During the second half of 1871, increased stability and security marked Edison's life. He met and married Mary Stilwell of Newark; his association with Gold and Stock grew closer; and Edison and Unger became prime contractors for that company. New-found financial security allowed Edison to buy a house for his bride and to assist his father and his brother William Pitt with their enterprises. For a time he had five shops in Newark operating at once. Although Edison's association with the American Telegraph Works became less intimate, the shop began manufacturing his large perforator for use on the Automatic Telegraph Company lines that were then being prepared for operation. Edison's procedure for recording his designs for printing and automatic telegraphy became more systematic when in late July he started maintaining a series of laboratory notebooks.

In printing telegraphy he had abandoned his cotton instrument in favor of the universal stock printer by early summer. He delivered two prototypes to the Gold and Stock Telegraph Company in June and then spent two months improving the machine. Manufactured by Edison and Unger, the first instruments were delivered in early September. By the end of the year Gold and Stock had bought 600, installing them on lines in New York and other cities.

Edison continued his attempts to make the universal private-line printer commercially viable. Precision was the biggest stumbling block, both in arresting typewheels synchronously on transmitting and receiving instruments and in positioning them accurately. Edison also modified the printing
lever in an attempt to increase the speed with which it recoiled after having made an impression. Toward the end of the year he designed a governor for the motor, a significant step in the machine's evolution. He also conceived how to make the printer's transmitting mechanism an independent instrument.

Sometime in the fall Edison became involved in starting the News Reporting Telegraph Company, a Newark enterprise that placed printing telegraphs in subscribers' homes and offices in order to provide "news of the world—financial, commercial, domestic, and foreign . . . hours before such news is published in the papers." The business seems to have quickly failed, but through it Edison met the woman he would soon marry, Mary Stilwell.

Automatic telegraphy demanded increasing attention from the young inventor. By the middle of July, the American Telegraph Works had begun production of his large perforator, while he, Joseph Murray, and William Unger prepared the New York office of the Automatic Telegraph Company for operation. Beginning in September, the American Telegraph Works began shipping perforators and other equipment to Automatic Telegraph's Washington office and the following month to its Philadelphia office. Edison designed many of these instruments, his most important contribution being the large perforator. This instrument had individual keys for each letter, allowing operators with no knowledge of Morse code to work it. Among the equipment sent was a copying printer, an early form of typewriter. It is unclear, however, whether the printers used by Automatic Telegraph in 1871 were those designed by Edison or were Christopher Sholes's typewriter.

Edison most likely designed the ink recorder that was installed in the Washington office. While no clear statement exists to explain the use of an ink recorder in place of the faster, chemical recorder, Daniel Craig did indicate in a July letter that the Automatic Telegraph Company planned to use a newly devised automatic "dot and dash printer" (i.e., ink recorder) on short lines.

Although a considerable amount of equipment had been shipped to its various offices by the end of 1871, Automatic Telegraph did not actually begin transmitting public messages until December 1872. This suggests that critical technical problems remained unsolved. The automatic system installed on the company's New York to Washington circuit was still principally that of George Little; yet his chemical receiver, the key to high-speed automatic telegraphy, still was not in use,
and only one of his transmitters had been shipped. An examination of Little’s many patent applications in 1871 indicates some of the technical difficulties that were plaguing the system.

Since the work of Alexander Bain, a continuing problem with automatic transmitters had been the adherence of fibers from the perforated paper to the transmitter’s stylus, which prevented the stylus from making contact with the metal cylinder on which the paper rode. In April 1871, Little executed a patent on a technique to obviate this difficulty by replacing the wire brush in his earlier transmitters with a roller. By the end of the year, he had also designed an improved paper feed to lift the paper from the roller. A second and more serious problem occurred in the recording of messages. Induced currents in the line elongated the chemically recorded marks. This problem, called “tailing,” continued to plague the Little system. Little developed several techniques to clear the line of induced currents by using improved electromagnets and shunt circuits. Use of the automatic telegraph was also severely restricted by the system’s inability to drop messages at inter-
mediate stations and to record messages on two machines at the same station.\textsuperscript{12}

Edison had his own ideas for improving automatic telegraphy. He recorded some of them in his notebooks and communicated some of them to Craig. Craig, however, wrote Edison that he considered Little's transmitting and receiving instruments to be "perfect" for their needs, although future improvements might be necessary. Not wanting Little to feel that Edison was attempting to supplant him as the inventor of the system, Craig suggested that Edison's perforator and copying printer would bring him sufficient glory.\textsuperscript{13}

1. App. i.A34–35, D155. The five "shops" were the Edison and Unger shop on Ward St.; a supplementary shop at 24 Mechanic St.; the American Telegraph Works on Railroad Ave.; an office at 738 Broad St. for the News Reporting Telegraph Co.; and, probably, a small experimental shop in White's Building on the Morris Canal, which Edison maintained sometime during the period 1870–1872. See gas receipts, 71–014, DF (\textit{TAEM} 12:493); and Doc. 205. For the experimental shop, see Murray's testimony, Quad. 71.1, pp. 34–35 (\textit{TAEM} 10:22); App. i.A34; Holbrook's \textit{Newark City Directory} 1871, 187, 580; and Hopkins 1873, Fifth Ward map.

2. Edison claimed that he walked out of the American Telegraph Works in a dispute with Harrington. Employment records show that most of the employees from that shop then began working instead at Edison and Unger in October 1871. However, because the American Telegraph Works was the principal supplier of apparatus for the Automatic Telegraph Co., Edison does appear to have continued some form of association with the shop. Cat. 30,108 and Cat. 30,107, Accts. (\textit{TAEM} 20:304, 307; and 21:4–9). For Edison's claim see his testimony and that of Joseph Murray in Quad. 70.7, pp. 273, 277; and 71.1, p. 36 (\textit{TAEM} 9:503, 505; and 10:23).


5. Doc. 205

6. Docs. 205 and 218.

7. Copy of an Affidavit by Edison, Murray, and Unger, 10 Feb. 1871, DF (\textit{TAEM} 5:996); and agreements between Frederick Spanenberg, William Parkinson, and American Telegraph Works, 17 and 26 July 1871, DF (\textit{TAEM} 12:301–7). By the end of the year there were eleven perforators, one transmitter, and two copying printers in the office in New York; six perforators, one transmitter, one printer, and one ink recorder in the Washington office; and six perforators, and one printer in the Philadelphia office. Each of the offices also received sundry other items such as paper reels and switches. PN-71-09-05, Accts. (\textit{TAEM} 20:171–74).

8. In August, Craig indicated that the Automatic Telegraph Co. was using Sholes's typewriter as its copying printer but that Edison claimed he could improve on its performance. Since the printers shipped to the

\textit{Innumerable Machines in the Mind} 304
company's offices were manufactured at the American Telegraph Works rather than at Sholes's shop in Milwaukee, they were probably Edison's. Craig to Lefferts, 8 Aug. 1871, Lefferts; Cat. 30,108, Accts. (TAEM 20:256–257 passim).

9. Although George Little also executed a patent for improved ink-recorder pens on 29 July (U.S. Pat. 120,289), the instrument made at the American Telegraph Works and shipped to the Washington office was probably Edison's (U.S. Pat. 124,800). Bill of Edison and Unger to American Telegraph Works, 19 June 1871, 71-015, DF (TAEM 12:590).

10. Craig to Frank Ives Scudamore, 20 Feb. 1871, ATF, UKLPO.

11. See Little's U.S. Patents 115,968, 120,288, 120,291, and 123,491.

12. See Little's U.S. Patents 122,266, 122,474, 123,490, 123,711, and 130,813.


-[175-]

Memorandum: Port Huron and Gratiot Street Railway Co.

[Newark?, c. July 1, 1871]

<table>
<thead>
<tr>
<th>Recpts</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 1st 1871</td>
</tr>
<tr>
<td>&quot; 2 &quot;</td>
</tr>
<tr>
<td>&quot; 3 &quot;</td>
</tr>
<tr>
<td>&quot; 4 &quot;</td>
</tr>
<tr>
<td>5 &quot;</td>
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<td>6 &quot;</td>
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<tr>
<td>17 &quot;</td>
</tr>
<tr>
<td>18 &quot;</td>
</tr>
<tr>
<td>19 &quot;</td>
</tr>
</tbody>
</table>

Cost of running road, rent of Buildings, Baggage Wagon, Freight Wagons—etc. Tkt offs = $20. per day =

Conductors Salary | 12.00
Drivers " Each | 9.00
Mens " | 78.00
Clerk | 12.00
Supt | 18.00

July–December 1871
<table>
<thead>
<tr>
<th>Owned by</th>
<th>Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Miller</td>
<td>70</td>
</tr>
<tr>
<td>Wm P Edison</td>
<td>30</td>
</tr>
<tr>
<td>Wm Wastell</td>
<td>70</td>
</tr>
<tr>
<td>Mrs. M Cooper</td>
<td>66</td>
</tr>
<tr>
<td>Wm Stewart</td>
<td>35</td>
</tr>
<tr>
<td>Wm Hartsuff</td>
<td>30</td>
</tr>
</tbody>
</table>

301 shares

Stock issued at 80. par 100. =

Company own—

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight Wagons</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baggage Wagons</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horses &amp; Furnishings</td>
<td>7</td>
<td>New Stable just put up</td>
<td>$1,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property on which stables are</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car House = Costing</td>
<td>927</td>
</tr>
<tr>
<td>Property on which stables are</td>
<td></td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>Cars</td>
<td>2</td>
<td></td>
<td>2,670</td>
</tr>
<tr>
<td>mile Spare iron</td>
<td>½</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow Plow</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight Car</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Sleigh for winter</td>
<td>1</td>
<td></td>
<td>330.00</td>
</tr>
<tr>
<td>Offices in Port Huron. Ticket office etc</td>
<td>1</td>
<td>Costing =</td>
<td>$450</td>
</tr>
</tbody>
</table>

AD, NJWOE, DF (EM 12:238). Letterhead of the Port Huron and Gratiot Street Railway Co. "17 days/671.80/40 say" and "29 days/644/36 pr dy" written below, probably in Edison's hand; "Average about $40 pr day, and this agrees with yearly return for this year 1871—If the running expenses—do not exceed $20. pr day—profit about 100 pr cent out of which must come equipment and dividends" written in left margin. "$100." "115 00", and "65 00" added later in column at right. Canceled check mark precedes this name. Check mark precedes this name. Ink badly smeared. Figures in this column may be in another hand.

1. John Miller was the company treasurer and a banker in Port Huron. Jenks n.d., 4, 7; History of St. Clair County 1883, 585-86.
2. Pitt Edison was the company's superintendent.
3. William Wastell, a Port Huron druggist, was one of the original organizers of the line and served as the company's secretary. Jenks n.d., 2, 4, 7; History of St. Clair County 1883, 600.
4. These shares were actually bought by Gage M. Cooper, manager of the shops of the Grand Trunk Railway at Fort Gratiot (Jenks n.d., 2, 4, 7; History of St. Clair County 1883, 565-66). An account-book entry for 28 November 1871 shows Edison purchasing Cooper's 66 shares for $3,500. An entry for 1 January 1872 shows $3,100 still owed on the stock purchase (Cat. 1213:3, Accts. [EM 20:6]; see Doc. 266, n. 3).
5. William Stewart was a major hardware dealer in Port Huron. History of St. Clair County 1883, 596-97.

6. William Hartsuff was the postmaster of Port Huron and part of the family that had forced Samuel and Nancy Edison out of their original house in Port Huron. Ibid., 573-74; Stamps and Wright 1982, 10-14.

From Pitt Edison

Port Huron, Mich. July 12 1871*

TA E

I send you today a Port Huron paper showing you the Amendment to the St R R Charter which gives the Co the Exclusive right over the Park which is a big thing as the City will probelry [-]never open a public [-]St through it. I am building the Car House and I am talking about building many other buildings and laying out a large amt of mony in building new road also I tell them that it is nesesury to Extend our road to connect with the Port Hurn & Lak Michigan Depot and they all say they cannot Stand it it will cost to much they want more Dividends and not so much Rail Road I sent you by mail\b the maps on the 6th of this month and suppose you have got them\c if not let me know and I will send you more by Express if you can get this stock taken I think the sooner the better as these parties are about as sick as they can be made\d I had some talk with Miller and I think par will fetch him\e the recets on the 4th of July was $169.40 as soon as the light House Reservation is sold\f the Dutch agoing to buy and open a big Lager beer garden which will help the road considerable\g
tell Charly\h to be careful agoing rond the Engine or the machinery and not be careless I hope he is not to much trouble to you should he be let me know and we will have him come home tell him that I say\d to be a good Boy and mind his uncle we are all well and send love to you & Charly W P. Edison

PS tell Charly that Nellie\g and Trofton\h left last night on the Montgomery\i for Chicago WPE

ALS, NJWOE, DF (TAEM 12:236). Letterhead of the Port Huron and Gratiot Street Railway Co. "Port Huron, Mich." and "18" preprinted. \b"by mail" interlined above. \cFollowed by "over" to indicate page turn. \d"that I say" interlined above.

1. When the land of the Fort Gratiot Military Reservation was divided into lots and sold, beginning in 1870, a large section was reserved for Pine Grove Park. Jenks n.d., 6; Bancroft 1888, 253-54.

2. The Port Huron and Lake Michigan Railroad was opened in 1871 as far as Flint, Mich., and was later extended to Chicago. The depot was

July–December 1871 307
located on the river on the south side of Port Huron, near the center of
town.

3. No maps have been found.
4. Probably a reference to the stock that Edison purchased on 28 No-
   vember 1871. See Doc. 175, n. 4.
5. See Doc. 175, n. 1.
6. The sale was not authorized until 1873. Bancroft 1888, 254.
8. Nellie Edison Poyer (1858–1947) was Pitt's daughter.
9. Unidentified.
10. Probably a steamboat.

To George Harrington

[Newark, July 22, 1871]

Mr Harrington.¹

Payroll this week is
Unger² wants on acct

\[
\begin{align*}
577.86 - 250.00 &= 327.86 \\
250.00 - 250.00 &= 0
\end{align*}
\]

If That old Gentleman² is going to take Charge of The Books it is about time. That department is in a very slack Condition =

I cannot stand this worrying much longer about Bills—Pay roll etc = it engrosses my attention to the detriment of our machinery You Cannot expect a man to invent & work night and day, and then be worried to a point of exasperation about how to obtain money to pay bills— If I keep on in this way 6 months Longer I shall be completely broken down in health & mind and the 30,000

AL (fragment), NJWOE, DF (TAEM 12:251). ¹“Credit Aut Tel Co” written by Harrington at top of document. ²"828 - 577.86 = 250.14" written in column in left margin. ³"828 paid 22 July" written below by Harrington.

1. On this date the payroll of the American Telegraph Works was $577.86 (later changed to $580.86). Cat. 30,108, Accts. (TAEM 20:255).
2. Unidentified.

To Samuel Edison

Newark N.J. July 24 [1871]

Dear Father

Rene² wrote me a Letter today about going into the Liquor Store, and wants me to put in from $500. to 1,000. and wants 200 or 300 cash down—

He says he will be satisfied with half the net profits =

He also says he will take the Liquor Business from the other store and put it in the new—

Innumerable Machines in the Mind
I send you $300 today for the purpose of going into this business. But you must be very careful what agreements you make. Do not agree under any circumstances to attend the store yourself = you want all your time you have to run around the country and build houses, speculate etc.

Have him advance his share of the Money and get every thing in Black and White which is the only possible Manner of doing business =

After investigation you do not think best to invest the money sent into the business—then invest in Land & houses to the best advantage

Enclosed is Renes Letter =

T. A. E

ALS, MiDbEI, EP&RI.

1. Handwriting style and content, particularly regarding Edison’s own financial condition, suggest that this letter dates from 1871.

2. Probably Rene Edison, a first cousin once removed (Samuel’s grandnephew). “Rene” may be a familiar name for P. M. Edison, who opened a new store in Port Huron in 1871. Obituary of Anna Edison, Detroit News, 21 Nov. 1910, in Edison, Anna E., EBC; History of St. Clair County 1883, 630.

3. There is no account entry showing that Edison gave Samuel $300 on 24 July 1871, although that amount is listed for 10 June (the placing of the entry suggests Edison may have meant July) and 15 August 1871. There is also a 4 July 1871 entry for $400. Cat. 1213:3, Accts. (TAEM 20:6).

4. Not found.

Newark N.J. July 28, 1871.

Record of Ideas as they occur day by day applicable and for the Dot and Dash system of fast Telegraphy invented for Geo Harrington and D H Craig = All of which are for them with the exception of one undivided one fourth interest in all patents caveats or ideas to myself applicable to that system and the proceeds from that one fourth interest either directly or indirectly =

I do not record anbut fewe previously carried out inventions—but commence at this date to record all my ideas made previously to the opening of this book which I have not put in practical operation at the time of writing, and if possible all future ideas relating to this system while it shall be my interest to do so =

T A. Edison

July–December 1871

309
AXS, NJWOE, Lab., Cat. 1182:1 (TIMEM 3:50). "Nothing on Tel!" written at top by William Carman, a bookkeeper at Edison's later Menlo Park laboratory.

1. This entry appears on the first page of the notebook; Doc. 180 begins on the second page. This notebook also contains Docs. 190-91, 227, 231, 234-36, and 256-58.

2. Automatic telegraphy was commonly referred to as "fast telegraphy."

3. It is not clear why Edison refers here to either a one-fourth interest for himself or a continuing interest on Craig's behalf when the 1 October 1870 agreement between Edison and Harrington (Doc. 109) gave Edison rights to a one-third, not one-fourth, interest in his inventions, and a subsequent agreement, dated 4 April 1871 (Doc. 155), again specified one-third. On Craig's interest, see Doc. 109, n. 5; and Doc. 261, n. 2.

–180–

[Newark,] July 28, 1871.

Notebook Entry:
Automatic Telegraphy

Chemical Telegraph Pen.

In this case I do not pass the current through the paper by using the paper carrying drum as a conductor in the usual way, but pass the current from one pen to the other (pens—C.B) across the paper. The pens C B are insulated from each other on the shaft G and one connected with Carbon and the other with Zince, so if the paper a be chemically prepared and the drum rotated a The chemicals with which the paper is saturated will be decomposed as long as the current passes from C to B through the paper, but if the current is interrupted the mark will cease. The object of arranging the pen in this manner is to make the paper resistance variable, so that when the paper is too wet or the Line is short and there is too much battery on, the pens can be separated which increases the resistance to the passage of the current, and a lighter mark is made which is too heavy or blurry when the paper is wet or the current too strong. Another advantage
which this pen has is that, the distance which the current has to travel through the paper can be reduced to the \(\frac{1}{1000}\) of an inch or even less, consequently reducing the resistance greatly and allowing a number of these receiving apparatus to be worked in one circuit without the electrical contrivances which has been found necessary on account of the tremendous resistance which the current encounters in passing through the paper in some instances. Paper properly wet has a resistance of 200 miles of 13 ohms eachs to a current passing through it. But by the use of this pen the pens A B C may be adjusted from 3 to 4 times as close as the thickness of the paper thereby reducing the resistance from to 50 tor 75 miles

Continued—

![Fig 2a](image)

The pens may be arranged in this manner, Fig 2\(^b\) one before the other, and a very close adjustment obtained—or what might be still better arrange them like that in fig 3. The pen C playing in between two prongs on the pen B the object of which is to get more surface on the non-recording pole or pen so as to reduce resistance.

![Fig 3a](image)

I have shown these pens with flat ends, but they may be provided with little rollers or wheels.

In sending positive and negative currents, for a chemical Telegraph The following idea has struck me =

*July–December 1871* 311
a and a' are paper carrying rollers insulated from each other on the driving shaft F on these two rollers are two pens C.B also insulated from each other. It will be noticed by referring to the drawing that the main line is connected to the pen and the opposite roller and the ground wire to the other pen and the opposite roller. Now when paper perforated in two lines and sent through this following apparatus Fig 5, a positive current will pass over the line when one set of holes passes under the pen and pass through the pen C through the paper thence through the roller to the ground decomposing the chemical solution with which the paper is saturated and leaving mark corresponding to the holes in the perforated paper at the other end of the line. Now the same current will pass through the roller a thence through the pen B and to the ground but in this case the current passes through the paper in an opposite direction. Consequently the marks if any will be underneath the paper and not be noticed while it will leave no mark on top—If now a current of opposite polarity is sent over the wire the reverse action takes place and the pen B records, so that a dot on one line will represent a dot and a dot on the other line will represent a dash. Fig 5 show the apparatus for sending the double rowed perforated paper.

The upper row of holes throws a Copper battery on the line and the lower holes throw a Zinc battery on the line.
Syphon, chemical pen.—or device for recording chemically upon “dry paper”\(^6\)

Fig 6

A is a hard rubber or any pen constructed after the manner of a drawing pen. It is secured to the shaft p and moves freely on it, and may be held closely on the paper by a spring. B and C are small platina points passing through each prong of the rubber pen of its extreme end and between which points the solution passes on to the paper. E and D are wires connecting these points to the binding screws F and G and thence to the battery X. S is a small funnel into which a syphon K leading from the reservoir L passes and keeps the pens supplied with the Chemical solution as fast as it is used. Now when the drum N is revolved carrying the recording paper M, the pen gives out a continuous line of the Chemical Solution which being colorless leaves no mark and is quickly absorbed by the paper. But if the Current is closed for an instant all the solution passing the platina points at that moment will be decomposed and passing on to the paper will leave a mark. The syphon might be dispensed with and the solution supplied to the pen by dropping it drop by drop (according to the speed of the drum) into the funnel S. One fact I will mention here is that only that portion of the Solution which is directly in contact with the platina points will be decomposed—

All written July 28, 1871

Witness Jos. T. Murray

T. A. Edison

AXS, NJWOE, Lab, Cat. 1182:2 (TAEM 3:51). *Rectangle drawn around figure label. **“Fig 2” interlined above. ***Signature.

1. The usual practice in chemical telegraphy was to pass the line current to ground through a metallic pen, chemically impregnated paper, and a metallic drum (here Edison represents the line circuit with a single battery wired directly to the pens). Edison’s arrangement presented several potential advantages, as stated here.
2. Battery electrodes were commonly made of carbon and zinc, which here constitute the positive and negative poles, respectively.

3. Should be F.

4. See Doc. 34, n. 2.

5. On 10 October 1871, Edison executed a caveat incorporating several arrangements of this type (PS [TAEM Supp. III]). See also the second drawing of Doc. 194.

6. The drying of the chemically prepared paper used in automatic telegraphy was a serious problem and one that Edison had been working on since at least March. The "syphon" receiver had the advantage that chemical paper did not need to be prepared in advance because the machine deposited the chemical solution while in use. In March 1873 Edison executed a patent application for a "syphon" receiver operating on the same principle as outlined in this notebook entry (Doc. 290). Bill to American Telegraph Works, 16 Mar. 1871, 71-015, DF (TAEM 12:581); Cat. 30,108, Accts. (TAEM 20:236).

Newark N J July 28, 1871

Record of ideas and inventions relating to Printing Telegraphs Which work with a Type wheel, all of which I am under Contract with the Gold & Stock Telegraph Co of NY. to give them subject to the Conditions of the Contract within the next five years from the date of Contract Reserving for myself any ideas contained in this book which I do not see fit to give said G & Stock Telegraph =²

This will be a daily record, containing ideas previously formed some of which have been tried some that have been sketched and described, and some that have never been sketched tried or described

AX, NjWOE, Lab., Cat. 1174:1 (TAEM 3:7).

1. This entry appears on the first page of the notebook; Doc. 182 begins on the second page. This notebook also contains Docs. 193, 207-10, 212-13, 216-17, 219-20, 222-25, 230, 232-33, 238-39, 243-48, 250-51, and 253.

2. Edison assigned all of his subsequent inventions in printing telegraphy to Gold and Stock. See Doc. 164.

[Newark,] July 28 1871

Innumerable Machines in the Mind 314
Double link motion for a shifting Type wheel, description unnecessary

Printing Telegraph—to work upon one wire = The difference between this and most of the Printing Machines hitherto invented is the printing of the Letter by the spring instead of the magnet as it is usually done, and preventing the printing Lever from responding to the pulsations which rotate the type wheel, by causing a lever of a separate magnet to lock the printing lever when the pulsations are of any degree of rapidity.\(^1\) by referring to Fig 2 the principle upon which this printer work will easily be seen and will need but a few words of explanation =

Having found in the Course of my numerous experiments that when a magnets armature is adjusted so close to the face of the core that it nearly touches that a current passed through it intermitted slowly it will stick or hug the core notwithstanding a considerable tension on a reacting spring. I have combined one of these magnets, adjusted in this manner with a printing lever arranged to print by a spring. E is the magnet which I will call the "Residual Relay" D is the armature lever X the reacting or adjusting spring B is the printing Magnet A The Type wheel rotating magnet. all these magnets are in one circuit in which is also the key m or
any intermitting Current device & the battery n. J is the Escapement Lever H the ratchet G the type wheel.

Now when the Current is sent through all the magnets The Magnet B pulls the printing lever F away from the Type wheel. The Magnet E pulls the lever D towards its core and the end of the lever locks the printing lever and the Magnet A rotateds the type wheel. If now the key is opened quickly & closed quickly the magnet A keeps rotating the Type wheel, but the lever of the Magnet E does not respond to these intermissions. Consequently the printing lever remains locked if now we wish to print we open the key for a moment Cut off all the circuit from the Line, the Magnet E has time to discharge, the Spring DX pulls the arm D back releases the printing lever, and the Spring C pulls it up and effects the printing. If the Current is now closed the lock action again takes place, and the Current can again be intermitted, the type wheel rotated, without effecting the Printing lever. In practice I think it will be necessary to have a separate clutch, click or lever to lock the type Printing Magnet and knocking it out and in by the lever D which will have dead play enough to acquire a Momentum, and Knock the clutch out. Thus

All foregoing written & drawn July 28 1871
Witness Jos T Murray

T A. Edison


Signature.

1. There is another (probably earlier) version of this idea in a laboratory scrapbook. Cat. 297:7, Lab. (TAEM 5:60-61).
Dot and Dash and Automatic Printing Translating System, Invented for myself exclusively, and not for any small brained capitalist.²

AX, NiWOE, Lab., Cat. 1172:1 (TàEM 3:78).

1. This entry appears on the first page of the notebook; Doc. 184 appears on the second page. This notebook also contains Docs. 186, 194, 196, 198, 237, and 241–42.

2. Perhaps Edison felt Craig and Harrington (the "small brained" capitalists) would have no legal right to the system described in this notebook because it records the message in roman characters rather than dots and dashes. However, Edison later contracted with Harrington and Josiah Reiff to develop a roman-character system of automatic telegraphy (see Doc. 295).

184

Notebook Entry: Automatic Telegraphy¹

The general plan of this system is this =

I propose to perforate or punch in by in paper in strips Roman Characters, by dies and punches, a punch and die of each Letter of the Alphabet, and made on a the³ stencil principle = The Machine which I am about to describe will be provided with 30 keys the depression of any one cutting out a Letter, after the manner of a stencil, and at the same time feed the paper ahead the distance of one Letter = ready for the next = After a strip of paper containing a message has been punched in this manner it is taken to a sending apparatus for transmission over the Line = This apparatus will be as follows = The Machine will have a paper carrying drum revolved by a weight or by magnetism, over the drum and revolving at right angles with it is another drum having a springs a number of springs in the same circle radiating off of the drum and all Connected to the Main Line = When the Machine is in motion both drum revolve the paper carrying drum very slowly and the drum carrying the springs very fast = The drum upon which the paper is carried being connected to the battery every time a spring passes over ta portion of the Letter is closes the circuit through the apertures of the Letter by the time one spring has passed over another Comes on in a different portion of the Letter as the paper drum feeds the paper ahead a given distance = Now another Machine precisely similar to this receives the message at the other end of the Line, the perforated paper being replaced with Chemically prepared paper = It will be seen that if the two machines run in unison that an exact facsimile of the stenciled letters of the perforated slip will

July—December 1871 317
be record chemically at the other end of the Line. I propose to construct two perfect Machines as near alike as possible, and provide each Machine with a very fine electrical governor, and a very convenient, delicate, and quick adjustment for varying the speed, by the use of this contrivance and the attention of an expert to adjust instantly any differences. I hope to obtain 300 words legibly recorded every minute.

The great advantage of this system of any other is that it is but one machine which requires intelligence of any amount and that is the adjusting of the receiving instrument =

Fig 1°

I will describe roughly the idea of my receiving and sending apparatus. B is the paper drum on the shaft L secured to the bearing K. D is a gear wheel E a worm on the shaft U. M is a gear wheel driven by the worm a of the engine O is the fly wheel of the engine. Q R S T the magnets N is a gear wheel driven by the worm a. z. the shaft carrying the wheel X with its sending or recording contact springs G H I J = C is the paper. When the Engine starts the Mechanism all the parts revolve the shaft Z and springs quite rapidly and the paper carrying drum slowly. While say the spring G is passing from one end of the drum to the other and recording a portion of the Letter, the paper carrying drum carries the paper ahead the 1/64 of an inch so that when the spring H comes on the paper it records another portion of the Letter the 1/64 of an inch behind that of G. And the Wheel X being provided with a sufficient number of springs to record a letter at every revolution—

It may be found in practice that moving the paper feeding
Drum while the pens G H etc are crossing the paper may interfere with the record in that case the wheel D may be made and rotated step by step and adjusted so that just at the moment one pen leaves the paper, it will feed the drum ahead the \( \frac{3}{64} \) of an inch before the other pen comes on the paper. The device is illustrated in fig. 2.

![Fig 2](image1.png) ![Fig 3](image2.png)

F is the shaft carrying the pin wheel D provided with pins E E a is a cam on the drum B which is on the shaft C when the shaft C is rotated the cam a in passing between the pins E E cams the wheel D forward one pin Fig 3 shows the cam a just in the act of passing between one of the pins and camming the pin wheel ahead.

The rotary motion of the pens might be dispensed with and the a back and forward motion made by a cam wheel on the driving shaft in this case but one pen would be necessary. This would give a motion to the pen much evener than a rotary, for when rotated the spring bears harder on the paper when in the middle than when it comes in contact. Fig 4 will give an idea of the devices by which I propose to accomplish the object.

![Fig 4](image3.png)

B is a drum with a groove planed or cut in it at an angle into which a pin n plays connected to the writing arm C and when the driving shaft X is rotated the pin following the course of the slot gives a forward and backward motion to the shaft or rather arm C which of course impells the writing pen D back and forth on. The paper & drum E = G is the support for the shaft H of the arm C.

The paper should be held down firmly upon the drum by a Shield thus:—
F is the shield; made preferably of an insulating substance.

The pen D may be provided with a small roller at its end for sending which I think will be found preferable to a flat pen, and it may be equally as good for receiving.\(^3\)

I propose to try several forms of Governors \(\text{fig } 6\) will give one

\[\text{Fig } 6\]

A is the shaft carrying the Governor. BBB is the governor\(^6\). C a collar which raises up on the shaft A as the speed increase and the balls spread out. M is another collars through which the shaft A passes but does not touch,\(^e\) on the top part of this collar is platinized, and the bottom of the Collar C is provided with several platina points which rub on the platina-azed surface of the Collar M\(^c\). N N' are rigid rods upon which the Collar M slides up and down,\(^e\) Q is the adjusting rod for varying\(^e\) the speed, pivoted at p, and adjusted up & down by the screw R\(^e\). This rod is secured to the Collar by at X. S are the Engine magnets V is the battery T is a collar upon which a spring rubs and is used as a means of con-
necting the battery with the shaft and its devices. It will be obvious that if the collar is adjusted to a certain position and the battery power is increased the speed of the Engine will be increased also, and the balls will spread out by reason of the increased speed, stand lift the Collar C and its platina points off from the platinized surface on M and break the Circuit, until the speed diminishes sufficient to allow the balls to collapse when the circuit will be again closed and so on the two collars will vibrate closely together alternately opening and closing the circuit and keeping the speed at the same rate. In practice I apprehend that the governor shown will not regulate the speed with sufficient accuracy if this is the case, a Leverage can be attained, and an extremely fine adjustment obtained by the following means.

Fig 7.

In fig 7 the electrical break as the speed increases is made by a lever Q secured to the Collar S by the devices shown in Figs 8 & 9 or in any usual manner. This Lever is pivoted at R, and the circuit is broken at T. By using this Lever, and placing the fulcrum R in close proximity to the Collar S greater leverage is obtained and the least rise of the governor.

July–December 1871
balls quickly shows itself in magnified proportions at the point \( T \). Fig 10 shows a mode of arranging the governor balls. This governor device may be worked on a different principle, instead of breaking the current of the engine when it goes too fast and thereby slowing it. A magnet is arranged with a break upon the fly wheel and the governor made to break and make the circuit of this magnet and thereby put on and take off the break from the fly wheel. Fig 11 will show this arrangement.

![Fig 11](image)

A. is the fly whieel secured to the carrying shaft, B is a armature provided with a Leather pad which when there is no circuit in the magnet N is held on the periphery of the wheel A by the spiral spring W, thus slowing it up, and the balls dropping closes the circuit at\( T \) through the magnet N, and pulls the break off from the fly wheel A, and doing this as often as the speed increase beyond the point set at \( T \).

Instead of a worm and gear to drive the paper carrying wheel ahead The idea has occurred to me that a cam motion the same as shown in figure 4. could be used thus **fig 12**
Fig. 13 shows the manner of feeding the pin wheel ahead step by step—

Fig 15 shows another device for feeding the paper carrying drum ahead step by step twice for at every revolution of the main driving shaft

Fig 14 shows another view of Fig 13

Fig 16 shows another device = Fig 17 shows another device for getting motion from the main shaft and also for driving the paper drum

Fig 17

Fig 18 is another device for feeding paper drum

Fig 18

Fig 19 The same

Fig 19

Fig. 20 Another device for procuring a double motion for each revolution of the driving shaft for feeding the paper drum =
Fig 21 Represents a case for keeping the chemically prepared paper in to prevent evaporation, and to keep it wet and ready for use the moment the machine commences operation. Heretofore in Chemical Telegraphs considerable trouble has been experienced in keeping the paper sufficiently damp to give a clear record, and I find that no provisions for exterminating this difficulty have been yet made to my knowledge. In my machine more than any other it is absolutely necessary that the paper should be in the machine and always ready for use, and owing to the slowness of the paper in passing through the machine it would quickly dry in coming from a roll exposed to the air.

Fig 21

B is a metal case hinged at C provided with a handle X for opening. This case is secured to the standard D. A is a long spout secured to B and leading directly to the paper carrying & writing drum in which the paper passes. E is the paper reel running within the Metal case upon a shaft the centers of which run in the standard D. The reel of paper which has previously been prepared is set within the Case B and the end led through the spout A, and then closed, and being almost or airtight the paper will keep moist and ready for use for weeks. It will be noticed that no part of the paper is exposed to the air until it reaches the paper Carrying drum ready to be used.
Proposed form for Constructing the Machine = Fig 22

In practice it may be found necessary to feed the paper drum by a separate magnet, which will take an intermittent work off from the Engine and perhaps add to the accuracy of the Unison of the two machines. It may be done in this manner. Fig 23

a and b are contact points, each connected with the magnets C.D, the connections arranged in the usual manner—When the writing pen comes over to one side it makes contact with one spring closes one magnet which feeds the paper ahead one tooth and going backs throws the current from the battery X through the other magnet and closes and feeds the paper ahead another tooth.

One magnet could be dispensed with and a spring used in its place.
It also may be found necessary to make the writing pen travel straight across the paper and not perform an arc as I have heretofore shown. Thus Fig 24.

Fig 24

Q is the lever a a sliding bar carrying the pen G and prevented from tipping by the wire B and guides C.D. It is connected to Q by the pin H and slot E is the paper feeding ratchet=Q and a might be connected by a link which would reduce the friction. The ratchet wheel E might be a double Crown wheel with V shaped teeth or a pin wheel and a a fork X made to feed the paper by the back and forward movement of the writing shaft a.

From Page 3 to Page 14 Written, and illustrated on the 29 and 30th of July

Witness Jos. T Murray* T A. Edison


Signature.

1. This entry is continued in Doc. 186.
2. A roller was less likely to tear the perforations in the paper tape.
3. This is the first evidence of Edison’s use of a flyball governor for regulating the speed of telegraph instruments. Although not used in his subsequent automatic telegraph instruments, this governor became an important element in Edison’s universal private-line printer. See Doc. 208, n. 1.

Dear General:

I have read your doleful note, and also that of our most excellent friend, who asks you if there is really any better ground for hope, now, as to our new system, than there was a year ago?

Whilst I do not admit that we had not advantages, a year ago, over the Morse system, of fully equal to 50 per cent. I do

Peekskill, July 31/71.

Innumerable Machines in the Mind 326
not hesitate to say, what I am sure, of your own knowledge, you can confirm, that within the past year, we have succeeded in making improvements, which, in the very material business of Perforating and Writing out (Copying) of messages, we are now at least three to five hundred per cent better off than we were 12 months ago.

I say, farther, and as the result of my closest observation and best judgment, that with our present complete machinery, we can and shall, very soon, prove our ability to beat the Morse system, in promptness and accuracy of transmission, very decidedly, and we shall prove our ability to beat all other systems, in case of labor, at least 4 or 5 to 1, & in cost of Lines, Batteries, &c more than 10 to 1, taking the whole country through.

There is another consoling thing, to me, in this matter, and that is that our inventors all say they have exhausted their wits, on our machinery, and they see neither the necessity nor the possibility of further improvement.

Mr. Harrington and the Automatic Co. are acting on this assumption and there will now be only so much delay as may be necessary to enable the operators to acquire a moderate degree of expertness in the use of the new machinery.1

Mr. Hoadley, and you and I are very near the end of our troubles. Yours truly

D. H. Craig

Private Dr General: Of course you know it would be perfectly suicidal for me to make a demonstration, now, to raise a large sum of money on our Telegraph interests. The fearful delay we have suffered, has caused some of Harrington's friends, I know, to become weak in the knees and I should simply act the part of a fool to make the least demonstration that looked like hedging, now.

Our Sholes Printers, (which are quite satisfactory to me) were shipped from Milwaukee some days ago, & soon we shall be all ready to move on the enemy's works, and lift the bigoted fools right out of their boots. At the end of one week, one of our Perforators could do, of familiar sentences, 42 words per minute on the new Perforator. We shall get 50 words per minute, sure, from Perforator & Printer.

Little & Harrington and Edison seem to be all on the best of terms, but I cannot get one of them to touch the Closing up matter between us & them.

Why not drop into the Clarendon and have a chat with Harrington. I wish you would, and tell me the general result.

July–December 1871
Confidentially, to you only, I will say that there is a Perforator, nearly completed, which is more simple, cheaper to make, easier to work & more rapid than Edison's. I shall try to shape the interest so that it can be controlled by all the friends of Automatic Telegraphy, & not by one or two. You may depend upon it that I sleep with one eye open, all the time, & I guess you may now do the same. Truly &c

D H Craig

ALS, NNHi, Lefferts. *Interlined above.

1. Just prior to the date of this letter, the Automatic Telegraph Co. made preparations to begin operations. Edison, Murray, and Unger shipped a perforator to the company's main office, at 66 Broadway, on 17 July; on 20 and 21 July a room was cleaned out, the switchboard fixed, and a "carpet put down and office opened ready for work." However, the company did not open for business until 14 December 1872. Affidavit, 10 Feb. 1879, Cat. 297:310, Lab. (*TAEM* 5:996); "Automatic Telegraphy in Practical Business Operation," *Telegr.* 8 (1872–73): 556.


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[Newark,] July 31–August 4, 1871

In this system I intend to use an automatic Letter puncher in my preface I mentioned that I intended to use and punch the Letters in the paper upon the stencil principle, that is The letter after being punched would resemble a stencil letter, the interstices of the Letters being held together by strips from outside of the paper = Thus. = upon experimenting with this and several other previously Conceived ideas, I found that the inslide of the letters or parts left after the letter was cut was very fraible or weak and that the transmitting stylius or other device would be liable to break them out in passing over them and thus destroy the legiability of the Letter at the other End of the line = The best form for punching or preparing The Letters I found was to form them of sa large number of small holes. Thus:—

**Fig 25**

**B O N**

upon experimenting with this and several other previously Conceived ideas, I found that the inslide of the letters or parts left after the letter was cut was very fraible or weak and that the transmitting stylius or other device would be liable to break them out in passing over them and thus destroy the legiability of the Letter at the other End of the line = Thus. =

**Fig 26**
When the Letter is punched in this manner no part of the paper left within a Letter after punching is materially weakened, at least not weak enough to produce inconvenience in transmitting the same.

I also find that by adopting this mode and way of making a letter, the Mechanical difficulties which would be encountered in preparing messages by a stencil Letter would, be greatly reduced by making The Letter in the manner last described. Another advantage in using the perforated Letter composed of small holes is that the received copy at the other End of the Line is much more legible, and has a more handsome appearance—

The copy if received from a stencil letter would resemble the following:

Fig 27

BON

While that received from the Letter composed of round holes would be thus:

Fig 28

BON

which will be more legiable—

The One of the devices with which I propose to prepare the paper with This kind of Letter is shown in Fig 29

Fig 29

S is a hollow Drum in which is fitted 28 letters formed of holes. The manner of making each letter I will briefly explain before I give a description of the Machine:

A block Fig 30, of steel is drilled from end to end with holes to form the letter thus Fig 31. Then the metal around these
holes is filed or cut away so as to leave the edge of the hole sharp enough to cut a hole in the paper when pressed on it. Fig 32 will show this, and Fig 33 will show one single punch in this manner on a magnified scale.

These blocks each containing a letter of the alphabet is set in the periphery of the wheel .S. and secured firmly to it.

R is the roller which carries the paper and upon which the letter—is cut out. This roller is formed in a peculiar manner, to withstand the constant wear of the cutting punches on it after passing through the paper. Fig 34 will show the metallic portion of the roller.

The flanges a b of this roller is filled with washes of raw hide, or cat gut, or with paper and then subjected to an immense pressure and held together by the nut x. Then turned of smoothly in a lathe. These two substances when arranged in this manner have a “peculiarity” which no other discovered substance has or is known to have, that is that the Cutting edges of punches or knives or sharp tools do not wear them at all and they will stand for months of continuous cutting, and still preserve their specific peculiarity or quality. Now it will be seen by referring to fig 29, that when a letter with its cutting edges is brought directly under the roller R and the Lever Q lifted upwards with sufficient force, the cutting edges of the punches will cut through the paper on to the rawhide roller R and punch a letter—

The manner in which I bring around any desired letter & have the lever Q raise the drum R upwards to the face of the drum .S. I will not explain:—

B & C are frames in which the shaft A run, upon which
shaft is two wheels S and M, the latter having teeth upon one side of its periphery, on the other side is a pin o rubbing continuously upon said periphery. This pin is connected rigidly to the lever P which is connected rigidly with the lever Q by means of the shaft 10, so that when the lever P is raised it raises the lever Q and drum R with it. T is a spring to keep the pin o down upon the periphery of the wheel M where there are no teeth. The shaft A slides endwise, but is prevented from doing so when not operated, by the spring K secured to the shaft and standard L. The manner of arresting the rotation of the shaft and throwing it forward of endwise is quite simple.

N is the finger key pivoted on the shaft F, which runs in the bearings H and G and the end of the key N is bent in the manner shown in the drawing, so that when the key is depressed the cam or bent end E is thrown into the path of the pin D on the revolving shaft A. the pin D first strikes the bent end at 15 and the shaft continuing to rotate, the it is cammed forward or endwise and then suddenly arrested by the straight part of the key at 16. The moment that the shaft is moved endwise the pin O on the lever P is thrown further. That portion of the periphery on the wheel M which has the teeth is thrown into the path of the pin O on the lever P which riding upward on one of the teeth lifts the lever Q and drum R and paper up to the letter which corresponds to the arm D upon the wheel S, with sufficient force to cut it out. Now the moment the key N is allowed to be released, The spring K pulls the shaft back and throwing the teeth on the wheel M out of the path of the pin O, and the shaft commences to revolve again. before this is done the pin O would have passed over a tooth on the wheel M and effected the cutting out of the letter & dropped down out of the way before the shaft was released. The shaft A could be provided with 28 or 30 pins set in different positions upon the shaft and directly in the path of as many keys similar to N so that by depressed any key a certain character upon the die wheel S could be brought in the desired position. In practice it may be found necessary to dispense with the teeth and on the wheel M and substitute in their place undulatory "races" as shown in Fig 35. This would be a positive movement and prevent any momentum being given to the levers P & Q by the suddenness with which the teeth strikes the pin O.
When the Wheel M is thrown forward the pin O enters one of the undulatory cams at its lowest point and rides up and down one undulation when which lifting the Levers P & Q and punching the letter is thrown out of these slots by the wheel M moving back and then the pin O rides up on the smooth portion of the periphery.

Fig 36 & 37 shows how these slots are made XX being fitted inside of X and both secured together and with the shaft = The manner in which I propose to move the paper, I will now describe.

*Date of written between July 31 and Aug 4 1871*

Witness — Jos T Murray

T A. Edison


1. This entry is a continuation of Doc. 184.

2. See Doc. 184.

3. In his first patent for roman-character telegraphy (U.S. Pat. 151,209), Edison employed a perforator with a square matrix of twenty-five separate punches (various combinations of the punches producing different characters) rather than a punch wheel with a separate block for each character.

4. Edison probably meant to write “now.”

*Innumerable Machines in the Mind*
Record of ideas conceived, and experiments tried on miscellaneous Machineries and things, to which dates are appended, and such record to be used in any contest regarding or disputes regarding priority of ideas or invention.

T A. Edison

AXS, NjWOE, Lab., Cat. 1181:1 (TAEM 3:174).

1. This entry appears on the first page of the notebook; Doc. 188 begins on the second page. This notebook also contains Docs. 189, 214, 221, 226, 228, and 240.

Device for recording upon chemical upon chemically prepared paper, by a “jump spark” or [-]Current of electricity of high tension. Fig. 1 will give the principle of the device.
This device I do not consider fast but and not applicable to Automatic or fast telegraphy, but that shown in another figure is. — The main result which I have endeavored to obtain in this device is procuring or effecting a visible record by a very feeble current. Sir Wm Thompson some time since invented what is known as the Syphon Ink Recording Galvanometer, which is used on the Atlantic Cable and is the first recording Apparatus which had no friction in its parts. In my device I am enabled to move the recording parts which much less Current than the Apparatus of Sir Wm Thompson and also dispense with a large amount of apparatus which accompanies that apparatus.

In my recorder the pen consists of an exceedingly fine steel neede of about \(\frac{1}{2}\) inch in length and suspended within a helix of very fine insulated wire, and held by a single fibre of silk to the adjusting screw E. the end lower end of the suspended needle after passing through the helix nearly touches the paper which is chemically prepared, upon the drum which is rotated by suitable Machinery. The helix A is connected to the line and battery K and break key J so that by opening & closing the key alternate positive & negative Currents will be sent of the line and the needle deflect back and forth over the paper but not touching it. With the exception of having the chemically prepared paper under the end of the needle, so far it is but a Common Galvanometer.

C is a point adjusted quite closely to the needle but not touching it. This point C is connected to the secondary Coil of a powerful "Inductorum" by the wire T and the Drum to the other end by the wire U so that when the Vibrator N and primary Coil is working powerful Currents of electricity will be generated of sufficient tension to jump from the point C to the needle B thence jump through the wet paper to the drum & back to the Inductorum forming a complete circuit. this current in passing through the chemically prepared paper decomposes the substance with which it is saturated and leaving a Mark if the paper is carried along Continuously by the drum B a eand the needle B is at rest a Continuous mark mark will be left on the paper, the positive & negative Current passing with such inconceivable rapidity through the paper that the line is continuous. If now the needle is moved back and forth by operating the key J a Zig Zag line will be given to the right by a positive and forming a dot and to the left by a negative and forming a dash — Fig 2.
The word "this" would be recorded\(^d\)

Above drawn & written Aug 5 1871
Witness. Samuel Edison\(^d\) T A. Edison

AXS, NJWOE, Lab., Cat. 1181:2 (TAEM 3:175). Date taken from text.
\(^a\)Interlined above. \(^b\)Preceded by "x" in an unknown hand. \(^c\)Signature.

1. This entry is continued in Doc. 189.
2. Sir William Thomson (later Lord Kelvin) was professor of natural philosophy at Glasgow University and was among the premier contemporary physicists and electrical engineers. A director of the company that laid the first successful Atlantic cable in 1866, he superintended the cable's construction and developed the mirror galvanometer that enabled an operator to read feeble signals. DSB, s.v. "Thomson, William."

3. An article in the \textit{Telegrapher} on 5 August 1871 described William Thomson's siphon recorder for cable telegraphy and may have prompted Edison to make this notebook entry. Thomson's device, first patented in 1867 and improved in 1871, recorded on paper the feeble signals transmitted over the Atlantic cable and was significantly easier to read than the mirror galvanometer, which had been employed previously. The siphon recorder passed the incoming signal through a coil of wire suspended between the poles of a powerful electromagnet. The resultant magnetic field caused the coil to turn one way or the other, depending on the direction of the current. A thread transmitted the motion of the

\textit{Drawing of Sir William Thomson's siphon recorder, which was used on cable telegraphs.}
coil to a glass tube that siphoned ink from a reservoir and deposited it on a piece of paper. Coil motion recorded "dots" in one direction and "dashes" in the other. "The Syphon Recorder of Sir William Thomp-son," Telegr. 7 (1870-71): 400-401; Bright 1974, 604-16; Prescott 1877, 559-61; Maver 1892, 269-70.

4. Edison proposed using a simpler method, which he was employing in his automatic telegraphy experiments.


6. In the American telegraphic code, the letter "T" was represented by a single dash, "H" by four dots, "I" by two dots, and "S" by three dots. The zigzag shown in Edison's figure 2 is a nonsensical jumble of dots and dashes.

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Notebook Entry: Chemical Recorder

[Newark,] 8th August [1871]

I will mention here that the inductorium can be dispensed with and a magneto electric machine used to generate the high tension currents. I do not wish to confine myself to any particular device for making the high tension currents go in a Zig Zag motion right to left & left to right and recording the jump spark upon Chemically prepared paper as it can be done in innumerable ways amany of which I could mention but which I consider quite unnecessary. What I will probably claim when I apply for a patent will be the General features or principle underlying the Combination to produce the ef-fect.

I will now explain a modification of this device for receiving very rapid writing. In this Case—No I will not—I was mis-taken—

An Idea strikes me that sulphuretted hydrogen or some other gas that will discolor certain chemical solutions Could be used in Chemical Telegraphs. Supposing a long Strip of paper was prepared with a chemical Solution Which would be discolored by a certain gas, and A fine jet of this gas was let play upon the surface of the paper, and the paper Carried forward by clock work a continuous mark or line would be made on the paper. If the Jet was controlled so that it could be let off and on by an electro magnet placed in the main circuit, it would produce the same results, as the decomposition of the Chemical Solution by the electricity itself, and an ad-vantage gained would be that the marks would not tail out and that the mark could be made large or small without regard to the strength of the Current which worked the magnet.

Innumerable Machines in the Mind 336
Ink recording Telegraph

F a paper carrying drum over it suspened and held by E is a Air tight bulb B filled with ink into which is connected the main line wire D and .C. at every closure of the Current, gas is generated by the current passing through the ink and decomposing the Water contained in it. this gas expands & pushes the ink out at the End of the bulb B at X through an very fine aperture, and it falls on the paper, so that as long as the Circuit is closed gas is made which continues to force the ink out through the aperture X on the paper which passing along leaves a continuous Mark if the Current be now interrupted no More gas is generated and the ink ceases to come out of the aperture X—

Witness Jos T Murray

T A Edison


Preceded by "X" in an unknown hand. Signature.

1. This entry is a continuation of Doc. 188.

2. This is a reference to Edison’s proposed improvement of the Thomson siphon recorder (see Doc. 188). A magnetoelectric machine could be used in place of an induction coil to produce high potential currents of alternating polarity. The operation of magnetoelectric generators was based on Michael Faraday’s discovery that the motion of a magnetic field relative to a coil of wire produced an electric current in the wire. Developed primarily as scientific instruments in the 1830s, magnetos came into use for electroplating in the 1840s and were more common in the 1870s as electric power sources for arc-light systems. King 1962c, 333–407; Maver 1892, 27.

3. No patent application has been found.


5. Hydrogen and oxygen.
Device for receiving by chemical Telegraphs =

In the ordinary way of receiving on chemical paper the pen or stylus .C. always remains in contact and the circuit of the main line is connected to it and the drum A, and the circuit opened and closed at the distant station leaves dots and dashes formed by action of the main line current upon the paper. But one great drawback to the practicability of receiving in this manner either by the main or Local circuit is that the dots and dash Tail out, (ie) continue to make a mark after the Current has ceased, the reason of this has not yet been explained. The above device is to prevent this “Tailing” and is brought about by connecting the Magnet E, pivot in the main Circuit, and the stylus C Drum A chemical paper B armature D in a local Circuit within which is the battery K. H is a stop screw for D & G a spring to draw D from the magnet the armature Lever & pen stylus holder D is pivoted at .P.

When the Circuit on the main line is closed it operates the Magnet .E, brings the stylus C down on the paper and the current of Battery K decomposes the solution in the paper and leaves a mark as long as the magnet is closed if the Magnet is now opened the pStylus C is lifted entirely off the paper by the action of the spring G etc thereby effectually preventing the tailing of the Character which is being received which would otherwise be the case if the pen was allowed to Stay on the paper and the Current through it simply broken.

The chemical paper might be dispensed with entirely and the record made from an inking ribbon.

If the stylus C had a point or roller at its extreme end and an inking band passed gradually by Clockwork between it and the the paper every time the magnet was actuated by the Cur-
rent the roller would be brought down and pressing the ink band on the paper leaving a mark.

Or the Drum A might behave an inking band wound around it and the pressure of the roller on the end of the stylus C would be sufficient to impress the ink upon the paper on the underside of the paper. Or the drum A might have an inking roller to ink a slight line in the middle of its periphery directly under the roller on the stylus C, so that when the roller was brought down the pressure would be sufficient to make the paper take ink as long as the pressure continued—

Witness. Jos T Murray

T A. Edison.


1. This entry is a continuation of Doc. 180 and is continued in Doc. 191.
2. See Chapter 5 introduction, n. 9.

Fig 8

Rock shaft for giving motion to the paper feed in my large perforator.

A is a fork piece secured to the shaft N by a screw or other means. B is a pin having a roller on it. G is a square piece upon the upright R. When the key X is depressed the upright
R is carried with it and the roller B coming in contact with the fork piece A at n. this rotates the shaft N, and at the same time the m end of the fork A comes in contact with the square G and the n end being down so far below the center that it ceases to act as a lever or means of rotating the shaft and the wheel or roller B slides down the straight part at N. It is obvious that by the two prongs being long and being arrested at two different points makes a perfect "lock" of the rock shaft N and prevents any momentum, of that shaft from taking up the dead motion, occasioned by imperfect mechanism. There being a dead lock in this case and no loss motion to take up. Fig 9 will show the position of the fork and key when it is depressed to its full stroke and a dead lock takes place of the Rock shaft.

Fig 9

AX, NJWOE, Lab., Cat. 1182:7 (TAEM 3:53).

1. This document is a continuation of Doc. 190.

2. On or about 11 August, machinists at the American Telegraph Works made experimental modifications of the rock shaft for the large perforator. Edison applied for his first perforator patent on 16 August, and it included a variation in the design of the rock shaft proposed here. In the patent application, Edison did not use the square piece G to lock the shaft. He placed the pin B at varying heights on the shaft according to the distance the shaft had to move the sliding paper carrier to accom-
modate the different lengths of paper tape needed to perforate each character. This application issued as U.S. Pat. 121,601 on 5 December 1871. Cat. 30,108, Accts. (TAEM 20:264).

From Charles Williams, Jr.

T. A. Edison

To Please send something on acct of this bill = How about that voter machine made for Roberts

C. Williams Jr


---

Jointed Printing Lever. The object of jointing the Printing Lever is to dispense with the device I have now on my universal Printing Telegraph Machine, which consists of an Electrical Cam and Throw over. When the Type wheel is suddenly arrested and the Current through the Printing Lever Magnet closed the A piece Springs forward and the arm D & Screw C kept in contact with the springy impression Lever B by the spring E brings that forward. at the moment that the piece A is suddenly arrested by the screw X. the Lever B spring forward by its momentum and impresses a Letter and flies back till it comes in contact with Screw C and when the Current is opened in the Printing Magnet all the devices fly back.

It is obvious that the printing Lever made in this manner will impress a Letter instantly & fly back out of the path of the type wheel leaving it free to start off

July–December 1871 341
Device for arresting the rotation of the break wheel on my Universal Ptg Machine by a Magnet instead of Mechanically. A Description Unnecessary.

All previous Written Aug 25 1871
Witness Jos T Murrey

T. A. Edison


1. Because Edison wanted the universal private-line printer to work quickly, the printing lever had to move immediately away from the typewheel after pressing the paper against it so that the typewheel could resume its rotation. In the original design, an arm attached to the printing lever broke the printing circuit just as the paper pressed against the typewheel, allowing a retracting spring to pull the lever back (see Doc. 165). The design sketched here resembles the printing lever of George Phelps’s “financial instrument” (U.S. Pat. 110,675), used by Gold and Stock and certainly known to Edison. See Doc. 223.

2. In the original universal private-line printer design, typewheel shaft S was driven by a ratchet and pawl (not shown in this diagram). When a key was depressed (K and K’ represent the instrument’s 30 keys), it blocked arm D (or D’) and stopped the shaft. A series of levers working off the bottom of S stopped pulsator (breakwheel) P on motor assembly N as the typewheel halted, thereby
Notebook Entry: Automatic Telegraphy

A new system of Telegraphy, using neither dots nor dashes, but receiving the message by a Puncher or Embosser and Running it through an Automatic Translating Printing Machine. I do not wish to confine myself to any particular Translating Printing Machine, as I have innumerable machines in my Mind now which I shall continue to illustrate & describe day by day when I have the spare time.

The Printer which I propose to use for translating from the punched or embossed paper, is as follows though I may improve it in time or adapt an entirely new one using Magnetism or dispensing with it and make the paper perform a mechanical Operation.
A is the type wheel, B its shaft, C is a small ratchet wheel rotated by E Magnet armature Lever pawl & detent, and D another ratchet wheel rotated by the magnet F Armature Lever click & detent. The first Magnet E pushing the type wheel ahead one Letter and the magnet F, 4 Letters. G is a pawl for preventing the type wheel from returning to Zero which it would do by the action of the rubber cord m secured to its shaft. The Printing throws this detent out of the path of the ratchet when it takes an impression. When this takes place the type wheel returns to Zero. This click is placed back in its original position by the first forward Movement of either ratchet Lever operated by the Magnets.

The Printing Lever is jointed near its fulcrum and held to the other part of the lever by a tension, and when the Magnet attracts this Lever the forward part goes farther by its momentum than it would if the Lever was actuated Slowly and in so doing effects the impression and immediately springs back out of the way of the type wheel and at the same moment when the Lever has reached its extreme Limit, the click G is thrown out of the ratchet and the Cord m pulls the type wheel back to Zero. The circuit of the type wheel rotating Magnets are is opened & closed by perforated or Embossed paper. The characters being in two rows one row rotating & the type wheel 4 letters at a time and the other but one Letter at a time, the 4 Letter Magnet & devices might be dispensed with but the characters of the perforated paper would be too Lengthy. The Printing Magnet is closing when the Both Escapement Levers have ceased to work and touch the back points of the printing Circuit. They both rest on these points for an instant, according to the length of the space between the Letter on the perforated paper.

To translate the Word “This” The perforated character should be thus = the holes in Line No 1 rotate the type wheel 4 Letters for each one and as T is the 20th Letter 5 dots are used when the space between the Letter Comes this gives the Escapement Lever time enough to close both points & close the printing Lever & effect the ptg of that Letter.

The Letter H being the 8th Letter but 2 holes are necessary the letter I being the 9th Letter in the Alphabet 2 holes
in Line No 1 turn the the type wheel to the 8th Character & one hole in Line No 2 one more Letter bringing it to I S being the 15th Letter 4 in the upper line bring it to 12th Charctr & 3 in the Lower to the 15th which is S. 3 rows of holes could be used but it would be hard to transmit Them over the wire.

The Device for Running the perforated Embossed or otherwise prepared paper through may be a Drum Carried by Magnetism Weight Spring & any other force or force storing device.

There are several ways by which this translating paper May be prepared by an instrument operated by similiar paper at a distant station.

first 1st = An Electro Magnet may have a very delicate Valve fitted to its armature Lever and this Valve Operated a cylinder & piston worked by Compressed air or other force or power, and the piston of which has a punch like a belt punch, Cutting upon a block of Leather, Raw hide or Compressed paper and at every hole punched feed the paper ahead, or the punching May be done while the paper is being fed Continuously by other means. The Magnet should be a polarized one working two valves & pistons one cylinder & piston punching or Embossing holes in one Line & the other piston in another Line, which line being determined by the polarity of the Current. The paper might be Embossed. The Lever of an ordinary Morse Register being operated by the cylinder & Compressed air or Chemical paper might be used, the decomposed portion being of such a character that by immersing it in another substance an action would take place to form a salt or other matter & so raise the character in relief—which Could be made to raised a very delicately poised Lever & open & close on the electric circuit of the Translating Printing Machine or an Ink Recorder Could be used the ink of which would be a conductor and two points closely together & CONNECTED with either end of a battery & magnet the mark would elo connect the two points together or the ink could be a Chemical & dipped in some solution like that which I proposed to dip the Chemical paper.

Above written Aug 31 1871

Witness. Jos T Murray

T A. Edison

1. This entry is continued in Doc. 196.
2. Edison used a similar arrangement in U.S. Patent 123,984. See also Doc. 210.
3. Edison also suggested the use of a Morse register for this purpose in a patent application draft made about the same time (Cat. 297:133, Lab. [TAEM 5:922]). See also Doc. 10.

UNIVERSAL STOCK PRINTER  Doc. 195

In the spring of 1871, even as Edison manufactured his cotton instruments, he began developing a new printing telegraph design—the universal stock printer. The Gold and Stock Telegraph Company received a wooden model and a prototype on 3 June and a second prototype on 14 June,¹ and in late summer Edison began manufacturing the universal machines. By the end of the year he had delivered 600 to Gold and Stock² and had finally executed a covering patent application.³ Although the new ticker superficially resembled the cotton instrument, it incorporated several changes Edison had made in the earlier instrument and also displayed some novel constructions. The fundamental design became a standard in the Western Union ticker inventory for many years.

The original design of the universal stock printer refined two of Edison's earlier innovations—a mechanism that shifted the typewheels (U.S. Pat. 123,006), and the screw-thread unison (Doc. 158). Edison redesigned the shifting mechanism to

Photograph of the shifting mechanism of Edison's universal stock printer.

Innumerable Machines in the Mind 346
reduce friction. This, together with a new paper-feed mechanism, reduced the power requirement of the printing lever magnet. When a dozen instruments were on a circuit several miles long, the cumulative reduction significantly lowered battery consumption. In addition, Edison altered the universal so that the release was done by the printing lever itself, rather than by a separate set of levers actuated by the printing magnet.⁴

Edison improved the printer in two other important ways. First, he mounted the magnets so that the gap between a magnet and its armature was adjustable. Second, he changed the mounting of the shafts that carried the printing lever, the escapement lever, and the typewheels and made them laterally adjustable (cf. Doc. 136). Consequently, parts fit together far more readily and were considered completely interchangeable.⁵ For several years, company instructions warned service personnel not to “attempt to file, bend or tinker with the different parts of the instrument, as they are interchangeable and accurately made, and if any part should in time get defective, supply it with a new one which will be furnished from the New York Office.” By mid-decade, however, the company had decided that “it does not pay to furnish new parts for instruments, as the instruments are not all alike and consequently the parts do not always fit.”⁶

Edison continued working to improve the universal stock printer after filing the patent application. Although he executed patent applications for many variations on the basic design during 1872, these features were not incorporated into the production model.⁷

2. Unlike the cotton instruments, which had been made by the American Telegraph Works, these printers were manufactured by Edison and Unger (Newark Telegraph Works). Gold and Stock received roughly 640 more in 1872. By late 1874, Edison had made about 3,600. PN-71-09-06, Accts. (TAEM 20:974-83); 72-017, DF (TAEM 12:895-99); Ford 1874, 231.
3. U.S. Pat. 126,532. The patent model, now at the Edison Institute in Dearborn, Mich., was received at the Patent Office on 12 January 1872. It was universal stock printer No. 568, which had originally been delivered to Gold and Stock on 18 November (PN-71-09-06, Accts. [TAEM 20:978]). Edison often made patent models by modifying cotton
instruments or universal stock printers that were defective or had been returned for repair.

4. See Doc. 158 headnote.


6. Gold and Stock 1872, 10; idem 1876, 28. The cotton instrument's parts had little margin for adjustment. Consequently the parts of each instrument had to be individually fitted together. This is evident from the serial numbers stamped on the various parts of each machine. The early universal stock printers—at least the first 1,200 or so—had no such numbers on their parts, indicating that the parts were indeed interchangeable. Some later universal stock printers, however, such as one privately held in New York City (No. 2,041), do have numbered parts. The apparent reversion in manufacturing and repair techniques may have derived either from inadequate manufacturing standards or from the proliferation of universal stock printers of slightly varying design. For a full discussion of contemporary production techniques, see Hounshell 1984, esp. chap. 2 and app. 2.

7. U.S. Pats. 126,528, 126,529, 126,533, 131,338, 131,339, 131,341, 131,342, 131,344, and 138,869. The artifact illustrated in Doc. 195 is a production model that was used and modified; see also the descriptions of the instruments given in the company handbooks cited in n. 6.
M (22 cm dia. x 11 cm), MiDbEI(H), Acc. 29.1980.293. This universal stock printer has been modified in three ways. First, a 15-tooth ratchet wheel has replaced the original 30-tooth wheel on the typewheel shaft, allowing a doubling of the transmission speed. Edison first experimented with such a wheel in May 1872 (Cat. 1183:111, Accts. [TAEM 20:915]) and was making the change on his stock printers by that fall, as evidenced by the 15-tooth wheel on the model for U.S. Patent 138,869, submitted in October 1872 and now at the Edison Institute in Dearborn, Mich. (Acc. 29.1980.1335; the ratchet wheel is not covered in the patent claims; see also Doc. 338). Second, there is an adjustable spring for the printing lever in place of the original, fixed spring. Third, there is a stop to limit the upward travel of the printing lever. It is not known when or by whom the last two changes were made.

1. See headnote above. The instrument shown, No. 510, was completed and delivered to Gold and Stock on 2 November 1871. PN-71-09-06, Accts. [TAEM 20:978].

-196-

Notebook Entry: Automatic Telegraphy

[Newark,] Sept 4, 1871

Or the ink of the ink recorder could be mixed with a sticky or gummy substance and just at the moment the recorded characters were made by the Roller a fine Spray of hard sub-
stance could be thrown upon it, it adhering to the ink and raising it in relief. Sand, flour, Emery, Pumice Stone, Sugar, or some hard substances of a porous nature, having an absorbant power & ground fine. Could be used, or the ink might contain an acid or chemical substance which would burn eat or rot holes in the paper.

or a lead pencil might be used instead of the ink roller and the plumbago mark could be made to close a circuit having a very high tension Battery in it, or the end of the magnet lever might have a fine needle and prick holes in the paper and the burr which would be thrown up on the other side be made to close a circuit by means of lifting a delicately poised lever.

or a sharp groove might be cut in the paper carrying drum and in which the roller having a sharp edge would just fit, and tissue or other thin paper being used when the roller came down it would enter the groove and shear the paper.

I will now explain my compressed air receiver.

A & B are the Levers having ordinary belt punches pcutting on a raw hide surface or roller C. D & E are the punches, F is the paper feed drum have VTwo V shaped ratchet Wheels the End of Lever A & B having wedges which throw the paper forward after it is punched. K is a magnet having a lever H which is provided with a pawl working a ratchet on the paper feed drum F. This is to feed the paper ahead between the we Letters. The two Levers A & B being provided with closing points so that when both Levers are at rest they close the Circuit through this Extra Magnet.
But when operating they do not stop at the Contact point Long Enough to allow the magnet to act owing to the tremendous rapidity with which the Levers act. O P are the air cylinders, the Valve being operated by the Main Line Magnets, one Magnet responding to Negative Currents and the other to positive Currents.

I do not wish to Confin e myself to any particular form of Air Cylinder or Valve. I merely claim Punching paper or Embossing paper by Compressed air controlled by Magnetism, also positive & negative Currents for doing same. I have been experimenting this day upon a novel idea by which the paper may be Embossed at a tremendous rapidity & requiring very little power to Control it.

I do it by means of an Endless Chord.

A & B are two rollers rotated by power and closely held by together by immovable bearing one & carried around by gear wheels. One Roller is very hard substance and the other soft. The paper passes between the rollers, and with it a Hard thread, or watch chain. This thread or chain in passing through these rollers with the paper of Course the thread or chain is impressed its full depth in the paper and leaves an endless embossed or raised mark upon the paper. This chain or thread is Endless band like, and the Thread passes through a little hole on a head at the extreme end of the Armature Lever X at D. E is a guide roller for guiding the chain and worked by gears or other device, from the roller A.B, so that the thread or chain will always be slack where it passes through the point on the magnet Lever. The Characters are formed by guiding the thread either one side or the other. When a loop either one side or the other is Thus made the rollers seize the thread and inme'y indent this loop in the paper. This paper after being prepared has a follower with a point, the point Running in the groove and of Course
giving a back & forward motion to the Lever which closes a

circuit each time it passes to the right and clsg another in psg
to the left. Thus

![Diagram of lever mechanism](image)

Though this may be done in many other ways the Characters being made to lift a lever or two Levers & closing the
circuit that way This chain band or thread might be wound
around the roller itself and a slight slack made, to allow of
making characters & the thread guided by a fork afrom the
armature lever of the Electro or polarized Magnet.

or the roller could have two flanges at its end higher Than
itself and innumerable little wires passing from End to End
around the cylinder & free to move endwise These little
wires could have teeth on them two teeth in Each and when
in their normal position These teeth would form two con-
tinuous wheels but if the armature lever should throw one of the
little bars forward One of the teeth would indent out of line
& thus form a character A Cam on the other side of the roller
would throw the rod back in position after the impressed was
taken

Witness Jos. T. Murray T A Edison

Innumerable Machines in the Mind 352
Edison and Unger
Summary Account

[Newark,] Sept 13th 1871

T A Edison  
by Cash Capital  
indebteness

Wm Unger  
by Cash Capital  
indebteness

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Wm Unger by note D[ebto]r to T A Edison with Inst at per cent

D, NjWOE, Lab., Cat. 298:132 (TAEM 5:258). In Joseph Murray’s hand.

1. An account book entry of 1 January 1872 lists a note from Unger of this amount with a term of one year (Cat. 1185:16, Lab. [TAEM 22:570]; see also Doc. 215). Edison gave the note back to Unger as part of the agreement that dissolved their partnership the following July (Doc. 264). The amount was stated incorrectly there. See also Cat. 1183:36, Accts. (TAEM 20:878).

Notebook Entry:

Automatic Telegraphy

[Newark,] Sept 15 [1871]

The ink used on the Ink Recorder, or any recorder which I may adopt could be of a gummy nature, and as quick as The Record Should have been made it could be quickly Covered with gold Leaf or other atenuated metal or very fine metallic dust Could be mixed with The ink or thrown on after the record was made

—Instead of the Thread or chain wfor embossing after the manner described Sept 4 1871, The armature Lever Might be a tube within and placed at an angle and Continuously fed with very fine Shot or round, or small substances there could be near the two rollers a stopper, and the End of The tube when in its normal position would rest against this & thus prevent the shot from Rolling down the tube, if now the armature Tube is deflectd to the right the shot run out are Caught between the two rollers & the paper and they are indented in the paper, and when deflectd to the left the shot

July–December 1871 353
roll between the rollers in another line. These indentations can be made to close & open an electric circuit in connection with the printer. the mechanism which rotated the indenting rollers all also carries the shot back to be fed through again.

At the present writing I am inclined to believe that I am the originator of the idea of using perforated paper for controlling or working printing Telegraphs

Witness. Jos. T. Murrey Thomas A. Edison

AXS, NjWOE, Lab., Cat. 1 1 7 3 : 2 8 (TAE M 3 : 9 2 ). Followed by “(x)” in an unknown hand. Preceded by “(x)” in an unknown hand. Signature.

1. This entry is a continuation of Doc. 196.
2. Metallic leaf or dust would serve as a conductor.
3. Edison was the only American inventor working actively in both printing and automatic telegraphy at the time. The system described here, combining elements of each, was never adopted.

-199-

George Little Agreement with George Harrington

New York, September 22, 1871

Whereas, George Little of Rutherford Park New Jersey, has invented and patented a system of automatic or fast telegraphy, and has a contract for the development of said system so that the same may be adopted under the direction of George Harrington of Washington D.C. by the Automatic Telegraph Company of New York, and extended over the United States, the said Little having agreed by contract to dispose of said system and patents for certain stipulated sums of money and amounts of stock of said Automatic Company.

And whereas, the said George Harrington is interested to the extent of one third in certain inventions and patent rights useful in automatic telegraphy including a copying printer of Thomas A. Edison of Newark New Jersey.

Now therefore, in order to avoid all difficulties, as to the relative value of Edison's invention as compared with Little's inventions and for the further consideration of one dollar paid in hand, one to the other, the receipt of which is hereby acknowledged, it is hereby agreed by and between the said George Little and the said George Harrington that they will mutually and equally divide one with the other all such sums of money and stock as they may or shall be entitled to out of or from the payments to be made by said Automatic Company for the said inventions and patents of said Little and said Edison in so far as such inventions are applied by said Company.
to Automatic telegraphy and used by them in the United States.

It being understood, that the amount of interest in his own inventions and patents retained by him (the said Little) vary in none less than twenty seven one hundredths parts thereof.

In witness whereof, the said Little and the said Harrington have hereunto set their hands and affixed their seals this 22nd day of September, Eighteen hundred and seventy one in the City of New York, State of New York

Geo. Harrington\textsuperscript{b} 
George Little\textsuperscript{b}

Sealed and delivered in presence of the words “the said Little” being interlined before execution J. W. Treadwell\textsuperscript{3} C. L. Vanderwater\textsuperscript{4}

ADDENDUM\textsuperscript{c}

[New York.] October 7, 1871\textsuperscript{d}

The foregoing instrument applies to the following named patents, allowed cases and applications and improvements on the same and an invention of Edison of a printer for messages &c. not yet applied for.\textsuperscript{5}

<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Inventor</th>
<th>Subject</th>
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<td>108,495</td>
<td>Oct. 18, 1870</td>
<td>Geo Little</td>
<td>Electric Circuits</td>
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<tr>
<td>115,968</td>
<td>June 13, 1871</td>
<td>&quot; &quot;</td>
<td>Circuit Roller</td>
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<td>Nov. 2, 1869</td>
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<td>96,330</td>
<td>Oct. 2, 1871</td>
<td>&quot; &quot;</td>
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Allowed\textsuperscript{e}

| Allowed | Sept. 28, " | " | Circuit Closer |
| 111,112 | Aug. 18 "    | " | Recording Instrument |

| Allowed | Jan. 26, 1871 | T. A. Edson | Motor Governor |
| 114,656 | May 9, 1871   | " "        | Transmitting Instrument |

Allowed\textsuperscript{e}

| Application | Aug. 18, 1871 | " " | Telegraph Instrument |

| Filed | Aug. 18, 1871 | " " | Perforating Machinery |

\textit{July–December 1871}
Signed by said Little and Harrington this 7th day of October, A.D. 1871.
Geo Harrington
George Little
Witnessess J. Treadwell C. L. Vanderwater

D (transcript), NjHum. This document appears as an enclosure to “Opinion of E. N. Stoughton as to rights of Prescott to Duplex Telegraph Impts,” a document related to the Quadruplex Case. *Place and date taken from text; form of date altered. bFollowed by representation of a seal. *Addendum is a D (transcript). *Date taken from text, form altered. *A brace in the manuscript indicates that “Allowed” referred as well to the items immediately above and below this line.

1. A contract of 9 September 1869 between Little and Daniel Craig and the National Telegraph Co. (see Chapter 6 introduction, n. 8) was transferred to the Automatic Telegraph Co. in January 1871 (Doc. 141).
2. Typewriter; see Doc. 155.
3. James Treadwell was a copyist at 115 Broadway. Wilson 1872, 1156.
4. Charles Vanderwater was a student at 115 Broadway. Ibid., 1172.
5. Caveats of 10 October 1871 (DF [TAEM 12:628]; PS [TAEM Supp. III]).

Dear Mr. Edison:

From Daniel Craig

Peeskill, Sept. 26/71

I want you to give me your own suggestions as to an arrangement for the introduction of your machine,1 but as you asked me to tell you what I thought was right, I will do so, to a certain extent—but first, let me tell you what I can do:—

If you will finish three or four machines, I will have good wires put up in the city, & provide three good offices where the machines can be thoroughly tested, and if they work satisfactorily, I can raise in a single day, all the capital necessary to pay for the manufacture of all the machines that can be introduced, and to build all the lines we can find a use for.

I will undertake that you shall have cash and liberal pay for all the machines that can be introduced, in all the cities.

I will also guarantee my undivided and best efforts to work this business up,—will furnish all the capital that can be judiciously used, and give you one half of all the advantages I may obtain in connection with the business—and I firmly believe I can make your interest worth at least $5,000 per year, & probably much more.

All this I can do at once, & without serious trouble.

Of course, I can raise some money beyond what I have

Innumerable Machines in the Mind 356
above stated—but that will be a real trouble, & I hope you will not feel that you ought to put a very heavy load on to me. I have done all in my power to promote your interests during the past year, and expect to continue to do so for many years to come, and our appreciation of your great abilities has certainly not had a tendency to lessen the appreciation or liberality of Lefferts & his company.

Any kindness that you can feel justified in extending to me, will not be wasted. I claim to have more real hard work in me than any other ten men except, only, yourself—and I have all the ambition in the new field that you could possibly desire me to have. Truly &c

D. H. Craig

< Don't forget several samples. >


1. Probably a reference to Edison's proposed domestic telegraph. See Docs. 143 and 203.

New York, Sept. 27/71

Dear Mr. Edison:

I have just learnt of an entirely new movement for a strong opposition to the G.&S. Co.,¹ and I am sure you ought to sell your stock. There is intense hostility to the Co. & all the more since the W.U. Co. swallowed it, and any party of common sense with any decent machine can render the Co. powerless to pay another dividend.

As I have not yet got the promised specimens of your Printing (I want several short messages for interested friends) I suppose you did not get your machine² up, as expected, yesterday.

Give me your views, as promised yesterday, & be merciful

D H Craig

ALS, NjWOE, DF (TAEM 12:464). "P.O. Box 3237." written above and to the left.

¹ Craig is probably referring to the work of Robert Gallaher, who had been involved with the Gold and Stock Telegraph Co. since its beginning and who left that company about this time to develop and introduce his own ticker. Early in 1872 he organized the Gallaher Gold and Stock Telegraph Co. Reid 1879, 67; "The Reporting Telegraphs," T e l e g r. 8 (1871–72): 225.

² Typewriter; possibly the design for which Edison executed a caveat on 10 October 1871 (PS [TAEM Supp. III]).
Dear Mr. Edison:

In thinking over your talk today, I am moved to write you my reflections.

First, let me say, that it seems to me your programme is not calculated to advance the immediate introduction of Automatic Telegraphy—you are proposing to travel over, substantially, the same ground as Lefferts, Little and I travelled over many times between 1868 & 1870. We reached perfect Transmission at any speed up to 1000 words per minute, and also the most perfect recording, both on iron (permanent) and platinum, (fleeting) paper-marks. Our great wants, a year ago, were a rapid perforator and a good copying printer. I take credit to myself for having discovered in you the genius we required, and I hope you will not refuse to let me suggest to you the proper way to utilize your great inventions.

We want, to give the required confidence in our new system, the Edison perforator and printer—nothing more, and we do not need 48 hours to illustrate all we need to illustrate, after we get machines for N.Y. Phila Balto & Washn offices.

I know, of course, that you have many most capital things to bring in to improve our operations, but I am sure we ought not to be delayed a day or an hour, in demonstrating what we can do with the aid of your perforator & printer. There will be plenty of time for you to present & develop your ideas after we prove to our impatient friends that we have got a practical working system.

I know there is the most urgent necessity for immediate operations by the Co., and as the Line is now all right, I hope you will bring over the perforator & printer & spend all the time needful in the office to have them well-worked, and then we can have a full test and prove all we need to prove to assure the complete success of our enterprise. Do, pray, use your influence to have no more time lost. If we stand our fingers no, the great mom[ent?]ll have themselves out to the Govern[ment boots?] & breeches. They are prepared to spend $10,000,000 if necessary, and Orton expects to go in to the Cabinet and will be the Engineer of the impudent fraud. Do, pray urge and aid Harrington to get full tests this week, or at the earliest possible moment.

I cannot use that sample of Printing, as it is full of blunders. Will you not oblige me with several perfect & clean nice samples, soon.
Do not delay telling me what I may do about the Domestic Telegraph scheme. I will do you no harm in trying.

D. H. Craig


1. Craig had claimed 1,000 words per minute for the Little automatic in the 1 January 1871 issue of *Scientific American* (Craig 1871, 4). However, in tests on 11 December 1873 conducted before the postmaster general and members of Congress, the Automatic Telegraph Co. transmitted only 12,000 words in 22½ minutes, or slightly over 500 words per minute. In 1876 at the Philadelphia Centennial Exposition, the Edison automatic telegraph successfully transmitted 1,015 words in 57 seconds, a speed that was considered impressive. Edward Johnson to George Harrington, 28 Jan. 1874, DF (*TAEM* 13:52); William Thomson, “Report on Awards—Edison’s American Automatic Telegraph,” 30 June 1876, PPDR.

2. See Doc. 152, n. 2.

3. It is not known what plans Craig is here referring to.

4. See Doc. 143.

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New York Oct. 6/71

*From Daniel Craig*

Friend Edison:

It is now nearly two weeks since you promised to give me your ultimatum in regard to the Domestic Telegraph invention,¹ and I have not a word from you, yet. I certainly think this is cruel. You say that the G.&S. Co. have no right to the invention and that you can arrange with me through other parties, so that you will not have any trouble with the Co.

Whatever I now do is to inure to the benefit of the Automatic Co. of which you are destined, no doubt, to be a very large stockholder.

I beg you will say something decisive at once—if you are not willing I should carry out the programme which I had supposed was settled between you and me a year ago, you have only to say so; & I shall not annoy you any further. But say yes or no now.

Sholes has very greatly improved his printer, and it now does such work as I inclose² right along, and I have no doubt an expert can average 50 words per minute & change the paper besides.—

I strongly advise that you should not hold the wire a moment beyond what is necessary for you to test your Perforator & Printer. We have absolutely perfect Transmitting & Recording devices, and at the present moment it will make serious

*July–December 1871* 359
trouble with Little, if he sees an effort being made to supplant him in what he justly regards as a discovery of the means of very rapid & correct Telegraphing. We cannot afford to have any wrangling. By and by it will be in order to make improvements in the Little System—but we are now in too much haste for practical work, to afford even one hour for any unnecessary tests. Give us perforations & plain Print. There is glory enough in that for a whole life-time.

The WU. Co. are very anxious to know our secrets—and I suggest the utmost care & prudence to keep every fact of possible value from their legions of spies. They begin to see that we are not the d——d fools they said we all were. Truly &c

D. H. Craig

How about the gas motor?

ALS, NjWOE, DF (TAEM 12:468). *Postscript written at top of first page and separated from rest of text by a line.

1. See Doc. 200, n. 1.
2. Not found.
3. This is the only reference to this device by either Craig or Edison; "gas motor" probably refers to an internal combustion engine, several types of which were available and in use. Encyclopaedia Britannica, 9th ed., s.v. "Steam-Engine: Air and Gas Engines."

Dear General:

Peekskill, Oct. 26, 1871.

It is a good while since I posted you upon the subject of Automatic Telegraphy, and I will now proceed to relate to you what has occasioned our long delay.

In 1869, when you relinquished your interests to myself, Little and others, you will recollect that the Perforating Machine, though performing very accurately and beautifully, could not be worked up to more than 600 to 700 words per hour. Shortly afterwards, we engaged in a long series of mechanical devices to get greater speed, and after nearly two years of hard and expensive work, we have now attained our utmost desires—having three different, and strongly patented Perforating machines, which have been worked at the rate of more than 5000 words per hour. —3,000 words per hour can be done, accurately & regularly. See sample.¹

We have also obtained a Type-Writing Machine, which is worked by Girls at the rate of 2000 to 3000 words per hour. See sample.

Our Transmitting and Recording machines are substan-
entially as they were first produced by Little under your direction in 1868–9, though we have in some respects considerably improved the mechanism. In the matter of speed of transmission, we have gone more than five hundred per cent above even your most sanguine hopes, and we can now Transmit, in longer circuits (we fully believe, in circuits 5 to 8 times greater) than can be worked by the Morse system—and we have actually transmitted over 300 miles of wire 1050 words per minute, with one wire and the services of two girls. You see, therefore, that whilst we used to think 12,000 words per hour over one wire, would be an enormous advantage over Morse, yet, in truth, we can do more than Sixty Thousand words per hour, if necessary, over one wire. See sample of dots & dashes.  

Here, I take it, are the main elements of fast & cheap Telegraphing, and as every part of the labor can be performed by Girls, I am sure you will concede to us such enormous advantages over the Morse system, that competition is entirely out of the question. If you will make an estimate even upon the basis of 2000 words per hour for the Perforators and Copyists (printers) and 30,000 for the single wire transmission, you will find that we can better afford to send 50 word messages from Chicago to New York for 25 cents, than the Morse lines can send 10 words for $1. In reality, we can, counting all things that enter into the business of Telegraphing, beat the Morse system more than 10 to 1. But I have given you the facts and you do not need my estimates or deductions from those facts.

Three years ago, you will recollect that you promised me you would entertain a proposition to assume the management of our new system whenever we got ready to make a vigorous demonstration looking to actual business, on a large scale. That time has now arrived. We have good men, with ample capital. We have a fully tested & complete system, capable of strangling all opposition. I see nothing more to be wished for except one thing—we need a practical man to go forward and properly systematize the introduction of our new system, and I need not tell you that of all the practical gentlemen connected with the Telegraph business of the country, you only come fully up to my ideas of the right man for our leader. I have reason to know that all of my friends and associates will gladly unite with me in a call for your services if you now feel about this matter as you did in 1868–’69. I am aware that your position has greatly changed for the better, during the past three years, and I naturally suppose that in your present comfortable quarters, you would be less likely to entertain
my wishes than you would have done two or three years ago. You, I am sure will take it in no unkind spirit, when I tell you that you are not long to enjoy your present monopoly of Local telegraphing. We have an entirely new system of rapid Telegraphing, by which we can do at least twice as rapid work as you are now doing, and we can do it even more reliably than you can possibly do with your last improved Edison machine. I mention this only that you may see what is coming—and you may be sure that we shall leave no stone unturned to secure and maintain all the advantages we are entitled to. I shall regret to be placed in a position, as manager of the News Department in the Automatic Telegraph Co., to oppose you, but if this should be unavoidable, I trust we shall agree to disagree, and manage our rival interests in a gentlemanly way. Of course, I know I shall beat you out of your boots, as a News Manager, and I hope you will render this disagreeable thing unnecessary by saying to me that you will now entertain an official call to assume the management of our new system.

I judge that my friends will willingly pay you $6,000 the first year, $8,000 the 2d & $10,000 thereafter, and I will give you outright ¼ of my patentee interest, and Little & others will do the same.

Your answer will, of course, be entirely private with me, but let me have it soon, as now is the time to act. Faithfully yours,

D. H. Craig

ALS, NNHi, Lefferts. Underlined twice. Interlined above.

1. George Little, Frank Anderson, and Edison all received patents on perforators in 1871. Since Craig apparently controlled the Anderson patent, he probably refers to it here, although the reference may also be to Little’s 1869 perforator (U.S. Pat. 96,331). A sample perforation found among the Craig correspondence in the Lefferts Papers (NNHi) may be the one referred to here.

2. Not found.
Engraving of the Newark Daily Advertiser Building, where Edison and Unger established the News Reporting Telegraph Co.

world—financial, commercial, domestic and foreign—the moment such news is received in the main Telegraph Office in New York, and several hours in advance of all newspapers.³

The advantage to those who become subscribers we scarcely need enumerate, for hardly any event of consequence can occur in any part of the world reached by the telegraph, but which is instantly transmitted over our wires and printed out on a continuous strip of paper, in Roman Letters, hours before such news is published in the papers, and if the event should be of great consequence minute telegrams will be transmitted during the day and at a late hour at night.

The instruments are novel and very ornamental, are quite noiseless, and require very little attention.⁴

On request we locate these instruments in the Drawing Room, Library, or any part of a dwelling Free of Charge.

For furnishing ink, paper and the news, $3 per week is charged.

Our agent will call and exhibit and explain the instrument in a few days, and take the names of persons who desire the machine.

News Reporting Telegram Co., Daily Advertiser Building, 788 & 790 Broad St., Newark.

PD, NjWOE, Scraps., Cat. 1178 (TAEM 27:140). ³Place taken from text. ⁴This line and next line each followed by a centered horizontal rule.

1. Account records relating to this company cover the period 18 October–30 December 1871. Cat. 1213:100–103, Accts. (TAEM 20:15–16).

July–December 1871
2. Little is known of the company. Both Edison and Unger were involved in its operations, and P. J. Boorum later recalled arranging the company's right of way and working with someone named Thompson to establish its circuits. Both Boorum and an S. C. Thompson appear in the company's account records, as does Mary Stilwell, a sixteen-year-old Newark girl who worked for one month at $6.00 per week. On 25 December 1871 she and Edison were married (see Doc. 218). Boorum to TAE, 29 Aug. 1878, DF (TAEM 15:1088); gas receipt for 788 Broad St., 71-014, DF (TAEM 12:492); Cat. 1213:100-106, Accts. (TAEM 20:15-18).

3. The company appears to have had an arrangement with Gold and Stock, probably for the supply of commercial news. Cat. 1213:100-104, Accts., (TAEM 20:15-17).

4. The instruments used by the company have not been identified.

5. Located just a few doors from the Atlantic and Pacific Telegraph Co.'s Newark office, the building at 788 Broad St. also housed the Daily Advertiser and the Newark office of Western Union. Edison and Unger paid a gas bill for 788 Broad St. during the period September-December 1871. The accounts indicate that the News Reporting Telegraph Co. may have had two rooms in the building, an office and a battery room. Hopkins 1873, Fourth Ward map; Cat. 1213:100-104, Accts. (TAEM 20:15-17).

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Newark, N.J., Nov. 21 1871

$100

Received from Thomas A. Edison the sum of One Hundred Dollars as a payment on House and Lot1 known as No. 535 Wright St.2 Newark N.J. sold him this day3 for the sum of Five Thousand Five Hundred Dollar upon terms as follows: $1500 in Cash and Balance in Bond & Mortgage4

Ross, Cross & Dickinson Agents5

1006


1. This was the first house Edison bought. Only a few years old, it was one of a row of similar houses on a block in a desirable neighborhood near a trolley line. At the time Edison purchased it, he was probably boarding at 854 Broad St. in Newark. About a month later he married Mary Stilwell. He owned the house for three years. Urquhart 1913, 2:673; Hopkins 1873, Fourth Ward map; TAE to Dolly Buscho, 1 Nov. 1930, GF; Cat. 1213:151, Accts. (TAEM 20:19); Holbrook's Newark City Directory 1871, 161.

2. The seller, J. Clinton Walsh, owned the 53 and 55 Wright St. properties. Edison actually purchased number 53, but it became number 97 when it was renumbered in 1873. Walsh retained number 55. Title
3. The deed of conveyance was signed the following day, certified on 25 November, and recorded on 27 November. Deed Records, NJNECo, Z15:410-12.

4. Edison gave Walsh a $1,500 bond dated 22 November. Walsh transferred to Edison a $2,500 mortgage held by the Dime Savings Institution of Newark. Receipt from Ross, Cross & Dickinson, 17 Dec. 1872, 72-001, DF (TAEM 12:677); Cat. 1213:3, Accts. (TAEM 20:6); Cat. 1185:8-9, Accts. (TAEM 22:566); tax and assessment record, 71-001, DF (TAEM 12:229-32).

5. According to their letterhead, Charles Ross, A. L. Cross, and Jonathan Dickinson were "real estate and mercantile negotiators." Their office was at 788 Broad St., Newark—the Daily Advertiser Building—where Edison and Unger established their News Reporting Telegraph Co. (see Doc. 205).

Notebook Entry:
Printing Telegraphy

Improvement in hand Transmitters, and their appliances, whereby The Second or Printing Circuit Cannot be closed by the key until The break wheel & point are on an open circuit = ²

The Sketch will explain itself. This appliance may be used with one wire.³
Another Device to produce the same thing—


1. The preceding entry in this notebook is dated 25 August; the following one is dated 10 December.

2. In using Edison's universal stock printer at this time, it was necessary to open and then close the typewheel circuit to advance the typewheel one letter. (Edison changed this about a year later so that opening or closing the circuit advanced the typewheel.) Both of the arrangements sketched here guaranteed that the typewheel would be positioned correctly for printing.

3. In the diagram at right, A is a breakwheel; B is the relay for the printing circuit (not shown); C is the relay for the typewheel circuit (not shown); D is a key that closes the printing circuit; E is a contact point that closes when breakwheel contact F is between two teeth; GW is a ground wire; and H is a battery. The projecting teeth on A are contacts; the interstices are insulated. On all relays, it is understood that a spring pulls the armature lever away from the magnet. To operate both this device and the one shown in n. 4, an operator turned A to advance the typewheel to the desired letter, stopped A with F between two teeth, and closed D to print.

4. In this diagram, A, B, C, D, F, GW, and H are as described in the diagram in n. 3. J is a back point relay; it opens the printing circuit when current passes through the typewheel circuit (including magnet K) and closes when the typewheel circuit is open. In operation, with the breakwheel contact in between teeth and hence magnet K not charged, a spring would pull
lever J away from the magnet and against the contact point to complete the printing circuit to D.

Notebook Entry:

Printing Telegraphy

[Newark,] Dec 10 1871

Electric Pulsator For Printing and other Telegraphs and adopted on my universal Printing Machine.

The point X is insulated, and to it is connected the main Line B is the break spring also Connected to the Main Line. when the armature lever C. is up against the point X the frame and break wheel D is connected to the main Line. So that when the Engine Shaft revolves the wheel is carried around and at every revolution 2 breaks are made, but if now the armature lever C is drawn down by the magnet the Main Circuit is broken and the Wheel D arrested.

G is a screw insulated and having a disk on top Which disk rubs on another disk on the Governor slide when the Engine has reached a certain speed. The disk G being Connected to the Engine Magnets The current is cut off when the Governor brings the slide N up to the disk of G, or the current may be closed altogether and the magnet used to retard the motion and effect the regulation quickly or the engine Current Can be cut or broken entirely or th.

I do not wish to confine myself to using a disk as in G as the a lever might be used = or any Governor, but I prefer this Governor as it is both electrical & frictional.
Neither do I wish to confine myself to using a magnet whose lever opens the main circuit before it arrests the Break wheel thus [-] ensuring against a failure to arrest Said break wheel and prevent an extra break being made, as the magnet may be dispensed with and the same arrangement used as described in my Application for patent for my Universal Machine and the Main Line break attachment used.

I will mention here that the break wheel is covered with platinum and the Little wheels of the break springs are of Copper—also that I provide a Brush rubbing Continuously on these break wheels to keep the Oxydized matter off and keep wheel clean to insure Correct breaks.

Following is arrangement on the type wheel shaft which rotates in path of the finger keys and is used for arresting type wheel and closing circuit of the arresting Magnet on the Engine, and preventing further breaks being sent.

[Witness:] Jos T Murrey

G shaft D collar insulated F continuous rubbing spring for bringing Current to D, and spring B. R is Collar with 2 arms N.M. has slot X with a stop pin in it connected to shaft to prevent ke sleeve going to far around when arrested by a key. C is a spring on collar R. J is a spiral to return sleeve to original position before arrested by key K is a Center in which shaft G works. The Collar R being connected to other end wire when a key is depressed and the arm say N comes in Contact with end of key while shaft is in motion the sleeve is slightly turned around an to a distance governed by the pin in slot X, bringing the point B & C in Contact and closing the circuit =

AX, NjWOE, Lab., Cat. 1174:7 (TAEM 3:10). *Both drawings carry this date; "Priv Line Printer" written by William Carman at right of first drawing. bSignature.

1. This entry is continued in Doc. 209.
2. Edison first planned a governor of this form as part of a transmitter.
Two sketches of flyball governors from Edison's laboratory scrapbook; the one on the left is dated 15 December 1871.

Two sketches of flyball governors from Edison's laboratory scrapbook; the one on the left is dated 15 December 1871.

Notebook Entry:
Printing Telegraphy

Following is another device.

D is the shaft. X a long Collar of insulating material with 3 Raised Collars on it the middle one having a brass ring on it and a wire leading from said ring to the two arc Connecting July–December 1871

369
springs a a'. C is a spring for carrying Current to Collar and springs a a'. B B' are arms behind these springs to as to ensure the arrestin g of the shaft should the springs and key fail to make a good electrical Connection. F F' are bridges to- Connected to the arms B B' to prevent the spring from coming out too far from the arms when the proper tension is placed on them.

Fig 2 shows how the arms and springs are secured to the rubber flanges.

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**Notebook Entry:**

**Printing Telegraphy**

Escapement for Printing Telegraphs.¹

[Witness:] Jos T Murrey

AX, NjWOE, Lab., Cat. 1174:10 (TAEM 3:12). 'Signature.


Innumerable Machines in the Mind
Edison's design for a transmitter for circuits using his universal stock printer is shown in Doc. 211. When first introduced, the universal stock printer used a hand-cranked breakwheel as a transmitter. In Doc. 211 Edison was working on an adaptation of the electric motor and keyboard from his universal private-line printer. As on that device, the motor drove a pulsator (a small breakwheel). For this transmitter Edison added a gear train connecting the pulsator to a lever that swept under the keys. Depressing a key stopped the lever and, through the gears, the pulsator. Edison made the transmitter practical during the first months of 1872 at Joseph Murray's shop and

Diagram showing a hand-cranked breakwheel, from an instruction manual for Gold and Stock Telegraph Co. employees. The three circular machines at the top are universal stock printers representing three separate subscriber circuits. Below them are the relays connecting the reporting circuits to the local transmitting circuit—$T$ marks the relays for the typewheel lines and $P$ marks the relays for the printing lines. The hand-cranked breakwheel is in the center; to its left is a key that closes the printing circuit. The rows of connected circles at the bottom are the battery cells.
executed a patent application to cover it in June. Others in the telegraph community, including Patrick Kenny and George Scott of the Gold and Stock Telegraph Co., were developing transmitters for printing telegraphs at the same time.

1. Cat. 1218:60 and Cat. 1214:4, 6, Accts. (TAEM 21:212, 566, 567); U.S. Pat. 131,343.

In this diagram Edison’s new transmitter replaces the hand-operated breakwheel. The two wires on the transmitter’s left terminals go to the typewheel and printing relays, the center right wire is the return wire for the transmitter’s motor circuit, and the far right wire is the common power line. The rightmost terminal is not used; what appears to be an unused center terminal is a knob that is pushed in to start the machine.

This transmitter for printing telegraphs, constructed at Edison’s Ward St. shop, embodies Edison’s U.S. Patent 131,343.
Patrick Kenny's printing telegraph transmitter.

George Scott's printing telegraph transmitter, described in U.S. Patent 126,336.
Devices for a two wheel printing Telegraph, figures and fraction wheel and Letter wheel, and preventing one from Printing while the other is. The principle is that the rim of the wheels are divided in 3 segments, and these segments have a space between them clear of about the distance of a space between the Letter these segments are radiated out from the Center to their full size, and then drawn in to a smaller size wheel, by the action of the printing lever. When one of the segments of one wheel is swelled or radiated out to its limit the segments of the other is drawn inward thus increasing the diameter of one and increasing that of the other.

[Newark,] Dec 19 1871

[Witness:] Jos T Murrey

Innumerable Machines in the Mind 374
a b c segments n n n studs on flange wheel with pins from segments sliding in them to guide segments R arms with crooked slots as fig 2 for giving outward or inward motion to segment

Fig 3

Fig 4

Shifting shaft

T Peice Stationary
Ratchet & evything shifts.

[Witness:] Jos T Murrey

AX, N]WOE, Lab., Cat. 1174:11 (TAEM 3:12). Both sets of drawings carry this date; "Stock Quotation Printer" written by William Carman at top of page. Signature. Followed by horizontal line drawn across the page.

Notebook Entry:
Printing Telegraphy

[Newark,] Dec 24 1871

Loose type wheels with an incline slide sleeve so that when shifted one wheel is made rigid while the other is Loose. each wheel is provided with a flange and the Printing Lever has two springs (flat) on each side. So that when Ptg Lever comes up to Print the springs touch both wheels, but one being rigid bows spring down while other being Loose the spring throws it up and keeps it away from paper.

July–December 1871

375
Printing Telegraphy and Gang Saw

[Newark,] Dec 24 1871

Device for printing on two strips on the Universal Stock Printer, the usual type wheel shaft being provided with an extra lever. Type wheel and an independent Printing lever beneath it, and paper driver. So when you wish to stop printing on the main strip you rotate the Type wheel around to the Letter Z where there is a pin. When the printing lever is brought up this pin strikes a slide bar and shoves it underneath the extra ptg lever and locks the two levers together, so
that by working the main ptg lever the other one goes with it & prints characters from the extra wheel but the pad on the extra ptg lever being much higher than on the main lever it does not allow main lever to touch type wheel consequently it does not print. Now when you desire to stop ptg on the extra lever & type W, you turn around to the main dot and strike the Ptg lever and a pin from the shaft of the type wheel Throws the slide back from underneath the extra Ptg lever consequently it ceases to Print.

I do not wish to confine myself to any particular way of doing this, but claim printing upon two strips of paper by Double Ptg Lever and their selection controlled by the position of the type wheel in conjunction with the power derived and the upward or downward motion of either Printing Lever Dec 24 71

I claim in a Printing Telegraph for type wheel bands of Rubber type, not hard rubber but pliable rubber type in bands and streached over a flat disk. 3 Dec 24 71

I claim fitting a band of silk or other fabric closely over the Type wheels of a Printing Teleg and allowing the ink roller to ink this band instead of the type direct, the object of which is to prevent clogging up the type wheel with fuzz from the type wheel = Dec 24 1871

[Witness:] Jos T. Murrey

AX, NJWOB, Lab., Cat. 1181:6 (TAEM 3:177). 3Signature.

1. The following day Edison married Mary Stilwell.
2. Edison may have been alerted to this problem by his father, who was probably in Newark to attend his son's wedding.
3. Universal stock printers were equipped with such typewheels some years later.