantially correct? You know I have always had a sort of a hanker to see you Boss at 145, and have said to you that then an arrangement satisfactory to that Co. and to all on our side, would be easy. Of late, I have felt as though that old hope was about played out, and I have been at work creating machinery which would be even now, hard to manage in that direction, and there should be no time lost in throwing an anchor to windward, if there really is anything at work looking to your becoming the manager of the W.U. Co.

What would be the harm of your asking Clark for a private talk, and then tell him what you know of Automatic Telegraphy, and the utterly unreliable character of the disparaging statements put forth by Orton, Prescott and the other fools of the W.U. Co.

Then, for any good reason that may occur to you, arrange for me to see Clark, & let me tell him what we are prepared to prove over any good Line, and let him understand that you are the only person qualified to introduce Automatic Telegraphy upon the lines of the W.U. Co. and also that you are the only man who could exert sufficient influence to arrest Automatic Telegraphy as an opposition and hostile element and bring it in to harmony with the interests of the W.U. instead of the opposition Companies’ interests.

The result of this little management, which can be confined to you & myself, would be to assure to you the position you ought to hold, as manager of the W.U. Co. and then it would be an easy step for you and me to make all parties see their interests in harmonizing with our views.

What I want, & all I care for, is the control of a News Co.
with one or two Automatic wires leading to all news-centres, and I will guarantee to bring every newspaper in the country into harness, and drive every Telegraph news shyster out of the business in less than 12 months.

With our new machinery, we shall certainly Perforate, with 1 girl, at three or four hundred dollars per year, 2000 words per hour—Edison says 2500 to 3000.

One of our copying (printing) machines has been worked by one who is over 50 years old & who has not had equal to 60 days practice upon the machine, 57 words per minute, for messages of over 500 words, and any girl or Boy can certainly average 2000 words per hour.

We have telegraphed, with accuracy, over 282 miles of wire, one thousand words per minute, and our Repeater works perfectly above 600 words per minute, and when we worked, for several days, from Washington to Albany (over a fearfully poor A. & P. wire nearly half the way) we really could discover no difference in the writing at Albany and at New York, at 600 words per minute, working direct, & dropping at New York.

Now then, here (on next page) is Automatic Telegraphy as Morse people have got to encounter it:—

**Automatic = 600 miles Line.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 girls, perforate 30,000 ws. pr. h @ $400.</td>
<td>$6,000</td>
</tr>
<tr>
<td>5 girls copy (plain Roman print) 400</td>
<td>6,000</td>
</tr>
<tr>
<td>2 girls to tend Motors.</td>
<td>800</td>
</tr>
<tr>
<td><strong>Total, for operators, 1 year</strong></td>
<td><strong>$12,800</strong></td>
</tr>
</tbody>
</table>

**Morse = 600 Miles Line.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>43 wires, averaging 700 words per hour, will</td>
<td>$51,600</td>
</tr>
<tr>
<td>require 86 first class operators, at $1,200</td>
<td></td>
</tr>
<tr>
<td>per year.</td>
<td></td>
</tr>
<tr>
<td>43 Repeater operators, @ $800</td>
<td>14,400</td>
</tr>
<tr>
<td><strong>Total, for operators, 1 year,</strong></td>
<td><strong>$66,000</strong></td>
</tr>
</tbody>
</table>

More than 5 to 1 against Morse, on Labor, and more than 20 to 1 on Capital & incidental Line expenses.

We shall not require Repeater instruments on 1000 mile circuits, & probably not on 2000 miles. Our careful tests go to prove this, as they clearly do to telegraph at almost any speed where there is a regular flow of current, much or little.

Medill, you know, said we could beat Morse out of sight on great lines or routes, but not on small lines or routes. He was green or fool enough to be taken-in by the Morse blowers.

Take a Line 100 miles long, & 10 offices, each averaging
100 words per hour: A girl will Perforate 100 words in 3 minutes & copy the same in 3 more, and will transmit the same in 1—Total 7 minutes. 3 minutes to Perforate & 1 to transmit, each office on the Line could be called every 40 minutes.

No Morse way-line with ten small stations, could call through & pass 1000 words over the wire, in less than 2 hours—so Morse offices would be served five times in 10 hours, and Automatic offices would be served fifteen times in 10 hours.

Morse Line would send 5000 words in 10 hours—Automatic Line would send 10,000 words or more, if offered, within the 10 hours.

The greater the business, the greater the Comparative money advantages—but the Automatic system, on small way-lines will show more than 50 per cent of business advantages—for, all other things being equal, telegraph business will go to the Line having the best facilities. We shall have a vastly more correct system than Morse can ever be even with first class operators, which, of course, are never found on way-lines.

I suppose, of course, that you know all these things much better than I do—but then, you have been running along in the Morse rut so long, that it will not do you any harm to get an eye-opener, occasionally.

Somebody told me that the G. & S. Co. was going in to the reporting of general news in all the great cities. Is this true? I hope not. I agitated this feature of the news business, and started it as far as the Ass'd Press would permit me, 14 years ago. It is only a News organization like the Associated Press that can do that business legitimately, and whoever gets in to that business will have to bury me or I shall them. I should be very sorry to bury you or even your old shoes—so I hope your Co. will not force you in to a position where they cannot sustain you. Yours, all the time,

D. H. Craig

ALS, NNHi, Lefferts. *Underlined twice. †Followed by two centered horizontal lines.

1. This is a reference to the agreement between the National Telegraph Co. (of which George Walter was secretary) and the Automatic Telegraph Co. concerning the use of Little’s automatic telegraph (Doc. 141). Harrington to Walter, 2 Feb. 1871, and Robert Squires to Harrington, 3 Feb. 1871, Respondents’ Exhibits 2, 1:454, Box 735A, Harrington v. A&F.

2. Probably Andrew Hyde, Edison’s foreman at the American Telegraph Works. The last date on which Hyde’s name appeared on the

3. To “bull” meant to make a mistake or a blunder. Farmer and Henley 1970, s.v. “Bull.”

4. George Bartlett Prescott (1830–1894), chief electrician of Western Union, authored a number of important works on electricity, including *History, Theory, and Practice of the Electric Telegraph* (1860) and *Electricity and the Electric Telegraph* (1877). He began his career in 1847 as an operator with the New York and Boston Magnetic Telegraph and soon became assistant manager of the company’s Boston office. He later served as chief operator, manager, and superintendent for a number of telegraph companies, including the American Telegraph Co., which merged with Western Union in 1866. In 1870 William Orton appointed him chief electrician of Western Union and placed those electricians formerly serving as assistants to the company’s general superintendents under Prescott’s supervision. Prescott also assumed responsibility for all improvements to the company’s lines and for evaluating the importance of new inventions. He continued to participate in the telegraph industry until 1882, when he retired and devoted his time to writing. *DAB*, s.v. “Prescott, George B.”; Orton 1870; “A New Order of Things,” *Telegr.* 7 (1870–71): 92.


6. Cornelius Vanderbilt, railroad president and financier, was also a major shareholder and a director of Western Union. *DAB*, s.v. “Vanderbilt, Cornelius Henry.”

7. Western Union’s headquarters were located at 145 Broadway.

8. Horace Clark, railroad financier and chairman of the Western Union executive committee, was William Vanderbilt’s brother-in-law. *DAB*, s.v. “Clark, Horace Francis.”

9. Joseph Medill, publisher of the *Chicago Tribune*, was mayor of Chicago in 1871. Two years earlier he had witnessed the test of Little’s automatic telegraph made by George Hicks, agent of the Western Associated Press. *DAB*, s.v. “Medill, Joseph”, Little 1874b.

My dear Edison

Hurrah! Now push to immediate completion one if not more of the hand transmitter1 & one at least of the 3 keyd perforators—and that large perforator—the two former at once.2

I want to confer with you about switches3 and the size of our tables & what kind will be best, at the proper time I will fix up one room for the tests in a manner suitable for gentle — men & in a manner not to disgrace our pretty machinery.4

Harrington

ALS, NJWOE, DF (TAEM 12:244).

1. On 4 March, Edison finished constructing a hand transmitter,
which probably operated by turning a hand crank. Just such a device is illustrated in the accompanying undated drawing labeled “Hand Transmitter Motor”. Cat. 298:106, Lab. (TAEM 5:198–200).

2. Account records show that Edison had worked on two large perforators as early as January 1871 and a three-key perforator in early February. On 17 February he had filed a caveat (not found) for a perforator; on 6 March he executed another, for a large perforator. Bills to Automatic Telegraph Works, Jan. and Feb. 1871, 71-015, DF (TAEM 12:578–82); Cat. 30,108, Accts. (TAEM 20:205–20); Quad. 72.11, pp. 44–45 (TAEM 9:187–88); caveat of 6 Mar. 1871, DF (TAEM 12:643 and TAEM Supp. III).

3. Switches diverted current from one circuit to another, thereby saving the time otherwise used in removing instruments from one circuit and rearranging them in another. Because a variety of switches existed, Edison and Harrington had to evaluate which kind would best serve their needs. Pope 1869, 37–42.

4. On 5 May, Edison had “four men working day & part night—on fitting up” a sewing machine table with instruments and batteries for the purpose of exhibiting the automatic telegraph. Bill to Harrington, 5 May 1871, DF (TAEM 12:586).

Dear Mr. Edison:

By doubling the perforated paper you will see that ordinary pens or rollers would not, by considerable, make dashes.¹ What I send is your M on “Mississippi.”² To make a dash, the upper hole would have to be at least ¾d larger. To make sure, it should overlap the two lower holes as much as the thickness of three thicknesses of thick writing paper.

Would it not be possible to have the 3 keys so arranged that you could depress the whole three at once?³ I think you struck two at one time & one the next, to make the dash. I did not see you make the long dash at all, but I suppose it is that.⁴

If you don’t let me see your Perforator and Printer working, soon, I think I shall hang myself—for things are getting too hot. I am too much a subject for commiseration on the part of my friends.

I shall try & see you on Saturday Truly &c

D. H. Craig

From Daniel Craig

Peebles, Mar. 16/71

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January–June 1871

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1. By doubling the thickness of the paper, Edison hoped to prevent it from tearing.

2. Transmission of the letter "M" consisted of two consecutive dashes.

3. In his first perforator patent (U.S. Pat. 121,601), Edison described only overlapping holes of equal size. He developed an arrangement of punched holes to represent a dash similar to that recommended here by Craig, but he did not claim it until his second perforator patent (U.S. Pat. 132,456). See Doc. 255.

4. A long and a short dash, in addition to the dot, were elements of the telegraph code used in nineteenth-century America. For example, a single short dash meant the letter "T," and a single long dash represented the letter "L." Pope 1869, 99-101.

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From George Harrington

New York, 18 Mch 1871

Sir;

I accept your proposition to make fifty of your perforators with the various improvements referred to, for one hundred dollars each and hereby authorize and request you to manufacture them forthwith.

Geo Harrington Presdt Aut Co

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Technical Note: Automatic Telegraphy

[Newark, Winter 1871]
Vibrating

emboss paper deeply & cut off top of embossed dot or dash by a revolving knife =

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magnet brings revolving punch forward and it acts as a shear revolving with great reapidity. use continuous feed =
movable die = = wheel & ratchet for paper feed = clockwork for reciprocating = self vibrating weighted lever =
cutting wheel = revolving cutting punch = = reciprocating transmitter = for sending reverse currents bring second punch in only when other punch not wkg =

mention that in local perforator magnet may be dispensed with & key & hand used =


1. This material, which appears to be preliminary notes for a caveat, came to light as this volume was in press; hence the intercalary numeration. It will be filmed at the end of Part III of TAEM as a supplement.

2. Edison might have made these notes as early as January. On 26 July 1871 he executed a caveat describing an electric perforator, but it was unlike these designs. See Doc. 289 headnote.

3. In each of the six numbered sketches, Edison is trying to harness a constantly reciprocating rod to punch holes in the paper tape, either by moving a punch in line with the rod (3 and 4), by closing a gap between the rod and the punch (2), or by introducing a tongue of metal into that gap (1, 5, and 6). In each case the sketch shows only one punch; a perforator would have several. Depressing a key would activate the appropriate punches for that letter or dot/dash signal. Several of the punchers drawn have electric motors like the one Edison was using in his universal private-line printer.

In this design the motor (at top) drives an eccentric (as shown in elevation in sketch 2). At lower left, driven by the eccentric, is the "wheel ratchet for paper feed" mentioned at the end of the document. When the electromagnet at right center is charged, levers connected to its armature drive a tongue between the reciprocating rod and the punch lever. The object at lower right is the roll of paper.

4. This design incorporates the "movable die" mentioned near the end of the document. When the electromagnet at center is charged and attracts its armature, the die (top center) slides to the left and the reciprocating rod (driven by the electric engine at top left) hits the punch, perforating the paper. The line wire (with electromagnet) slanting from lower right to middle left indicates that Edison intended this to be used remotely (perhaps as the "local perforator" mentioned later). Cf. Doc. 194.

5. Here the operator supplies power with the hand wheel at lower left. The long rod attached to the rotating shaft at left center is the paper feed; the other rod supplies power for the punch. Each is on an eccen-
When the electromagnet at lower center is charged, the bar hinged to the punch (center) descends and is struck by the reciprocating rod. Sketch 4 shows the basic punch mechanism from the side.

6. In this variation, charging the electromagnet pulls down the tongue (drawn vertically at center) between the reciprocating rod and the punch. This design is essentially the same as sketch 5; here the power supply is an electric motor.

7. This is the “self Vibrating weighted lever” mentioned later in the document. Closing the key at bottom charges the electromagnet at right center. The armature lever is weighted at the top and has the punch attached (extending to the right just above the electromagnet). As the lever moves toward the magnet, the circuit breaks (top); as the lever is pulled from the magnet, contact is made and the magnet charges again. The oscillation will continue until the key is released.

8. Here the paper tape is folded and cuts are made in the fold. When the paper is opened, the perforations will appear in the middle. The labels on the figure are “or relay on line”, which refers to replacing the key, and “Engine or other power”.

9. Cf. Doc. 135C.

10. The motor at top drives the punch shaft at center through a gear wheel. When the magnet at left center is charged, a lever engages the reciprocating piece at left, pushing the punch through the paper. At right is a detail of the punch.

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New York, 22 Mch 1871

My dear Edison

I telegraphed to day to know when you will be over. I want your “sounder” to try.1 We can have the circuit to Charleston for the purpose. If successful ‘twill be a card for you. Also I want a roll or two of your chemical paper for permanent recording which shall have a full trial. I will give you the rolls.2

I hope to see the sounder on Monday. very truly

Harrington

I think we can get the Charleston circuit at between 12 & 2 o clock.3


1. The “sounder” may be Edison’s relay (U.S. Pat. 114,657), as those two terms were sometimes used interchangeably. “Western Union and Automatic Telegraphy—Mr. Little in Reply to Mr. Orton,” Telegr. 10 (1874): 259; Pope 1869, 32.

2. Depending upon the chemicals employed and the metal constituting the stylus, the marks recorded in automatic telegraphy were either transitory or permanent. A platinum pen and a solution of potassium iodide (KI), for example, left transitory marks called “fugitive printing.”

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An iron pen used with paper soaked in an aqueous solution of ammonium nitrate (NH₄NO₃) and potassium ferrocyanide (K₃Fe(CN)₆) gave a permanent record. Sabine 1872, 202, 212.

3. This is probably a reference to the line of the Southern and Atlantic Telegraph Co. that ran between Washington and Charleston, S.C. Between 12:00 P.M. and 2:00 A.M., telegraph traffic was light, allowing Harrington to test Edison's relay.

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**List of Machinery**

Machinery ordered by Mr Harrington

1. As seen in the illustration on p. 266, Edison also wrote a slightly different, undated version of this list, which he entitled "List of Machinery necessary to exhibit a perfect 'Fast system' [i.e., automatic telegraphy] and all its ramifications." 71-003, DF (TAEM 12:256).

2. According to American Telegraph Works accounts, employees worked on a large perforator between February and April 1871. Foundry work on ten other large perforators was completed by 18 May, and several perforators were constructed during the summer. Cat. 30,108, Accts. (TAEM 20:188); Doc. 162; agreements between Frederick Spannenberg, William Parkinson, and the American Telegraph Works, 17 and 26 July 1871, DF (TAEM 12:301–7).

3. The small hand perforators were most likely the manually operated, three-key machines for which Edison and Unger billed the American Telegraph Works on 3 April 1871 (71-015, DF [TAEM 12:583]). Employees of the American Telegraph Works also worked on a three-
Edison’s list of the machinery that was needed to operate an automatic telegraph system.

For a machine necessary to exhibit a perfect “Ford system” and its ramifications:

- 4 Large Post Perforators
- 4 Key Perforators
- 4 Key Perforators
- 3-Grooving Perforators
- 2 Automatic Paper Wetters
- 4 Telegraph Stations on Continuous roll, with gland moisture for shift
- 2 Repairs
- 2 Office Switches
- 4 Hand Transmitter & Receivers
- 4 Magnetic Transmission & Receivers
- with automatic stop & release
- 1 Tallow
- 1 Ink Receiver
- 1 Book
- 2 Power Transmitter & Receiving Adapters

4. This device may have been powered by a compressed-air cylinder similar to that described in Doc. 196. “Hand” may refer to the manner in which the device was operated, perhaps like the perforator of Richard Culley and Charles Wheatstone, the valves of which were worked by finger keys. “Wheatstone’s Automatic Telegraph,” Telegr. 4 (1868–69): 273.

5. A pocket corrector could fix faulty perforations such as those caused by operator error, the punched-out portion clinging to the paper tape, or the punch cutting out only a partial opening. Ibid.

6. The paper-wetter was probably the “chemical paper machine” listed in the payroll accounts of the American Telegraph Works for 18 and 25 March 1871. It may have saturated the chemical paper for the Little automatic receiver. Cat. 30,108, Accts. (TAEM 20:188).

7. The accompanying drawing shows a device with a number of transmitters operated by a belt-driven pulley. Cat. 298:21, Lab. (TAEM 5:38).

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8. Edison and Unger charged the American Telegraph Works $50.00 for each of three repeaters on 5 May 1871. These were probably Edison's patented repeater (U.S. Pat. 114,657). 71-015. DF (TAEM 12:586).

9. Edison did not execute a patent for an ink recorder until 12 August 1871 (U.S. Pat. 124,800). Edison and Unger billed the American Telegraph Works on 6 April 1871 for experimental work on a model of an ink recorder, on 24 April 1871 for polishing an ink recorder, and on 2 May 1871 for a Patent Office model of an ink recorder. As seen below,
This drawing from Edison's patent for an automatic telegraph ink recorder differs from his notebook drawings (U.S. Pat. 124,800).

10. The hand transmitter (see Doc. 149, n. 1) was operated by a hand crank. Cat. 298:106, Lab. (TAEM 5:199).

11. The accompanying drawing of a weight transmitter does not show the drive mechanism, but it was probably powered by a descending weight. The "automatic" may have been an automatic paper-feeding device. Cat. 30,094, Lab. (TAEM 5:350).

12. Account records show that Edison and Unger charged the American Telegraph Works for work on a magnetic transmitter on 24 April 1871. An electromagnetic (hence "magnetic") motor probably drove the apparatus. 71-015, DF (TAEM 12:584).

13. Typewriters.

From Daniel Craig

Dear Mr. Edison:

Hall¹ made for us, in March, 18689, a working model of the Little Motor and Puncher, and Tablet.²

In Jan. 1870, after Little had considerably changed all the
mechanism, Hall & two other men, went to work and made
Ten of each in 13 weeks, and Hall himself did not work on the
machines over \( \frac{1}{2} \) of the time.

I asked your foremen today, how long it would probably take
to make 4 more Perforators, supposing the present one was
found to be all right, and he almost took my breath away by
saying, "about three months!".

Surely, there must be some grievous mistake about this.

He said working drawings could be made from the
machine, in a week or less, so that we could take the machine
away for practice—and I hope you can confirm this.

Are you absolutely sure, from your own personal observa-
tion, that all is being done that can be, to expedite the com-
pletion of our machines? The 3 weeks of January have run in
to three months, and as I know we are all suffering terribly by
the delay, I feel as though I must speak to you about it—but,
of course, only to be sure you are doing all you can to help us
out of hot water. Truly &c

D H Craig

ALS, NjWOE, DF (TAEM 12:456).

1. Probably Thomas Hall, Boston electrical manufacturer.

2. Regarding George Little's motor, see Doc. 132, n. 2. His puncher
(U.S. Pat. 96,331) was a multikeyed perforator that used electromagnets
to punch the holes and advance the paper. Little's tablet (U.S. Pat.
96,330) used essentially the same perforating mechanism, but the op-
erator indicated the letter to be punched by sliding a metal stylus the
length of a groove corresponding to that letter. A unique arrangement of
contacts at the bottom of each groove differentiated the letters.

3. It is not known what alterations Little made.

4. This is probably a reference to the four large perforators ordered
by Harrington on 28 March. See Doc. 153, n. 2.

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Newark, April 4, 1871

Whereas I, Thomas A. Edison, of the City of Newark, State
of New Jersey, for certain valid and valuable considerations,
to me in hand paid, and in further consideration of certain
covenants and stipulations to be fulfilled by George Harrin-
ton, of Washington, District of Columbia, did stipulate and
agree to invent and construct for the said Harrington full and
complete sets of instruments and machinery that should suc-
cessfully and economically develop into practical use the
Little or other system of automatic or fast system of telegra-
phy, and subsequently to improve and perfect such instru-

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Agreement with George Harrington

January–June 1871 269
ments and machinery by adding thereto from time to time such further inventions as experience should demand, and my ability as an inventor and electrician might suggest and permit; and furthermore, to prepare, or cause to be prepared, the necessary descriptive papers, the models and drawings requisite and necessary to obtain patents for all such inventions and improvements, to be the joint property of the said Harrington and myself, and the patents to be issued to the said Harrington and myself in the proportionate interest of two thirds to said Harrington and one third to myself, the whole to be under the sole control of said Harrington, to be disposed of by him for our mutual benefit in the proportions herebefore recited, in such manner and to such extent as he, the said Harrington, should deem advisable, with power to sell, transfer and convey the whole or any part of the rights and titles in and to any or all of said inventions and improvements, as also of the patent or other rights arising therefrom; and the said Harrington having faithfully fulfilled all of the covenants and stipulations entered into by him: Now, therefore, be it known, that in consideration thereof, and of the sum of one dollar to me in hand paid, I, Thomas A. Edison, of the City of Newark, State of New Jersey, do by these presents hereby assign, set over and convey to him, the said Harrington, two thirds in interest of all my said inventions, including therein all my inventions of mechanical or copying printers, and of all the patents for all such inventions and printers, whether already issued, applied for, or to be hereafter applied for, and of all and whatsoever of my inventions and improvements made or to be made, and of all the patents that may be issued therefor, that are or may be applicable to automatic telegraphy or mechanical printers.

And whereas, I am desirous of obtaining the cooperation and assistance of the said Harrington in disposing of my said one third interest, as before recited, and for the purpose of united and harmonious action in negotiating for its use or its sale and transfer by or to others in conjunction with his own, and in such free and unrestricted manner as will tend to success, and for the sum of one dollar to me in hand paid, the receipt whereof is hereby acknowledged: Now, therefore, be it known, that I, Thomas A. Edison, of the City of Newark, State of New Jersey, have constituted and appointed, and by these presents do constitute and appoint George Harrington, of the City of Washington, District of Columbia, my true, lawful and only attorney, irrevocable, with power to substitute for me and in

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my name, and in such manner as he may think best, to sell, transfer and convey all my rights, titles and interest in and to any and all of my said inventions, and the improvements thereto, whether made or to be made, and to sell, transfer and convey all of my rights, by patent or otherwise, arising therefrom, already made and obtained, and all such as may hereafter be made or obtained, and to execute in full any or all necessary papers and documents requisite for the transfer of title, and to invest in other parties full and legal ownership therein; hereby divesting myself of and investing him, the said Harrington, with all the powers necessary in the premises fully and completely to carry out the purposes and intentions herein set forth, hereby fully confirming all that my said attorney may or shall do in the premises as fully as if done by me in person; and request the Commissioner of Patents to recognize him as such attorney.

In witness whereof, I have hereunto set my hand and affixed my seal, in the City of Newark, this fourth day of April, eighteen hundred and seventy-one.5

T. A. EDISON,5b

In presence of A. D. COBURN, A. B. CANDEE.5c

PD (transcript), NJWOE, Quad. TL.C.2, p. 8q (TAEM 10:864). Ten versions of this document are in the Quadruplex Case, two more are in Harrington v. A&P, and another is in Libers Pat. U-13:412. Among the versions there are dozens of minor textual differences, most of which were not noted in the court proceedings. However, a few discrepancies were observed and one became an issue (see n. 3). This copy was selected because it best represents all the legal copies, its obvious errors are few, and it is clearly punctuated. Place and date taken from text; form of date altered. la“description” in some copies. “model” in some copies. 1b“and necessary” missing in some copies. 1cPreceded by “the said inventions and improvements” in some copies. 1dNot present in some copies. 1ePreceded by “George” in some copies. 1fRepresentation of seal follows. 1gFollowed by representation of 50¢ Internal Revenue stamp; other copies indicate a different placement and another stamp, both canceled by Edison.

1. This document amplifies the agreement of 1 October 1870 (Doc. 109) by explicitly assigning to Harrington partial rights to certain patents and granting to him Edison’s power of attorney in regard to those patents. Quad. 70.1, pp. 1–2 (TAEM 9:293–94).

2. Typewriters.

3. In the Quadruplex Case, Western Union claimed that this word had been forged on the original; it does not appear on some copies. For evidence and some argument regarding this and other disputed textual variations, see Quad. 71.1, pp. 1–24 (TAEM 10:5–17).

4. The duration of this arrangement was governed by the five-year term of the agreement reached on 1 October 1870 (Doc. 109).
To George Harrington

Had Printer\(^2\) operating, but broke it. am making some alterations, may be done tomorrow

Perforator getting on finely, will probably have it within the time promised Mr Craig.

Tools all done for Gold & Stock Contract\(^4\)—and we are pushing right ahead on it =

In the Other Shop\(^5\) I am having made the “Little Distributer”\(^6\) Expenses may be a Little heavy for the present but the results will be tremendous!

Edison

ALS, NjWOE, DF (TAE 12:255).

1. The discussion of the printer, perforator, and “the other shop” indicates that Edison wrote this to Harrington.

2. Edison was working on both a perforator and a typewriter (printer) in the spring of 1871, and in April he began production of cotton instruments for Gold and Stock at the American Telegraph Works. The universal stock printer, manufactured in the fall, was produced at the Newark Telegraph Works.

3. Typewriter.

4. The contract was for 150 cotton instruments; see Docs. 131 and 136.

5. The Newark Telegraph Works.

6. Unidentified; possibly some component of George Little’s automatic system.
LEASE.

This is to Certify, That I have this First day of May 1871 LET and RENTED unto Wm Unger & Thos A Edison the third and fourth stories of my new factory corner of Ward street & Pear Alley in the city of Newark N.J., with the privilege of four horse steam power. The power in the third story not to be charged for until applied with Appurtenances, and the sole and uninterrupted use and occupation thereof for the term of one year to commence the first 4 day of May 1871 at the yearly rent of Fifteen hundred Dollars payable monthly in advance.

Witness, Wm. S. Vliet

Wm H Kirk

SCREW-THREAD UNISON

Printing telegraph systems required that the sending and receiving instruments be precisely synchronized. A problem at the sending end, on the line, or in the printer could make the printer "throw out"—that is, fall behind the transmitter by one or more letters. A unison device whereby the transmitting operator could reset all the printers on a circuit to the same character was therefore much desired. Sometime in the spring of 1871 Edison devised a unison stop mechanism that was one of his two most significant inventions in printing telegraphy (the other was the typewheel-shifting mechanism invented for the cotton instrument). By mid-May, Edison had sent a draft of the U.S. patent specifications for the unison stop to his patent attorney, Lemuel Serrell. George Field and Elisha Andrews also included the unison in a British patent
application they communicated to their London solicitor, William Lake, in early May.¹

The fundamental feature of Edison's unison was a small peg seated in a screw thread on the typewheel shaft (see Doc. 158, photograph B). As the typewheel rotated, the thread moved the peg to one side. Every time the printing-lever magnet was charged, the peg lifted and was drawn back to its starting point by a spring. If the printing magnet was not charged, however, the peg continued to move until the arm holding it hit a "stop" attached to the typewheel, which stopped the rotation of the shaft. By sending enough impulses to rotate a typewheel the requisite number of turns, a transmitting operator could bring all the instruments on a circuit to unison. The operator then charged the printing magnet, which freed all the typewheels at the unison point. The operators on reporting circuits were supposed to run the machines to unison every five minutes or so, but in practice they were often too busy. For private lines, Edison recommended resetting the printers before each communication.²

These undated sketches appear to show Edison's redesigned screw-thread unison: the mounting for the release arm on the printing lever (top); the thread on the shaft (center); and the top of the release arm (bottom).
In its earliest form, the screw-thread unison was actuated by the printing magnet but was mechanically independent of the printing lever. Edison soon modified it, however, by attaching the release mechanism to the printing lever, and the arm holding the peg to the ink-roller shaft. Subsequently he attached the arm itself to the shaft of the printing lever.

1. James Reid called the screw-thread unison “the invention of... Theodore M. Foote... as constructed by Edison,” but the only similarity between the Edison and Foote unisons was that both were actuated by the printing magnet (Reid 1879, 618). Foote’s unison was specified in U.S. Patent 105,060.

A 13 February 1871 Newark Telegraph Works invoice to the American Telegraph Works included a pattern for a “unison post” for the Gold and Stock Telegraph Co. (71-015, DF [TAEM 12:580]). Edison’s agreement with Gold and Stock in May (Doc. 164) included the screw-thread unison under “List of patents applications for which are pending and in progress at the solicitors,” even though the unison application was not executed until 13 November (U.S. Pat. 126,535). Field and Andrews’s application, filed in England on 24 May, became British Patent 1,400 (1871). An undated notebook entry lists the time needed to make and install one screw-thread unison. PN-70-12-25, Lab. (TAEM Supp. III).

2. NS-Undated-005, Lab. (TAEM 8:258); Healy, 1905, 121; Gold and Stock 1872, 5-6; item n.d., 14.

3. According to the diagram shown above, when printing magnet A charged, it pulled down rod B, which pivoted arm C and lifted tooth D out of the screw thread on typewheel shaft E. Photograph B of Doc. 158 shows the screw thread and tooth; rear-view C shows the lifting mechanism.


5. George Phelps later adopted the screw-thread unison on his stock ticker, which was widely used toward the end of the century. In Phelps’s version, a wire was wrapped in an open spiral around the typewheel shaft, and a flat bar rested on edge in the groove thus created. The New York Stock Exchange Archives houses a representative machine.
M (21 cm dia. × 13 cm), MiDbEl, Acc. 29.1980.1313. The ink roller and the spring between the frame and unison arm are missing.

1. See headnote above.

2. Edison modified a cotton instrument (serial no. 29) to create this patent model. Although the instrument is stamped "P. Kenny 35 Ann St. N.Y.," the design and modifications were probably made in Newark.

3. See headnote above, n. 1.
Memorandum of an Agreement made the tenth day of May, A.D. 1871, between George Harrington, party of the first part, and William J. Palmer, Samuel B. Parsons, John McManus, Josiah C. Reiff and William P. Mellen, parties of the second part. Witnesseth:

That whereas the said Harrington entered into a contract with Thomas A. Edison, dated October 1st, 1870, a copy of which is hereto annexed, on account of which he has paid out the sum of six thousand dollars, and advanced the further sum of ten thousand dollars for machinery, tools, fixtures and other property, situated at corner Green street and Railroad avenue, in the City of Newark, an abstract of the inventory of which is hereto attached; and also the sum of eleven thousand dollars, for work, materials, etc., in inventing, making and perfecting machines connected with the development of automatic telegraphy, and a machine for mechanical printing, some of which have been perfected and some of which are but partially completed:

And whereas said Harrington has also received a power of attorney, from said Edison, dated April 4th, 1871, by and in virtue of which he has acquired certain rights in connection with said contract and with inventions made and to be made by said Edison, and services to be performed by him, a copy of which is also hereto annexed.

And whereas still further money is required for the purpose of purchasing more machinery, etc., and for continuing to invent, make and perfect machines as aforesaid, and for doing all things contemplated by the contract with said Edison:

And whereas the said parties of the second part desire to become interested with said Harrington in the said contract and in the prosecution of the pursuits and business aforesaid and said Harrington desires that they should become so interested:

Now, therefore, it is mutually agreed by all the parties hereto as follows:

Said Harrington agrees to sell, transfer, assign, and set over unto the said parties of the second part, one, full, equal, undivided half part and interest in the said contract with said Edison, and in all property, rights, and interests of every name and nature which have been acquired under, or have grown out of the said contract or otherwise in connection therewith, or which may result therefrom, and the said parties of the sec-
ond part agree to purchase and receive the same, upon the terms and conditions following, viz.:

Said parties of the second part agree to reimburse and refund to said Harrington the sum of twelve thousand dollars, that being the amount which he has paid as aforesaid over and above the sum of fifteen thousand dollars in connection with the contract, pursuits and business aforesaid and also the sum of seven thousand five hundred dollars, in consideration of the greater risk of loss incurred by him in originally making the said contract with said Edison, and in advancing and paying the money under it as aforesaid.7

And the said parties mutually agree that after the date hereof all further moneys which both parties shall consider necessary for use in prosecuting the said pursuits and business shall from time to time be paid and furnished one-half by said Harrington and one-half by said parties of the second part.

And it is further mutually agreed that if either or any of the said parties shall desire to limit the whole amount invested and to be invested under this agreement to thirty thousand dollars he or they may do so, and nothing herein contained shall be construed as obligating him to pay any more than his pro rata share thereof, and further, that in case said Harrington or said parties of the second part shall wish to terminate the said business after the thirty thousand dollars shall be invested, and before undertaking to prosecute it upon a larger scale, it may be done upon written notice to that effect, and thereupon the property, rights, interests and effects aforesaid shall be sold and the net proceeds thereof shall be divided pro rata, or either party desiring to continue may purchase the same by refunding to each of the other parties the amount paid in by him. And it is further stipulated that no debts shall be contracted in carrying on the said business or in connection therewith.

In testimony whereof, we have signed this agreement the day and year first above written.

GEO. HARRINGTON,                      SAM. B. PARSONS,
WM. J. PALMER, by WM. P. Mellen,      JOSIAH C. REIFF,
WM. P. MELLEN.

ADDENDUM

Newark: [10 May 1871]

Abstract of Inventory of property, fixtures, etc., at Newark:

1061 Files, assorted sizes, and of all kinds.

44 Vises of different kinds and sizes.
826 Lbs. Cast iron anvils and 2 larger anvils.
19 Gongs of various kinds.
63 Hammers of various kinds and sizes.
10 Hand punches.
72 Chisels.
9 Oil cases, various kinds and sizes.
112 Turning and planing tools.
4 Engravers.
46 Lathe tool rests and fixtures.
426 Drills of various sizes.
19 Set brass vise clamps.
48 Figs of different kinds.
9 Gauges.
50 Reamers.
668 pieces and articles, comprising tape measure, clamps, brushes, emery wheels, funnels, wrenches, oil stones, nippers, shears, mandril, planes, drill chucks, saws, bits, hand-turning tools, etc., comprising all the tools necessary for a well furnished machine shop.

Machinery. Consisting of shafting, pulleys, 18 engine lathes, punch machine, milling machine, belting of various sizes, etc.

Office Furniture. Comprising tables, chairs, carpet, matting, and generally all necessary office furniture.

Fixtures. Comprising gas pipe of different dimensions, gas burners, shelving, rubber hose, window shades, work bench, ash and pine plank, etc.

Stock. Consisting of iron wire, sheet iron, nails, cast iron, cast steel, screws, bases, printer No. 1, copper wire, etc.

A detailed inventory of all the articles in this abstract is entered in the Property Book.

Addendum is a PD (transcript). Place taken from text.

1. William Jackson Palmer (1836–1909) was a railroad executive and financier. Prior to the Civil War, he served as private secretary to J. Edgar Thompson, president of the Pennsylvania Railroad. During the war he organized the 15th Pennsylvania Cavalry, eventually earning the rank of brigadier general. In 1894 he received the congressional Medal of Honor for his service during the war. After the war Palmer was treasurer of the Eastern Division of the Union Pacific Railroad, which became the Kansas Pacific Railroad before merging with Union Pacific. In 1870 he founded and headed the Denver & Rio Grande Railroad. He was also involved in Mexican railroads, including the Mexican National Railway, of which he was president. Palmer helped found the city of Colorado.

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5. See Doc. 109.

6. According to Daniel Craig, this interest had originally been reserved for him. Quad. 70.8, pp. 53–55 (*TAEM* 9:790–91).

7. This contract was endorsed as follows:
   Endorsed—Contracts—Geo. Harrington with Wm. J. Palmer and others—dated May 10th, 1871—On account of this contract the following sums have been duly paid which are hereby acknowledged:
   Sam'l B. Parsons, one-fifth in full, $4,500; Wm. J. Palmer, one-tenth in full, $2,350; J. C. Reiff, $1,000; all of which was expended in factory—Geo Harrington, April 17, 1875—Also received from J. J. Marsh, $1,500; Corning, $1,000; Morten, $1,000; Gouraud, $200—Geo. Harrington.

   Marsh is unidentified. "Corning" probably refers to Erastus Corning, Jr. Alex Morten was connected with Edison's work on the electric pen and domestic telegraphs in the mid-1870s. George Gouraud (1842–1912) was associated with Josiah Reiff and William Palmer in several business and real estate ventures before becoming involved in the Automatic Telegraph Co. in 1873. Gouraud achieved the rank of colonel during the Civil War and received a congressional medal for his service. Following the war, he worked for a time at the Treasury Department, where he became associated with George Harrington. When Edison went to England in 1873 to introduce his automatic telegraph, Gouraud was there as an agent for the Pullman Palace Car Co. and acted on behalf of Automatic Telegraph. He remained associated with Edison's interests in England for many years. George Gouraud folder, BC.

8. A copy of the complete inventory, dated 10 May 1871, can be found at the Edison National Historic Site. 71-008, DF (*TAEM* 12:420–31).

9. For a description of tools and machinery, see Doc. 280.

10. Probably a misprint for "jigs."
From Daniel Craig
Peekskill, May 11/71.

Dear Mr. Edison:

I have your note.

I expected & desired you to be interested in the process for Insulating Wires, if there was anything good about it, and I feel so now, and you can judge better than I can as to what answer I ought to make to you about giving up the wire covering machine.¹ If I wasn’t at the moment so devilishly hard up, for money to keep half a dozen valuable things moving, I should not say a word but pay all expenses of machine & everything else, and push right on with the Insulation of wires.

I was sorry to have more than a few dollars expended to give me enough wire for a simple test, but as you acted as you thought for the best, I have not a word to say, except that I will, before a great while, pay all expenses provided you think our real interests will be promoted by having the use of the machine—but if you think that is not material, then, for your convenience as well as for mine, I would like you to get your pay as you suggest.

I am very busy in other matters just now. I would be delighted to know from you, just how automatic machines now stand. Truly

D H Craig

ALS, NjWOE, DF (TAEM 12:456).


From Daniel Craig
Peekskill, May 14/71

Dear Mr. Edison:

Our little philosopher, the Great Little, says our Paraffine insulation will not answer because it in a peculiar degree, operates to retard the current!¹ As he also said your three-keyed perforator was a very complicated & expensive affair, and that your big Perforator was merely a poor imitation of Wheatstone’s, his insulating story hasn’t made a very deep indentation into my heart—still I would like you to tell me if there is a bit of truth in what [he?]¹ says.

Do not fancy I am losing any interest in your operations because I do not bother you personally. I have been very busy about other matters, and am getting ready for active business as soon as you can give us the needed machines. I am not quite

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sure but that I shall have to take a hand in the News business even before we get the new telegraph system to work, as I am hard pressed by some of my friends.

I shall try to run out [to see?] you on Tuesday [ ] [?]. You can tell me [ ], if you have any, which [ ] [not?]. Truly &c

D H Craig

ALS, NjWOE, DF (TAEM 12:458). *One corner of the document is missing.

1. In 1887, the British mathematical physicist Oliver Heaviside discovered that minimum distortion of the transmitted message occurred when the product of resistance and capacitance of a circuit was equal to the product of leakage and self-induction. Insulating the wire increased the capacitance while decreasing the leakage, thus distorting the signal and causing it to elongate. George Little thought that a retardation of the current caused this elongation of the message. Britain 1970, 39.

Newark, N.J., May 18, 1871

To George Harrington

Mr Harrington

Please give Murray¹ $265 and $70. The former for a Milling Machine² and the Latter for the Last of the Type wheels =³

Town⁴ has taken stock of the whole Establishment, Has the Experimental Perforator Done,⁵ and has the patterns in the foundry for the 10 perforators which he is going right ahead to build = The Mechanic Printer⁶ is nearly finished. Will be ready next Saturday for visitors. We have had it together and it works Very Easy and Nicely = It is a good Looking piece of Mechanism

Saturday Night will settle the Success of all the Automatic Machinery = Hoping you are all right again. I remain Yours automatically

Edison⁷

ALS, NjWOE, DF (TAEM 12:248). Letterhead of the Newark Telegraph Works. "Newark, N.J." and "1871" preprinted. *At the bottom of the page Harrington wrote, "Received three hundred & thirty five dollars New York May 19 1871," and Joseph Murray signed it.

2. Milling machines were used in machine shops to shape metal. See Doc. 280, n. 6.

3. The typewheels were for printing telegraphs being manufactured for the Gold and Stock Telegraph Co.

4. N. W. Towne was superintendent of the American Telegraph Works.

5. This was probably one of the perforator designs Edison covered in his 11 May caveat. See Doc. 151, n. 1.

6. Typewriter.

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From Charles Jones

Albany May 25, 1871

To T. A. Edison

At Mr Craig's request I have sent you a printing machine upon which I was working some years ago & nearly completed. I was obliged to take the train before I could have it weighed & charges fixed upon it from Buffalo, or I should have paid them in advance. I hope to be at your place in a few days & we will talk the thing over. Yours &c

C. S. Jones


1. See Doc. 140.

2. Nothing further is known of Jones's machine or his relations with Edison.

3. Charles Jones, a telegraph operator, was later superintendent of telegraphs for the Illinois Central Railroad. Reid 1879, 322.

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Agreement with Gold and Stock Telegraph Co.

[New York,] May 26, 1871

Agreement, made this Twenty sixth 26th day of May 1871 by and between Thomas A. Edison of Newark, State of New Jersey, Inventor and Telegraph Instrument maker, of the first part, and The Gold & Stock Telegraph Company, a corporation incorporated under the laws of the State of New York, of the second part.

Whereas the party of the first part is the inventor of various inventions and improvements in Electro-Magnetic Printing Telegraph instruments and appliances, applicable to the business of private lines and the simultaneous distribution of market reports and other information to a number of persons by means of instruments operated in the same circuit, some of which have been already patented, as to others of which applications for patents are now pending before the United States Commissioner of Patents, and as to others, of which

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caveats have been filed, by the said party of the first part, and all of which inventions and improvements, are intended for the party of the second part, a portion thereof being in actual use by the party of the second part, and the remainder not yet fully completed, but in process of development, and

Whereas, the amount of compensation to be made to the party of the first part therefor, and for the other inventions specified in the Schedule hereto annexed, has been left open for adjustment up to the present time, and a general settlement has now been agreed on between the said parties touching the said inventions, and improvements, and all future modifications and improvements thereof, and the patents to be issued therefor, including all reissues of said patents upon the basis hereinafter set forth.

Now the said parties have, and do in consideration of the premises, and each, in further consideration of the covenants hereinafter contained to be kept and performed by the other, covenant, and agree, to, and with each other, as follows, that is to say:

First— The party of the first part, agrees to sell, convey and assign, and hereby does bargain, sell, assign and transfer, unto the party of the second part, the full and exclusive right to all the inventions and improvements made by him, in Electro-Magnetic Printing Telegraph instruments, apparatus and appliances, for which patents have been already obtained, or as to which applications for patents are now pending, or embraced in caveats filed by the party of the first part, the same being more particularly described in Schedule "A" hereto annexed and the other inventions in said Schedule mentioned with the exception only of those embraced in the caveats in said schedule therein described as "not relating to printing telegraphs" (the intention being to embrace in this agreement all such inventions and improvements of the party of the first part, in Electro-Magnetic Printing Telegraph instruments, apparatus or appliances, whether specified in said Schedule or not) and all letters patent, granted, or to be granted, by the United States, for any and all said inventions and improvements, and all reissues, of said letters patent, granted, or to be granted, and all the right title and interest, which the party of the first part, has, or may, or can, or shall have, now or at any time hereafter, to, or in the said inventions, and improvements, and each and every of them, and all future improvements, and modifications thereof, and each and every of them, to have and to hold, to the party of the second part, their suc-
cessors and assigns, to their sole use, benefit and behoof forever.

Second— The party of the first part further agrees, to go on and complete, and perfect, the said several inventions and improvements or so many of them as the party of the second part shall upon further examination and consideration in writing direct, with all reasonable dispatch, for the benefit of the party of the second part, and to prosecute with diligence, applications for patents for such inventions and improvements, as the same, shall respectively be matured and perfected; such patents to be issued to the party of the second part as assignee, and to make and deliver to the party of the second part free of all charge, complete working machines, embodying the said several inventions and improvements, one for each. As to the invention known as the “Universal Printer” it is expressly understood, and agreed, that the party of the first part, is to complete and deliver to the party of the second part, two complete and perfect working instruments, including the apparatus for the transmission and reception of messages, and also a modification of said instrument, without the transmitting apparatus, capable of being worked with a number of other instruments of the same character in the same circuit, from a common transmitter, so as to record the messages so transmitted.2

Third— The party of the first part further covenants and agrees, to and with the party of the second part, that he will on demand, from time to time, and as often as he may be required so to do, by the party of the second part, execute and deliver free of charge, to the said party of the second part, all such further conveyances, assignments, and instruments, as the party of the second part, their successors and assigns, or their counsel may reasonably devise, advise, or require, for the purpose of vesting in the party of the second part, the full and exclusive right to each and every of the inventions, and improvements, herein, or in the said annexed schedule, mentioned or intended to be comprised, and to each and every future modification or improvement therein, and in any Electro-Magnetic Printing Telegraph instrument, apparatus, or appliance whatever, applicable to the business of the party of the second part, which the party of the first part shall invent, design, or acquire, during the period of five years, succeeding the date of this agreement, and each and every patent for any such invention or improvement obtained or to be obtained during such period of five years succeeding the date of

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this agreement, and each and every reissue of each and every patent already issued, or which may hereafter be obtained therefor, and that he will during such period, give the said party of the second part, the benefit of his best skill and ability in the perfecting and improving of such inventions and improvements, and will to the best of his ability, co-operate with and assist the party of the second part, in obtaining such patents and in protecting the same, and the exclusive right of the party of the second part thereto.\(^3\)

Fourth— The party of the first part further agrees, in consideration of the annual salary, hereinafter agreed to be paid, to enter the service of the party of the second part in the capacity of consulting Electrician, and Mechanician, for the period of five years from the date of this agreement, and during such period, to give the said party of the second part the benefit of his best skill and ability, in that capacity, in all matters relating to their business, and in all things to strive to promote the success of the said party of the second part.

Fifth— The party of the second part, in consideration of the premises, agrees to pay to the said party of the first part, for said several inventions and improvements, patents, and services, as follows, that is to say:

1st— For the whole of the said invention known as the "Universal Printer," complete and entire, and the exclusive right to the same, and the several modifications and improvements thereof, made, and to be made, at any time hereafter, and the patents to be obtained therefor, including any and all reissues of said patents, the sum of fifteen thousand dollars, in shares of the capital stock, of the party of the second part, at par.\(^4\)

2nd— For all the other inventions, and improvements mentioned in this agreement, including as well those already made, as those to be hereafter made, and all patents issued, and to be issued therefor, and all reissues of such patents, and the good will of the party of the party of the first part, the further sum of twenty thousand dollars, in shares of the capital stock of the said party of the second part at par.

3rd— For the services of the said party of the first part as consulting Electrician and Mechanician, during the period of five years from the date hereof, a salary of two thousand dollars per annum, payable semi-annually in cash. And the party of the second part further agrees, that in each of said years, in which the party of the first part, shall invent and perfect, a new, useful, and valuable improvement in Printing Telegraph...
instruments, which shall be adopted and used by the party of the second part, the party of the second part will pay to the party of the first part, a further or additional compensation for that year, of one thousand dollars cash. It is understood, that the party of the second part, is also to pay the usual patent office fee and expenses, upon applications for patents under this contract.

In Witness whereof, the party of the first part has hereunto set his hand and seal, and the party of the second part has caused this contract to be signed by its President and Secretary, and its corporate seal to be hereto affixed, the day and year first above written.

Thomas A. Edison. The Gold & Stock Telegraph Co
H L Hotchkiss Secretary by M. Lefferts President
Witness A F Roberts

Schedule A referred to in the preceding agreement.

List of Patents issued and in the hands of the Gold & Stock Telegraph Company.

Patent No. 113033. Printing Telegraph, = called the "Chicago instrument"
Patent No. 114658: Printing Telegraph magnets for working a Printing Telegraph instrument on one wire.

List of Patents applications for which are pending and in progress at the solicitors.

Printing Telegraph No. 1. This is an instrument which works upon one wire and with one magnet the two distinct operations of Printing and Rotating The Type wheel being performed by actuating a polarized clutch and devices, by a reversal of the current. (Model in Serrells Patent No 126530)

Printing Telegraph No. 2. This invention consists of having two Type wheels worked independent of each other by two separate escapement levers both levers being operated by one magnet—either type wheel being grabbed at the will of the operator by means of a shuttle which is thrown in on either, by the printing current when both Type wheels are in certain positions. (Patent applied for Patent No 126534)

Printing Telegraph No. 3. Shifting Type wheel and its devices. (Patent issued not in safe Jany 1872 No 123006)

Printing Telegraph No. 4. Universal Printing Telegraph with
its various devices, same as exhibited to the Company. It is

doubtful if everything can be covered in one patent. (applied for  Granted No 123005 131340 140488 140487 134866)

Printing Telegraph No. 5. This invention consists of working
two type wheels independent of each other producing the
same result as No. 2 but with entire different means, No. 2
being mechanical and No. 5 electrical. (Applied for
131339)

Printing Telegraph No. 6. Shifting shield, Unison, and other
devices. (Applied for 126535)

List of Caveats in the Patent office.

No. 1. Not relating to Printing Telegraphs.

No. 2. Not relating to Printing Telegraphs.

No. 3. Printing Telegraph. A lengthy caveat describing several
Printers, with unisons, paper drivers, escapements, Print-
ing devices and modes of working on one wire. The claims
are: (128,608)

1st. To an electro-magnet combined with a bar that is
moved according to the polarity of the current, and
cuts off the electrical current, or admits it to its own
magnet, substantially as described.

2nd. To the escapement wheel with teeth combined with
double acting pawls, and stops, arranged and acting as
specified.

3rd. To the polarity armature, either inert or perform-
ing the duty of a motor according to the direction of
the current.

4th. To the paper clamps constructed as specified.

5th. To the unison lever and stops, worked by the mag-
net that is the motor for the printing mechanism.

6th. To the yielding frictional unison for rendering the
type wheel operative and inoperative according to the
strength of the current.

7th. The expansion of a spring by the heat of an elec-
trical current through a reduced wire as a means of dis-
connecting the unison mechanism.

No. 4. Relays for Printing Telegraphs, for working any Print-
ing Telegraph upon one wire. Lately adopted by Amer
Printing Tel. Co. (Included in Chicago Inst ([Refused?]!))

No. 5. Not relating to Printing Telegraphs.

No. 6. Universal Printer relating thereto. (See no 143
123006)

No. 7. Not relating to Printing Telegraphs.
No. 8. Printing Telegraph = Shifting pad devices and Mechanical equivalents. (Patent issued No 113034)

No. 9. Electrical Rheotome, and apparatus for switching a main Trunk Line on to any number of lesser lines at a distance. Applicable to a system of Private Lines, as one main line may be made to do the work of twenty five firms and yet be independent of each other. (No 131,334)

No. 10. Printing Telegraph magnets. A device for rendering the magnets of a Printing Telegraph more sensitive to rapid pulsations. The claims are: The helices arranged with the armatures operated substantially as described. (found in 126532 Sel Sloting cores &c)

No. 11. Printing Telegraph. One wire, Switch working magnet, Local, Suitable for Private Lines. The claim is: The combination of polarized bars, with the type wheel and Printing magnet and local battery arranged and operated substantially as set forth. (Abandoned)

No. 12. Printing Telegraph. One wire, Polarized magnet, Local, suitable for Private Lines. The claim is: The combination of two polarized magnets, adjusted as described in a main circuit and a Printing magnet and type wheel magnet in a local circuit, connected and operated substantially as set forth. (Abandoned No 140489)

No. 13. Printing Telegraph, one wire, Mechanical Lock, Reversal, suitable for stock quoting. My claim is: The polarized bar and electro-magnet, combined with two other electro-magnets and connected substantially as specified so that the polarity bar will lock out of action, either of the armatures of the electro-magnets, according to the polarity of the current substantially as specified. (Patent issued No 114658)

No. 14. Printing Telegraph. One wire, Shunting magnet, Reversal, suitable for stock quoting. claims in caveat are: The two magnets A and A' placed within a secondary circuit, and operated by a shunt current, from the main circuit, by means of the magnet constructed as described.

No. 15. Printing Telegraph. One wire, "Rheostat" total cessation of the current to Print, Relays, Local, suitable for Private Lines. The claims are,

1st. "To a local electrical circuit at a distant station, open or closed by an electro-magnet, and pulsations from the sending station when combined with a connection in the Local circuit, that is self closing when the main line is deprived of an electrical current so as to pro-
duce an operation, that is distinct from that performed by the electrical pulsation.

2nd. I claim increasing & decreasing a current over a constant current upon one wire, to effect the rotation of the Type wheel and the total interruption of the constant current to effect the impression of a letter, or vice versa, or to produce separate operations.

3rd. A battery reversing device, or its equivalent. (Cannot be found Supposed to be issued September 1874 Coverd practically by 139128)

No. 16. Printing Telegraph. One wire, Air Relay, Suitable for stock quoting. The claims are The use of an air chamber, and two or more plungers or their equivalents, combined with two or more electro-magnets for the purpose set forth. (Not taken out experiments not satisfactory)

No. 17. Printing Telegraph. One wire, Double helice, Local, Suitable for Private Lines. The claims are The two compound electro magnets to perform different operations and connected to a local circuit and to a main line circuit, so that a positive current acts in one magnet to increase the attraction of the armature, and in the other the currents neutralize each other, and allow the armature to be moved by a spring, and when the negative pulsation is sent the operations are reversed as specified. (No 128,605)

No. 18. Printing Telegraph. One wire, Residual Relay, Local, Suitable for Private Lines. claims are

1st. The combination of the magnet G or its equivalent, operated as described with a Type wheel and Printing Lever magnet for the purpose set forth.

2nd. The relay G and Local battery B, and its connections combined with a magnet whose lever is rendered in operative on account of residual magnetism during rapid pulsations, and a Type wheel & Printing lever magnet for the purpose set forth. (Not taken out—Experiments not Satisfactory)

No. 19. Printing Telegraph. One wire, Air Retardation, suitable for stock quoting. claims are The air cylinders used in connection with a Printing Telegraph to render one or the other magnet inoperative, the same being controlled by the polarity of the current. (No 128604)

No. 20. Not relating to Printing Telegraphs.

No. 21. do do do

No. 22. do do do

No. 23. Unisons, for Printing Telegraphs. The claims are

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1st. The retarding spring D or equivalent magnet for the
purpose set forth.
2nd. The arm D. operated by an electro-magnet for the
purpose set forth.
3rd. The combination of the arm D or its equivalent with
an armature on the Printing or type wheel magnet.
(The instrument which contains these devices was
given to serrell but nothing has ever been heard of it,
not even f)

No. 24. Was an error and has been withdrawn.
No. 25. Not relating to Printing Telegraphs.
No. 26. Universal caveats. Long description of various devices
in the universal 12 claims. (No 126005 123005)
Thomas A. Edison.

DS, NNC, Edison Coll. Canceled 5¢ Internal Revenue stamp affixed in
left margin of each page. ¹Date taken from text, form altered. ¹Twenty
sixth 26th" written in Edison's hand. ²Followed by wax seal. ³Company
seal embossed at left. ⁴Written by Lefferts. ⁵Followed by centered hori-
tzontal line. ⁶Preceded by check mark in margin. ⁷Interlined above.
⁸Faded. ⁹"Private Lines" underlined in an unknown hand. ¹⁰Sketch ac-
companies marginalia.

1. This contract represents the culmination of the arrangement pro-
posed by Marshall Lefferts in October 1870 (Doc. 126). Edison and
Gold and Stock had begun formal negotiations in mid-April and settled
the terms of this agreement on 9 May (G&S Minutes 1870-79, 44, 49-
51). The Gold and Stock committee responsible for the contract consid-
ered it "a very advantageous one for the Company, receiving as it does
the Co-operation and good will of Mr Edison for the future [and] ac-
quiring the 'Universal Instrument' for the Company for . . . all purposes
at one half the price originally expected" (ibid., 51). At the time of this
agreement, Gold and Stock was merging with Western Union. See
Chapter 7 introduction.

2. Because Edison's universal private-line printer was intended for
point-to-point communication between unskilled users, it combined a
thirty-character keyboard and transmitter with the printing mechanism
for receiving. Gold and Stock also wanted to be able to use the printing
mechanism independently as a ticker.

3. Edison assigned a total of forty-five patents to Gold and Stock,
thirty-six after this agreement. They represent all of his work in printing

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telegraphy. Documents recording the assignments and other material concerning Gold and Stock are at Columbia University, New York City (Edison Coll.).

4. Gold and Stock was not a publicly traded issue. There is no record of Edison's disposition of the stock described here and in the following paragraph.

5. Horace Leslie Hotchkiss (1842–1929) was a New York stockbroker and financier. He became secretary and treasurer of Gold and Stock in 1868. Reid 1879, 607; DAB, s.v. "Hotchkiss, Horace Leslie."

6. Unidentified.


UNIVERSAL PRIVATE-LINE PRINTER, 1871
Doc. 165

The universal private-line printer, a combination telegraph transmitter-receiver, was Edison's most sophisticated device to date and represented many months of work by Edison and his co-workers.1 The Gold and Stock Telegraph Company's purchase of rights to it formed the basis of Edison's May 1871 contract with that company. The universal printer was meant for the same private-business market as the American Printing Telegraph Company instrument and George Phelps's 1870 printer (U.S. Pat. 110,675).2 Like those machines, it used a single typewheel with only letters.

The universal's primary innovations lay in its transmitter. Edison devised a continuously operating "pulsator" (break-wheel) powered by a small electric motor of his own design.3 The rapid intermittent signal from the pulsator drove the typewheels of the sending and receiving instruments through ratchet-and-pawl escapements much like those on Edison's earlier printers. By depressing a transmitting key, the operator blocked the rotation of the typewheel on the sending instrument and at the same time halted the pulsator, thereby stopping the rotation of the typewheel on the receiving instrument. As in Pope and Edison's gold printer, the printing magnet was in series with the typewheel magnet and was too sluggish to respond to the rapid impulses that moved the typewheel. When the typewheel stopped, the printing magnet had time to reach full strength and then actuated the printing lever.
The universal private-line printer was not a finished machine when Edison patented it. For example, it had no unison stop.4 Also, the speed of the motor-driven pulsator varied with the strength of the battery and was a source of trouble until Edison devised a governor to make it constant and reliable.5 Still, Edison never managed to make this design practical. His notebooks show that he continued to work on it until March or April 1872, when he abandoned its printing mechanism and combined a modified form of its transmitter with his universal stock printer to create a successful private-line printer.6

1. The earliest extant mention of the universal printer is early October 1870, when William Unger and an unidentified draftsman received payment for their work on the universal. During the last week of that year, Charles Batchelor and James Eagan—two mainstays of Edison's crew—spent 61½ and 38 hours, respectively, working on it. PN-70-10-03, Lab. (TAEM 6:803, 812); Cat. 30,108, Accts. (TAEM 20:202).

2. Edison later testified that Gold and Stock might have used this model of the universal private-line printer in the summer of 1871. Testimony of Edison, p. 16, Edison v. Lane.

3. One of the earliest commercial applications of electric motors was for powering small printing telegraphs. Although several inventors—including Charles Page and William Davenport in the United States, Robert Davidson in Great Britain, Moritz Jacobi in Russia, and Gustave Froment in France—had used electric motors to drive industrial machinery, railroads, and boats as early as the 1840s, their creations were impractical because electric power produced by batteries was far too expensive to be used in large-scale work. George Phelps's large printing telegraph (U.S. Pat. 26,003) had been designed for any available power, including electric motors, but in practice was powered by human "grinders" (see Doc. 54 headnote, n. 4). In 1868 Phelps devised a smaller printer (U.S. Pat. 89,887) incorporating an electric motor much like the one Edison used in this printer. Western Union had the Phelps printer in service by the end of 1870, and Edison was no doubt familiar with the design. Although Edison's motor appears to be original, he did not attempt to patent it. Post, 1976, chaps. 4–5; Martin and Wetzler 1887, chaps. 1–2; William Orton to Anson Stager, 8 Oct. and 12 Nov. 1870, and 11 and 24 Feb. 1871, LBO.

4. Edison later adapted his screw-thread unison to this machine. See Doc. 243.

5. See Docs. 184 and 208.

6. Doc. 262. Edison received several patents on the parts and modifications of this model (U.S. Pats. 131,340, 131,343, 134,866, and 140,487).
Patent Model: Printing Telegraphy

From George Harrington

New York, June 4, 1871

My dear Edison

I can get no strength and am ordered to the Country for ten days, & I go immediately.

I have concluded that your suggestion that we make one test without waiting for the printer, is the best & if you will have the Ink recorders, weight transmitters and stop or automatic attachment completed we will make the test with Littles and the 6 Key'd perforators. Towne says he will have one of the large perforators done “next week.” I am sick of “next week,” but on what is he expending—4 or 500 $ per week. What are his 20 odd men doing, as there are no orders nor likely to be unless I give them, would it not be well to Stop all work except upon the perforator. When one is completed if ever, as a model, I can understand that more men will be required to build a number. But there is no working model yet & until there is if I understand it, it is of no use to make jigs or special tools to build a [large] number.
All may be judicious but I cannot see what 20 men are doing. We shall see what progress has been made after 10 days hence truly

Geo Harrington

ALS, NjWOE, DF (TAEM 12:250).

1. Although Edison originally claimed that his typewriter would be ready by 20 May, experiments continued after this note from Harrington. Bills to the American Telegraph Works, 10 June–23 Aug. 1871, 71-015, DF (TAEM 12:589-94).

2. For discussion of these instruments, see Doc. 153, nn. 9, 11.

3. Edison completed work on four 6-key perforators about 17 May. Bill to the American Telegraph Works, 17 May 1871, 71-015, DF (TAEM 12:587). See also Doc. 255.

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Dear Mr. Edison:

Being pretty busy and short-handed here, & nothing to do in the city, I don’t go there much now-a-days, and did not see your small perforators till today, at 66. Mr. Darrow tried to work them, but it was impossible, and he could not perforate two words consecutively to save his soul. I think, if those machines are to be at the office, you should go in & teach Darrow & Grace how to use them, as they now reflect utter disgrace on all concerned. Even when, by possibility, Darrow could perforate 4 or 5 letters consecutively, the spacing was fearfully bad, as you will see by what I send you. I do not know what the word is, but I recollect Darrow said the two first letters were S A, and the last, M. If you cannot spend time to shew Darrow & Grace how to work the machines, do, pray, have them taken away, for they seem to justify Little’s foolish spite when he says Harrington and Edison is simply fooling away time and money to no good purpose.

Why, the deuse don’t you let me know how you are getting along. When are you going to have something to show in the way of the new Perforator & Printer.

I hear the W.U. Co. have swallowed the G.&S. Co. I hope you have sold your stock.

Harrington, I hear, has gone to Saratoga, to be back early next week.

Don’t be rough on your poor friends, & let me hear from you upon all points, or, what I would like better, come here Saturday, and be happy, for one day of your life by breathing fresh, cool air, filled with the perfume of a thousand delightful

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odors. We are in the midst of Haying. Write me if you will come by the 4 p.m. train, Saturday & return when you like next week.

Capital place to Loaf! Truly yours,

D. H. Craig

ALS, NjWOE, DF (TAEM 12:460).

1. The main office of the Automatic Telegraph Co. was 66 Broadway, New York City.

2. W. E. Darrow was a shophand at the American Telegraph Works. George Grace was superintendent of the Automatic Telegraph Co.

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Agreement with Marshall Lefferts and Elisha Andrews

New York* 8th June 1871

Copy

It is hereby agreed and understood that, Geo B. Field, is after this date interested in the Telegraph Instrument, Known as the “Universal Printer”—to the full extent of one fourth (¼) of the English patents.

Marshall Lefferts (Signed) E W. Andrews

T. A. Edison

The original given to M Field. Private Line Printer


1. One week before this agreement, Field, Andrews, Lefferts, and two other men had initiated a stock-reporting system on the London Stock Exchange (see Chapter 7 introduction). Edison executed the American patent application covering the universal private-line printer (U.S. Pat. 123,005) on 26 July 1871. William Lake, a patent solicitor in London, filed the provisional specification for the British patent to which this agreement refers on 19 March 1872 (Brit. Pat. 829 [1872]) as “a communication from George Baker Field and Elisha Whittelsey Andrews” and filed the complete specification on 18 September. The agreement between Edison, Lefferts, and Andrews to which this is apparently an amendment has not been found.

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[New York,] Saturday June 10 1871

8:35* AM at Test room² Took The Inst that Prince³ just fixed to Kent & Cos⁴ placed it in the Circuit had considerable trouble with paper hangers⁵ on account of one being longer than the other—imperfection in casting, fixed them OK—Inst worked all right—Globe Shade⁶ wanted for this Inst—
9:40 AM Went to test room got a shade & at
10:15 AM at the request of Scott Started over Cotton wire visited Kents first and fixed the shade— not being acquainted with the route of the Cotton wire it took me an hour & a half to find all of Them— Every Inst working satisfactory except Dunnells which wanted Ink—which I put on & it went all right. Johnson & H Complain that reports of transactions in NY are behind 15 to 30 Minutes & while I was standing by The Inst it commenced recording the 10½ AM Transactions which were 30 minutes late, it being just 11 AM.

11:35 at Test room sent a msg to Ludwig notifying him of above Complaint Then went to see Prince & hurry him up on the 2d machine for Prod wire

12:30 Complaint from Fatman & Co went there found spring of printing lever weak and Inst needed oiling fixed it so that it went allright

1 PM Dinner

1:30 Prince still working at Inst— Everything going smoothly—

2:30 got the Inst from Prince & placed it in C[r]k[u]t— works first rate required no adjstmt Battery made up fresh this AM—

3 PM Visited Kent & Co— Inst had Thrown out once— caused by Transmitting op[erator]—Fatmans Inst going OK—

Remained at Test room till 34:30 when all hands left— Callahan said just before leaving would want me in the Long room Monday & several days after to learn taking reports— said Scott would attend to Cotton & Prod wire meantime So ends The first week

G


2. Gold and Stock stored spare instruments and parts, made repairs, and tested instruments in its central office. Gold and Stock 1873, 7–8.

3. Unidentified.


5. Paper hangers were the arms extending upward to hold the reel of paper.

6. The domed glass shade kept dust off the instrument.

7. In May of 1872 George Scott would succeed Edward Calahan as

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From Lemuel Serrell

New York, June 10th 1871

Dear Sir

I would like you to call at my office on Monday to look over some papers in connection with your telegraph cases, if you can make it convenient to do so, as I expect to go to Washington on Tuesday.1 Yours Truly

Lemuel W. Serrell per H. Serrell.2


1. When Edison had a device to patent, he drew up a description and sent it with a model to Serrell. Someone at Serrell’s office wrote the patent specification and drafted the figures for the application. The cases Serrell refers to here are unknown. The U.S. Patent Office was located in Washington, D.C.

2. Harold Serrell was Lemuel’s son and bookkeeper. Ricord 1897, 449; Plainfield Merchant’s City Directory 1875, 76.

From Stockton Griffin

[New York?] Dated, June 12 1871

To Ed

How do you like the idea of my being in the Long Room1 this week. Calahan wants to get a man to send reports but I
suppose he wont offer an operator a living salary so he is going to have me learn so in case of necessity I can act there.

Scott² runs his books in the office & runs your Insts and you know how they will be run. Is it a conspiracy of C's to fix things so you will not have a fair show³

Griff


1. See Doc. 169, n. 17.
2. George Scott.
3. Edward Calahan's stock ticker was still the principal instrument of Gold and Stock.

June 20, 1871

From Elisha Andrews

Dr Sir

Please do no² more work on the 5 Printers you are finishing until farther orders.¹ It may be some weeks before they are wanted, & you are so hurried on other work that you let this rest—Yours Truly

E. W. Andrews

How is Autographic?—² Let me Know as soon as you can get it to work.


1. It is not clear to what printers Andrews is referring.
2. The “autographic” is the facsimile telegraph Edison was developing for Andrews and George Field under the 10 February 1870 contract. See Doc. 92.

N.Y. June 20/71

From George Scott

Dear Sir

Gentl. Lefferts wished me to write you, & ask where are the Cotton inst (with new switches)¹ you promised to send along with the produce insts—² He wants them badly & hopes you will send them at once—Yours Truly

Geo. B. Scott

ALS, NJWOE, DF (TAEM 12:618). “Gold & Stock Tel Co” written on date and place line.

1. Edison made two alterations to the cotton instruments used by Gold and Stock. He fitted them with his screw-thread unison and eliminated the polarized switch under the base (see Doc. 156). It is uncertain to which of these changes Scott is referring here.

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2. Since Gold and Stock adopted Edison's one-wire ticker on both its cotton- and produce-reporting lines, the distinction between produce and cotton instruments could mean that the instruments of the two circuits had distinguishing typewheel characters. However, it is also possible that it referred to as trivial a difference as decoration.

Boston, June 26th 1871

From James Hammett

Dear Sir

I have received nothing from you yet. You asked me to state the amount due me on your note. I did so and have also written you a second letter in regard to it. In yours of the 12th you say you will send checks. On receipt of this you will immediately send the funds or write and give me some explanation of the matter. I am tired of writing about it and if you can not attend to it I propose to see if it can be collected.

Yours Truly

J Hammett


1. Hammett's letterhead indicates that he was a banker and broker.

2. No other letters to or from Hammett have been found.

3. An account book entry shows that Edison owed Hammett $100 in January 1869. The same entry indicates that he paid this sum, plus $2.5 interest, to Hammett on 27 April 1872. Cat. 1185, Accts. (TAEM 22:549, 563).