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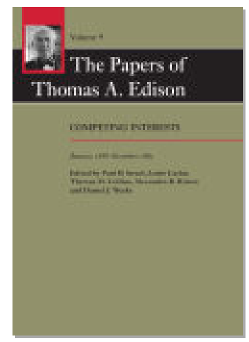

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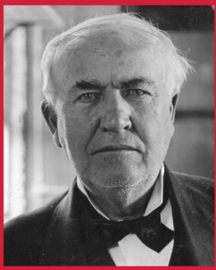

Volume 9

The Papers of Thomas A. Edison

COMPETING INTERESTS

January 1888–December 1889

Edited by Paul B. Israel, Louis Carlat, Theresa M. Collins, Alexandra R. Rimer, and Daniel J. Weeks

THE PAPERS OF THOMAS A. EDISON

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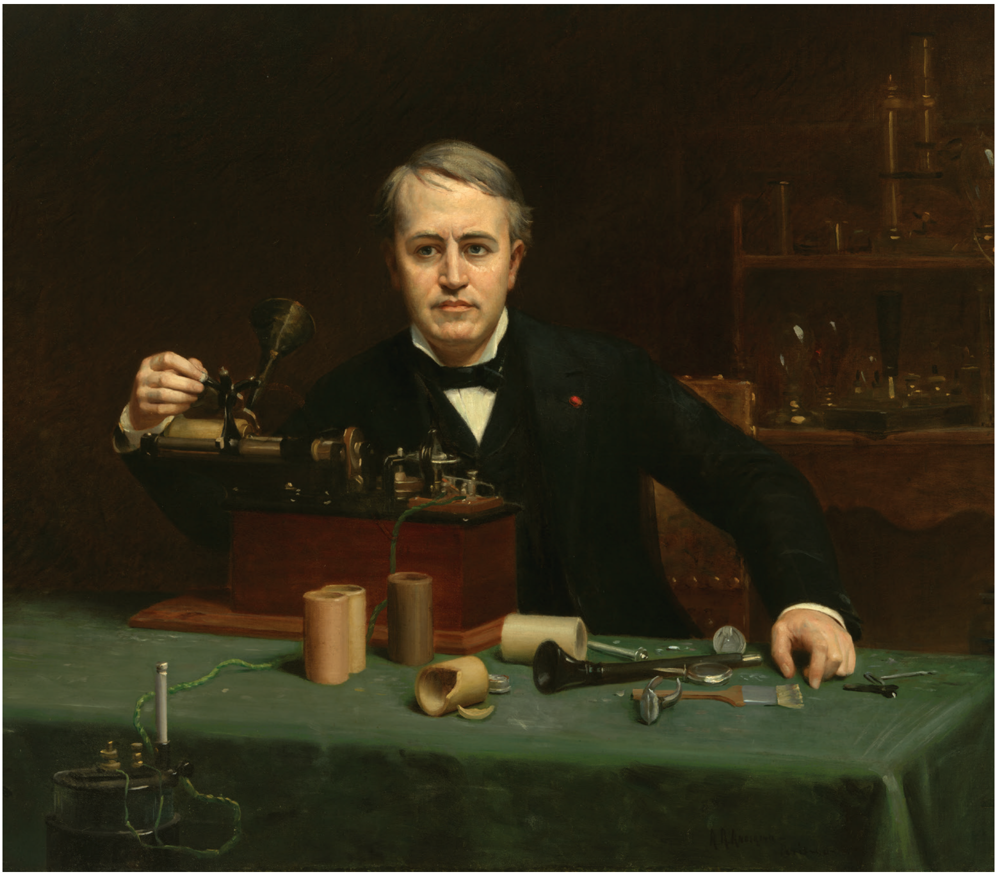

Portrait of Edison made in Paris by American artist Abraham Archibald Anderson, 1889.

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VOLUME EDITORS
Paul B. Israel
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TO THE MEMORY OF
EDMUND MORRIS

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Preface

With command of the unparalleled physical and human resources of his new laboratory in Orange, New Jersey, Edison transformed himself in 1888–1889 from an inventor into a director of research and product development. He was busy guiding and overseeing laboratory projects and only occasionally engaged in detailed day-to-day experimental work himself. These changes altered the nature of the written records created at the laboratory. Edison no longer routinely made his own copious and meticulously dated experimental notes. Instead, his notebooks from this period often contain ideas for research that he allocated among his staff in the form of written or verbal instructions. Those assistants, in turn, typically kept their own notebooks, most of which ultimately were lost after having been taken from the laboratory. The consequent void of historical information is partially filled by the long omnibus patent caveats that Edison aggregated from the work of his assistants. Quite unlike the day-by-day unfolding of research in the detailed laboratory records of past years, these caveats (illustrated with dozens or scores of drawings) offer snapshots of the progress of experimental work at specific instants in time. Illuminated by weekly time sheets detailing the daily work of individual staff members, the caveats provide the most information about the direction and pace of projects under Edison's supervision. The editors have selected a dozen such records for this volume.

Edison's style of management evolved as he developed his role as laboratory director. Experimenter Reginald Fessenden later described Edison's style this way: "he allows those of his assistants who are capable and who have been 'indoctrinated' in his methods a very considerable opportunity of developing their individuality in the working out of problems." During his daily rounds, Edison was "most considerate, and never found fault with the work [of his assistants], merely explaining what should be done to make it right." It was understood that inventions developed by the staff were Edison's, and he was masterful at distilling laboratory research into patent applications or securing them as trade secrets.

From early on, Edison had envisioned the large laboratory as a business venture allied with manufacturing to generate new sources of income. As he explained in letters to potential investors in 1887, the laboratory provided "facilities incomparably superior to any other for rapid & cheap development of an invention, & working it up into Commercial shape with models patterns and special machinery." His plan was to "build up a great Industrial works in the Orange Valley" by establishing a company to build factories and undertake sales of new inventions. In making this plan, Edison drew on his past success in establishing plants for the manufacture of lamps and other electrical equipment. Finding willing investors was difficult though, and at the beginning of 1888, he again approached financier Henry Villard, with whom he had discussed his proposal a few months earlier. Villard now showed greater interest, and Edison prepared for him a list of more than twenty inventions that were not encumbered by existing contracts for electric light and power, ore milling, telegraphs, telephones, and phonographs. Villard ultimately declined to invest in the industrial project, and Edison was forced to look elsewhere to support his laboratory's expenses, which included a weekly payroll of about $1,200. One steady source of income came from the profitable electrical manufacturing shops, which agreed to provide regular stipends to cover experimental work done for them at the laboratory.

Edison also expected revenue from manufacturing his new wax-cylinder phonograph. In late 1887, a small manufacturing operation had been set up by his close friend Ezra Gilliland in nearby Bloomfield, New Jersey, with the idea that it would produce twenty-five machines a day by January. However, the phonograph proved unsuitable for the market well into the spring, when Edison and his laboratory staff began the campaign that would produce what became known as the "perfected phonograph." Changes to the machine were designed to make it quieter and easier to use. At the same time, laboratory assistants (notably Jonas Aylsworth) were experimenting extensively to create new recording materials for improved fidelity and durability. Edison prepared to manufacture the phonograph at a new plant, known as the Edison Phonograph Works, that he began to build next to his laboratory. In keeping with his past successes, he focused on manufacturing the phonograph with the expectation that others would do the work of promoting and distributing it, and he accordingly named Ezra Gilliland as general sales agent. Edison was receptive when Gilliland and Edison's personal attorney John Tomlinson brought him a cash proposal to buy the rights for selling phonographs in the United States and Canada. Jesse Lippincott, who had acquired a large fortune from baking, sought to combine the marketing of the phonograph and the rival graphophone in a single company, and he offered Edison half a million dollars for the rights. Edison agreed, reserving to himself the rights to manufacture the machine and "duplicate records (i.e.) publishing of music, novels, operas etc." Unbeknownst to Edison, Gilliland and Tomlinson had made a separate arrangement with Lippincott for their own benefit; when he discovered this arrangement, Edison was incensed and permanently severed relations with both men.

Edison's phonograph rights in Europe and most of the rest of the world were vested with his long-time London agent, George Gouraud. Edison expected Gouraud to create companies to promote and sell the phonograph, but he grew frustrated by a series of advertising schemes and exhibitions that he feared would "Barnumize" his reputation. Gouraud's failure to create viable companies or generate regular orders from the Edison Phonograph Works eventually led Edison into negotiations with the Seligman banking interests to create a new company that would control the worldwide rights to Edison's phonograph patents beyond the United States and Canada.

Edison's name was still closely associated with the electrical industry, and much of the laboratory's work was directed to improving lamps, meters, and direct-current distribution systems. Edison was responding to the growing competitive challenge from alternating current (AC) systems, especially that of the Westinghouse company. This commercial competition coincided with growing interest in more humane methods of executing criminals and killing unwanted animals, in response to which Edison directed Arthur Kennelly to oversee electrocution experiments on live animals. Kennelly's initial experiments were designed to address inquiries from the Society for the Prevention of Cruelty to Animals, but they later became focused on the efforts of New York State to find an alternative to hanging as a means of execution. The experiments also confirmed Edison's own belief that high-voltage currents, like those used in AC systems, were inherently dangerous. He and the Edison Electric Light Company took advantage of heightened public concern about the safety of urban electrical infrastructure to argue for strict limits on voltage, limits that would neutralize the competitive advantage of high-voltage AC current systems. As part of the effort to compete against Westinghouse and other rival companies, Edison and Henry Villard developed a plan to recapitalize the Edison lighting interests by combining the manufacturing plants with Edison Electric into the new Edison General Electric Company.

Edison's phonograph and electrical system were among the highlights of the 1889 Exposition Universelle, a world's fair in Paris celebrating the centenary of the French Revolution. Edison's exhibit in the Palais des Machines, which would eventually win a grand prize for electrical appliances, encompassed nearly 9,000 square feet, or about one-third of the space allotted to American machinery. He entrusted electrical engineer William Hammer to organize the exhibit at Orange and to install and manage it at the Paris end. The most popular exhibit by far was Edison's phonograph: 20,000 to 30,000 people a day—more than 4 million all told—passed through and listened to musical recordings that had been made at the laboratory and shipped to Paris. Edison himself was as popular as his phonograph. When he and his wife Mina, who reluctantly left their young daughter Madeleine at home, arrived in France, he was besieged by admirers. "Poor Mr. Edison has not had a moment that he could call his own since our arrival," Mina wrote her mother a few days after they reached Paris. He was feted and dined extravagantly and was even made a Grand Officer of the Italian crown. A highlight for Edison was visiting with Gustave Eiffel in his apartment atop the iron tower he had designed for the Exposition. After a month in Paris, Edison and Mina traveled to Germany, where they visited Werner von Siemens and then attended the congress of the Association of German Naturalists and Physicians. From there they journeyed to England, where they were guests at Cray's Foot, the country estate of Sir John Pender in Kent, just a short distance from London. After a brief return to Paris they sailed home, leaving Edison's older daughter Marion in Europe.

Upon his arrival home in early October, Edison was delighted to see the progress made in his absence on motion pictures. Before the trip, Edison had abandoned his original idea for motion picture devices using a cylinder like his phonograph and, with William K. L. Dickson, had started to develop a strip kinetograph and kinetoscope. The devices that Dickson was able to show him in October suggested the promise of the new approach. Motion picture technology was one item among many in a long list of projects that Edison had left instructions about before going to France. Development of a new street car motor was another, and he soon used the motor in an effort to electrify part of the Orange Crosstown and Bloomfield Railway line near the laboratory.

Also on the list of projects were additions to the new factory complex at Silver Lake, a few miles east of Orange. During the summer, the battery plant began producing the new Edison-Lalande battery. Edison had developed this cell for the phonograph and phonoplex telegraph, but it became a widely used primary battery in a variety of applications. By the end of 1889, Jonas Aylsworth transferred the production of phonograph cylinder wax from the Phonograph Works to another building at Silver Lake, although the molding of cylinders remained at the factory in Orange.

Silver Lake represented the start of Edison's effort to create a "great Industrial Works in the Orange Valley." Edison hoped to manufacture and market new inventions created by his laboratory, "but not big cumbersome things like a system of Electric Lighting." One of these new inventions was the iron ore separator he had developed with William K. L. Dickson. Edison's plan to manufacture and sell the separator was frustrated, however, by the complexity of the device and the variability of the ores passing through it. As a consequence, he changed course. Instead of leasing ore separator equipment to any operator willing to pay the royalties, by the end of 1889 he had decided to buy up "practically all the magnetic ore deposits in the Center of the coal & iron district" of Pennsylvania and New Jersey and process the ore himself. The iron ore project became the primary focus of Edison's time and energy in the next decade.

The progress of the Thomas A. Edison Papers depends on the support of many individuals and organizations, financial contributors, academic scholars, Edison specialists, librarians, archivists, curators, and students. Representatives of the four Overseeing Institutions (Rutgers, the National Park Service, the New Jersey Historical Commission, and the Smithsonian Institution) have assisted with this volume and the editors thank them for their continuing concern and attention. The strong support of public and private foundations and of their program officers has sustained the project and helped it remain editorially productive.

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Some of the debts incurred over the lifetime of the Edison Papers project have been thrown into relief during the preparation of this volume. The editors note with sadness the passing of Christopher Kobrak, a scholar whose work informed our own; Greg Marshall, former superintendent of the Thomas Edison National Historical Park; and Nancy Helen Waters, former curator at the Thomas Edison National Historical Park.

Staff members, students, interns, and volunteers not mentioned on the title page but who have contributed to this volume include Thomas E. Jeffrey, Dylan Medici, Lewis Smiler, Randy Sparks, and Rachel M. Weissenburger.

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Chronology of Thomas A. Edison

January 1888–December 1889

1888	
3 January	Drafts long list of laboratory projects.
31 January	Attends opening of New York Electric Club.
January	Discusses formation of a partnership with Henry Villard to include research and manufacturing interests.
	Explores new ventures for financial support of laboratory.
	Directs Jonas Aylsworth to begin a long series of experiments on composition of phonograph cylinders.
c. 4 February	Agrees to scientific and technical lecture series for laboratory employees.
c. 7–13 February	In Chicago for meeting of the Association of Edison Illuminating Companies.
16 February	Attends Press Club dinner in New York City.
c. 27 February	Visited by photographic pioneer Eadweard Muybridge.
January–February	Renews worldwide search for natural fibers to use as incandescent lamp filaments.
	Arranges funding from electrical manufacturing shops for experimental work.
February	Investigates methods of duplicating phonograph recordings.
	Laboratory resumes development of talking doll.
	Begins practice of using caveats to document work of laboratory.
2 April	Elected a resident member of the New York Academy of Sciences.
April	Directs research on chemical treatment of tobacco leaves.
2 May	Advises SPCA on electrocution as a form of euthanasia.
3 May	Incorporates Edison Phonograph Works.
11 May	Opens laboratory and exhibits “improved” phonograph for representatives of the press.

12 May	Exhibits "improved" phonograph at the Electric Club in New York City.
14 May	Postpones dispatch of latest phonograph machine to Great Britain.
	Contracts for construction of new phonograph factory for $32,790.
31 May	Madeleine Edison is born.
Late May–mid-June	Redesigns phonograph again.
c. 13 June	Visited at laboratory by Samuel Clemens.
16 June	Records first transatlantic phonographic message to George Gouraud.
c. 17 June	Dispatches "perfected" phonograph to George Gouraud in London.
21 June	Supervises first animal elecctrocution experiment.
28 June	Agrees to sell his rights to the phonograph in United States and Canada.
June	Considers forming Amusement Phonograph Co. for commercial reproduction and distribution of recordings.
	Publishes "The Perfected Phonograph" in *North American Review.*
14 July	The North American Phonograph Company is organized.
25 July	Agrees with Walter Mallory to form Edison Iron Concentrating Co. for ore milling in Michigan, Wisconsin, and Minnesota.
26 July	Designates John Birkinbine his consulting engineer for mining and ore milling.
July	Adopts metallic "soap" as new recording medium.
	Executes at least nine patent applications on sound recording.
	Animal electrocution experiments continue at laboratory.
	Has laboratory begin production of zinc solution for electric meters for Edison central stations.
	Edison Phonograph Works begins occupying new factory buildings.
1 Aug	Reaches agreement with Jesse Lippincott and the North American Phonograph Company for phonograph marketing.
9–25 August	Suffering "dyspepsia," vacations at Chautauqua with at least part of his family.
28 August	Meets with Henry Villard about consolidating electric lighting enterprises.
11 September	Severs friendship and business ties with Ezra Gilliland and John Tomlinson.
c. 15 September	Begins anti-microbial research related to yellow fever outbreaks.

18 September	Informally retains Sherburne Eaton as personal legal adviser in place of John Tomlinson.
21 September	Drafts omnibus caveat encapsulating summer research at laboratory.
26 September	Sends Osgood Wiley to London to set up demonstration ore separator.
September	Continues trying to adapt phonograph cylinders for mailing. Quarrels with Edward Johnson over the phonograph business and reorganization of the Edison electric light and power interests.
8 October	Executes patent caveat for the kinetograph/kinetoscope, the first of four major caveats for early motion picture machines.
31 October	Places William Hammer in charge of his exhibit at forthcoming Exposition Universelle in Paris.
c. October–November	Begins small-scale production of phonographs at Edison Phonograph Works in West Orange.
November	Quarrels with longtime associate Sigmund Bergmann. Begins entertaining proposals to consolidate Edison electric light and power businesses.
2 December	Holds recording session with Arion Singing Society of Newark.
5 December	Attends animal electrocution demonstrations at laboratory for Medico-Legal Society committee investigating electrocution as a form of capital punishment.
c. 5 December	Visited by American Institute of Mining Engineers as part of their "Edison Day."
6 December	Visited by U.S. Association of Charcoal Iron Workers.
10–11 December	Reaches provisional agreement with Henry Villard for consolidating Edison electric light and power businesses.
c. 22 December	Leaves to spend holiday season with Miller family in Akron, Ohio.
27 December	New Jersey and Pennsylvania Concentrating Works organized in New Jersey.
31 December	Transfers more than two dozen discontinued projects into a "dead experiments" account.
1889	
2 January	Edison General Electric Co. incorporated in New Jersey.
c. 4 January	Returns from Akron vacation.
c. 11 January	Begins work on a new form of kinetograph/kinetoscope with faceted cylinder.
17 January	Published reports of grievances with Ezra Gilliland and John Tomlinson begin to appear.
24 January	Retains Sherburne Eaton as personal attorney.

1 February	Executes ten patent applications for phonograph improvements.
2 February	Declines invitation to meet George Westinghouse in Pittsburgh.
5 February	Begins acquiring mining properties near Bechtelsville, Pa.
8 February	Announces plans to disband laboratory's Chemical Dept.
20 February	Hosts session of the American Institute of Mining Engineers annual meeting.
c. 22 February	Injured in laboratory accident.
February	Begins considering cooperative patent-sharing arrangement with Thomson-Houston Electric Co.
6 March	Dispatches William Hammer to the Exposition Universelle.
c. 9 March	Marion Edison sails for France.
12 April	Shuts down Michigan experimental ore plant.
23 April	Edison General Electric Co. incorporated anew in New York State.
c. 27 April	Sends Albert Dick to Europe to investigate doll markets and manufacture.
11 May	Files suit against Ezra Gilliland and John Tomlinson over phonograph contract.
22 May	Attends Westinghouse patent lawsuit in Pittsburgh.
May	Begins constructing factories in Silver Lake, N.J.
May?	Begins to adopt timed spark discharges for kinetograph/kinetoscope in place of shutter devices.
c. 11–15 June	Inspects iron mining properties around Bechtelsville, Pa.
15 June	Dispatches Adelbert Wangemann to Europe for phonograph exhibitions.
c. 8–14 July	In Bechtelsville, Pa.
23 July	Testifies as electrical expert regarding the death sentence of William Kemmler.
27 July	Visits Schenectady with Samuel Insull and Henry Villard.
July?	Begins using flexible film strips in kinetograph/kinetoscope.
3 August	Embarks for France with Mina and Francis and Margaret Upton.
11 August	Arrives in Paris.
13 August	Received at Eiffel Tower.
16 August	Made a Grand Officer of the Crown of Italy.
19 August	Meets with French president Sadi Carnot.
	Received by the Académie des Science and the Société Française de Photographie.
24 August	Agrees to license Lelande-Chaperon battery for life of the patent.
26 August	Honored by *Le Figaro* of Paris.
27 August	Attends Buffalo Bill's Wild West Show near Paris.

10 September	Honored by Gustave Eiffel at Eiffel Tower.
12 September	Arrives in Berlin.
17–18? September	Attends congress of the Association of German Naturalists and Physicians in Heidelberg.
21 September	Arrives in London.
26 September	Returns to Paris and is named a commander of the French Legion of Honor.
28 September	Departs for New York.
5 October	Decision in McKeesport filament case in favor of Edison.
6 October	Arrives home.
	Sees demonstration of improved film strip kinetoscope.
16 October	Completes new phonograph prototype.
October	Begins to study feasibility of large hydroelectric plant at Niagara Falls.
2 November	Begins drafting omnibus caveat including new strip kinetograph/kinetoscope.
c. 4 November	Dispatches prospector to North Carolina to search for precious and base metals and minerals.
29 November–6 December	Examines mine properties near Dover, N.J.
12–16 December	Travels to western New York and Ontario with Alfred Tate.
Fall	Begins marketing Edison-Lalande battery.
23 December	Testifies before New York City grand jury about electric wire safety.
	Leaves with Mina for Akron, Ohio.
27 December	Receives a report from Sherburne Eaton on proposed agreements for the organization the Edison United Phonograph Co.
31 December	Licenses A. B. Dick and Co. to manufacture mimeograph equipment for export.
December	Purchases large mineral collection for laboratory.
	Begins to electrify portion of Orange street railway line.

Editorial Policy and User's Guide

The editorial policy for the book edition of Thomas Edison's papers remains essentially as stated in Volume 1, with the modifications described in Volumes 2–8. The additions that follow stem from new editorial situations presented by documents in Volume 9. A comprehensive statement of the editorial policy will be published later on the Edison Papers website (http://edison.rutgers.edu).

Selection

The fifteen-volume book edition of Thomas Edison's papers will include nearly 6,500 documents selected from an estimated 5 million pages of extant Edison-related materials. For the period covered in Volume 9 (January 1888–December 1889), the editors have selected 331 documents from approximately 11,400 available Edison-related documents. Most of those available from this period detail Edison's inventive work, commercial ventures, management of the laboratory, and relations with business associates, but some directly concern his family life. While still small, the subset of family or personal documents is notably larger than in the first seven volumes. Edison's courtship and marriage to Mina Miller in 1885–1886 marked a change in the record of his personal life. The Miller family wrote prolifically amongst themselves, and many of their letters shed light on life in the Edison household. In addition, the Edisons' trip to France in August and September 1889 generated a burst of correspondence as well, some of it from their traveling companions. The three Edison children old enough to write also found the desire (and sometimes the necessity) to correspond.

The editors have sought to select documents that illuminate the full range of Edison's thought, activities, and life events in this period. Those published here are primarily by or to Edison, his surrogates Alfred Tate and Samuel Insull, or others working in concert with him or on his behalf. Some third-party correspondence has been selected to highlight key events or to illustrate the context in which Edison worked. He evidently continued to read most, if not all, of the voluminous correspondence addressed to him, and his marginal notes on incoming letters frequently served as guides for the official responses prepared by secretary Alfred Tate. Where feasible, the editors have given priority to such incoming letters with Edison's comments.

Note on Digital Sources

The number and breadth of historical sources available electronically have continued to increase dramatically during the preparation of this volume. The editors have done their best to present state-of-the-art research as of the completion of this manuscript in late 2018, but the task of incorporating new information and references is potentially without end. Again for this volume, the editors have made abundant use of proprietary collections of digitized newspapers, principally ProQuest databases, Newspapers.com, and NewspaperArchive.com. They have also relied on Ancestry.com to view census records and other genealogical and biographical information, and this service is acknowledged within specific bibliographic records at the end of this volume. The utility of FindAGrave.com for birth and death dates is apparent in citations in numerous endnotes. Many of the contemporary sources and journal articles listed in the bibliography have been obtained electronically through proprietary services like JSTOR and the HathiTrust Digital Library (hathitrust.org), as well as Google Books and similar free online collections.

Transcription

The editors have again followed the transcription policies set out in preceding volumes, but several changes adopted with Volume 7 merit special emphasis. One is the standardization, to a modest degree, of Edison's idiosyncratic punctuation to make it reducible to type and intelligible to modern readers.

Expressions of time are also transcribed in a standard form. A third practice previously adopted is especially relevant now. The proliferation of typed documents in this volume (roughly thirty percent of the whole) brings a corresponding increase in the number of typing errors, and the editors have again silently corrected obvious mechanical mistakes or slips of the finger.

Edison's draft caveats present a particular problem. He sometimes made marks and corrections while reviewing his drafts, and his attorneys made their own marks and emendations while preparing clean copies for the Patent Office. The editors have sought to differentiate between the two, transcribing Edison's alterations as marginalia and omitting those by his attorneys. More generally in caveat and patent application drafts, notebook entries, and other technical materials, Edison frequently did not refer in his text to all the letters with which he labeled accompanying drawings. As in recent volumes, the editors have generally transcribed into the endnotes only those labels specifically referenced by Edison or that are otherwise essential for understanding a drawing.

Abbreviations used repeatedly in document text are listed in a special section below, following the list of editorial abbreviations used to describe documents.

Annotation

In the endnotes following each document, citations are generally given in the order in which the material is discussed (as in previous volumes). However, when there are several pieces of correspondence from the same person or a run of notebook entries, these are often listed together rather than in the order they are discussed in order to simplify the reference.

Updated Biographical Information

The proliferation of digitized primary sources continues to afford relatively easy access to a wealth of new biographical information. For this reason, the editors again provide updated or expanded biographical entries for a number of individuals identified in previous volumes.

References to the Digital Edition

The Edison Papers launched an updated online image edition as this volume went to press. The new edition can be reached at the project's website (edison.rutgers.edu) through the "Digital Edition" tab. It offers more powerful and flexible search options than its predecessor, as well as more convenient tools for navigating and viewing document images. The editors are planning further enhancements for the near and long-term future. The availability of the Edison Papers digital edition has led to the redefinition of the microfilm edition as a medium for archival preservation rather than research. The book edition accordingly no longer gives document-level citations to the microfilm. The Edison Papers website continues to offer a number of unique resources, including lists and pdf files of all of Edison's U.S. patents arranged by execution date, issue date, and subject; chronologies; bibliographies; and curriculum materials.

The editors intend that this highly selective volume should serve as a guide or an entrée to the more comprehensive online image edition. Annotations in the volume include citations to a large number of relevant documents available in the digital edition. These citations are indicated by the acronym *TAED* followed by an alpha-numeric identifier unique to each document (e.g., *TAED* D8818AAJ). When users open the digital edition (by following the "Digital Edition" tab at edison.rutgers.edu), they will see a prominent search box. Entering the document identifier into the box will produce a preview image and title for that document. Clicking on either the preview or title will yield images for each page of the document, which the user may scroll through or enlarge. Complete metadata (such as author, date, and repository) also appears, as does information about citing or linking to the item. The alphanumeric identifiers are useful shortcuts for retrieving specific documents, but readers likely will want to explore options for searching more broadly such as, for example, by personal or organization names, date, and subject headings, or to browse within folders or collections. Results can be sorted by date or identifier. Citations to specific portions of large bound records (such as notebooks, account books, and court testimony) may also include an image number to help direct the reader to specific pages.

Headnotes and Endnotes

Chapter introductions and headnotes serve to orient the reader in various ways. Each chapter begins with a brief introduction outlining Edison's technical, business, and personal activities in that period. Within chapters, occasional headnotes appear before particular documents (see List of Editorial Headnotes) for several purposes. An artifact without companion text of its own is always preceded by a headnote (e.g., "The 'Perfected' Wax-Cylinder Phonograph"). Headnotes may be used to provide a coherent narrative of selected events too intricate to follow only in scattered documents and endnotes (e.g., "Sale of Edison's U.S. Phonograph Rights"). They may also give an overview of important places or relationships ("The Laboratory at Orange"). In addition, headnotes present original research on major events in Edison's life that are under-represented in his personal papers (e.g., "Edison's European Trip").

Many of the endnotes attached to documents are highly specific, but some more discursive ones contain information of interest to the general reader. Some of these discussions are broadly contextual. Others, focused on biography, suggest the tight and overlapping character of the business, technical, and social circles of which Edison was part. Endnotes may include business or technical details likely to be of more concern to the specialized reader, and the editors provide more detailed information for technical issues that have received little scholarly attention than for topics that are already well treated in the secondary literature.

Citations

The citation practices used in previous volumes are carried forward to this one.

Appendixes

As in Volumes 1–8, we include relevant selections from the autobiographical notes that Edison prepared in 1908 and 1909 for Frank Dyer and Thomas Martin's biography of Edison (see App. 1). Two draft lists of inventions that Edison hoped to develop at the laboratory, prepared in connection with his efforts to attract financial backing from Henry Villard, are given in Appendix 2. Appendix 3 lists laboratory projects categorized as "Dead Experiments" at the end of 1888. Appendix 4 identifies the main members of Edison's laboratory experimental staff, with their dates of service and principal projects. Appendix 5 identifies Edison's U.S. patent applications (successful and not) according to the case number assigned by his patent attorneys. A comprehensive list of Edison's U.S. patents is also available on the Edison Papers website (edison.rutgers.edu/patents.htm). Unlike the years covered by recent volumes, there was not enough patent activity by others closely associated with Edison in 1888–1889 to justify a separate list.

Errata

Errata for previous volumes can be found on the Edison Papers website at edison.rutgers.edu/berrata.htm.

Editorial Symbols

~~Newark~~ Overstruck letters
Legible manuscript cancellations; crossed-out or overwritten letters are placed before corrections

[Newark] Text in brackets
Material supplied by editors

[Newark?] Text with a question mark in brackets
Conjecture

[Newark?][a] Text with a question mark in brackets followed by a superscript letter to reference a textnote
Conjecture of illegible text

<Newark> Text in angle brackets
Marginalia; in Edison's hand unless otherwise noted

[ ] Empty brackets
Text missing from damaged manuscript

[---] One or more hyphens in brackets
Conjecture of number of characters in illegible material

Superscript numbers in editors' headnotes and in the documents refer to endnotes, which are grouped at the end of each headnote and after the textnote of each document.

Superscript lowercase letters in the documents refer to textnotes, which appear collectively at the end of each document.

List of Abbreviations

ABBREVIATIONS USED TO DESCRIBE DOCUMENTS

The following abbreviations describe the basic nature of the documents included in the ninth volume of *The Papers of Thomas A. Edison*:

AD	Autograph Document
ADf	Autograph Draft
ADfS	Autograph Draft Signed
ADS	Autograph Document Signed
AL	Autograph Letter
ALS	Autograph Letter Signed
D	Document
Df	Draft
DS	Document Signed
L	Letter
LS	Letter Signed
M	Model
PD	Printed Document
PL	Printed Letter
TD	Typed Document
TL	Typed Letter
TLS	Typed Letter Signed
X	Experimental Note

In these descriptions the following meanings are assumed:

Document Accounts, agreements and contracts, bills and receipts, legal documents, memoranda, patent applications, and published material, but excluding letters, models, and experimental notes

Draft A preliminary or unfinished version of a document or letter

Experimental Note Technical notes or drawings not included in letters, legal documents, and the like

Letter Correspondence, including telegrams

Model An artifact, whether a patent model, production model, structure, or other

The symbols may be followed in parentheses by one of these descriptive terms:

abstract A condensation of a document

carbon copy A mechanical copy of a document made by the author or stenographer using an intervening carbonized sheet at the time of the creation of the document

copy A version of a document made by the author or other associated party at the time of the creation of the document

fragment Incomplete document, the missing part of which has not been found by the editors

historic drawing A drawing of an artifact no longer extant or no longer in its original form

letterpress copy A transfer copy made by pressing the original under a sheet of damp tissue paper

photographic transcript A transcript of a document made photographically

telegram A telegraph message; one encrypted for transmission and decoded upon receipt is identified as "decoded telegram"

transcribed phonogram A transcript of a phonograph recording

transcript A version of a document made at a substantially later date than that of the original, by someone not directly associated with the creation of the document

EDISON'S STANDARD ABBREVIATIONS IN DOCUMENTS

The following is a list of abbreviations that Edison used repeatedly, especially in technical notes and notebook entries. The editors have followed (to the extent possible) his inconsistent practices of punctuating and capitalizing these abbreviations. He sometimes used periods or occasionally hyphens or dashes between letters but he frequently did not include any punctuation. Edison typically used either all capital or all lowercase letters in these situations, but he occasionally capitalized just the first letter.

ckt	circuit
CP	candlepower
D. M. & Co.	Drexel, Morgan & Co.
E.H.J.	Edward Hibberd Johnson
EL	electric light[ing]
EMF	electromotive force
fil	filament
HP	horsepower
N.G.	no good
rcvr (or recvr)	receiver
res	resistance

STANDARD REFERENCES AND JOURNALS

Standard References

AACR	*Appletons' Annual Cyclopaedia and Register of Important Events*
ACAB	*Appleton's Cyclopaedia of American Biography*
ADB	*Allgemeine Deutsche Biographie* (online ed.; www.deutsche-biographie.de)
ANB	*American National Biography*
Appletons' Cyclopaedia	*Appletons' Cyclopaedia of Applied Mechanics: A Dictionary of Mechanical Engineering and the Mechanical Arts*
BDHT	*Biographical Dictionary of the History of Technology*
BDI	*Biographical Dictionary of Iowa*
BDU	*Biographical Dictionary of the Union: Northern Leaders of the Civil War*
BDUSC	*Biographical Dictionary of the United States Congress* (online ed.; bioguide.congress.gov/biosearch/biosearch.asp)
Brit. Acad.	*Britannica Academic* (https://academic.eb.com)
CDSB	*Complete Dictionary of Scientific Biography* (online ed.)

Chambers's Ency.	*Chambers's Encyclopædia: A Dictionary of Universal Knowledge for the People*
CGW	*Columbia Gazetteer of the World*
DAB	*Dictionary of American Biography*
DBE	*Deutsche Biographische Enzyklopädie*
DCB	*Dictionary of Canadian Biography* (www.biographi.ca/en/index.php)
DNB	*Dictionary of National Biography*
DNB (Supp.)	*Dictionary of National Biography (Supplement)*
DNC	*Dictionnaire National Contemporains*
DSB	*Dictionary of Scientific Biography*
DSUE	*Dictionary of Slang and Unconventional English*
Ency. Am. Journ.	*Encyclopedia of American Journalism*
Ency. Brit. 9	*Encyclopaedia Britannica* (9th ed.)
Ency. Brit. 14	*Encyclopaedia Britannica* (14th ed.)
Ency. Brit. online	*Encyclopaedia Britannica* (online ed.; www.britannica.com)
Ency. Brit. Supp.	*Supplement to Encyclopaedia Britannica* (9th ed.)
Ency. Chgo.	*Encyclopedia of Chicago* (online ed.; www.encyclopedia.chicagohistory.org)
Ency. NCP	*Encyclopedia of Nineteenth-Century Photography*
ERS	*Encyclopedia of Recorded Sound* [2004]
ERSUS	*Encyclopedia of Recorded Sound in the United States* [1993]
EWB	*Encyclopedia of World Biography*
Globe Ency.	*Globe Encyclopaedia of Universal Information*
GMO	*Grove Music Online*
Intell. Prop. New Tech. Age	*Intellectual Property in the New Technological Age* (2nd ed.).
Jewish Ency.	*Jewish Encyclopedia*
JUC	*Johnson's (Revised) Universal Cyclopaedia: A Scientific and Popular Treasury of Useful Knowledge (1889–1890)*
KAMD	*Knight's American Mechanical Dictionary*
KNMD	*Knight's New Mechanical Dictionary*
London Ency.	*London Encyclopaedia* (3rd ed., 2008)
MEABD	*Mechanical Engineers in America Born Prior to 1861: A Biographical Dictionary*

NAW	*Notable American Women, 1607–1950: A Biographical Dictionary*
NDB	*Neue Deutsche Biographie*
NPDS	*New Partridge Dictionary of Slang and Unconventional English*
OAO	*Oxford Art Online*
OCJ	*The Oxford Companion to Jazz*
OCTP	*Oxford Companion to Theatre and Performance*
ODNR	*Oxford Dictionary of Nursery Rhymes* (1997 ed.)
ODP	*Oxford Dictionary of Proverbs* (2015 ed.)
OED	*Oxford English Dictionary*
Oxford DNB	*Oxford Dictionary of National Biography*
REMT	*The Routledge Encyclopedia of Mark Twain*
TAEB	*The Papers of Thomas A. Edison* (book edition)
TAED	*The Papers of Thomas A. Edison* (digital edition, http://edision.rutgers.edu)
TAEM-G#	*A Guide to Thomas A. Edison Papers: A Selective Microfilm Edition, Part #*
WGD	*Webster's Geographical Dictionary*
WWW-1	*Who Was Who in America, Vol. 1*

Journals

Elec. and Elec. Eng.	*Electrician and Electrical Engineer*
NYT	*New York Times*
Sci. Am.	*Scientific American*
Sci. Am. Supp.	*Scientific American Supplement*
Teleg. J. and Elec. Rev.	*Telegraphic Journal and Electrical Review*

ARCHIVES AND REPOSITORIES

In general, repositories are identified according to the Library of Congress MARC code list for organizations (loc.gov/marc/organizations). Parenthetical letters added to Library of Congress abbreviations were supplied by the editors. Abbreviations contained entirely within parentheses were created by the editors and appear without parentheses in citations.

BIF	Bibliothèque de l'Institute de France, Paris
CEF	Charles Edison Fund Collection, Newark, N.J.
CU-BANC	Bancroft Library, University of California at Berkeley
DLC-MSS	Manuscript Division, Library of Congress, Washington, D.C.
DSI-AC	Archives Center, National Museum of American History, Smithsonian Institution, Washington, D.C.
(FFmEFW)	Edison & Ford Winter Estates, Fort Myers, Fla.
(ISSS)	Illinois Office of the Secretary of State, Springfield
MdCpNA	National Archives and Records Administration, College Park, Md.
MH-BA	Baker Library, Harvard Business School, Cambridge, Mass.
MiDbEI	Benson Ford Research Center Library and Archives, Henry Ford Museum & Greenfield Village, Dearborn, Mich.
Nc-Ar	North Carolina Division of Archives and History, Raleigh
N(ChaCI)	Oliver Archives Center, Chautauqua Institution, Chautauqua, N.Y.
NjHi	New Jersey Historical Society, Newark
NjWOE	Thomas Edison National Historical Park, West Orange, N.J.
NjWOE (Glenmont)	Thomas Edison National Historical Park, Glenmont Estate, West Orange, N.J.
(NMPC)	Niagara Mohawk Power Corp., Syracuse, N.Y.
NN	Manuscripts and Archives Division, New York Public Library.
NN-Sc	New York Public Library, Schomburg Center for Research in Black Culture
NNNCC-Ar	Division of Old Records, New York County Clerk, New York City Archives, New York
PHi	Historical Society of Pennsylvania, Philadelphia

PU-Ar	University of Pennsylvania Archives, Philadelphia
(SHI)	Siemens Historical Institute, Berlin

MANUSCRIPT COLLECTIONS AND COURT CASES

Accts.	Accounts, NjWOE
Batchelor	Charles Batchelor Collection, Special Collections Series, NjWOE
Clippings	Unbound Clippings Series, NjWOE
CR	Company Records, NjWOE
DF	Document File, NjWOE
EBC	Edison Biographical Collection, NjWOE
EFP	Edison Family Papers, CEF
EMC	Eadweard Muybridge Collection, PU-Ar
EMFP	Edison-Miller Family Papers, FFmEFW
EP&RI	Edison Papers & Related Items, MiDbEI
Fessenden	Reginald A. Fessenden Papers, Nc-Ar
FR	Family Records Series, NjWOE
FRU Scraps.	Francis Robbins Upton Scrapbooks, NjHi.
Heitz	David Heitz, New Hope, Pa.
Kellow	Richard W. Kellow File, Legal Series, NjWOE
Lab.	Laboratory notebooks and scrapbooks, NjWOE
Lit.	Litigation Series, NjWOE
Lbk.	Letterbooks, NjWOE
LHL	Lewis Howard Latimer Collection, NN-Sc
LM	Miscellaneous Letterbooks, NjWOE
Mallory	Walter Mallory Papers, Special Collections Series, NjWOE
Meadowcroft	William H. Meadowcroft Collection, Special Collections Series, NjWOE
MFP	Miller Family Papers, CEF
MFP-N	Miller Family Papers, N(ChaCI)
Miller	Harry F. Miller File, Legal Series, NjWOE
Miller, M.D.	Stuart H. Miller, M.D., Landing, N.J.
Misc. Legal	Miscellaneous Legal File, Legal Series, NjWOE

MMC	Miscellaneous Manuscripts Collection (Edison Folder), DLC-MSS
MME-CD	Mina Miller Edison Correspondence and Documents, Edison-Miller Family Papers, Sloane
MTP	Mark Twain Papers, CU-BANC
NJPCW LM-202	New Jersey & Pennsylvania Concentrating Works, Letterbook 202, CR, NjWOE
Pat. App.	Patent Application Files, RG-241, MdCpNA
PM	Miscellaneous Published Documents
PPC	Primary Printed Collection, CR, NjWOE
PS	Patent Series, NjWOE
Pub. Works	Published Works and Other Writings, NjWOE
Scraps.	Scrapbook Series, NjWOE
Sloane	David E. E. Sloane, New Haven, Conn.
Sprague	Frank J. Sprague Papers, NN
Teeple	Charles Teeple, Jeffersonville, Ind.
Time Sheets	Laboratory Time Sheets, Employee Records, WOL
UCCL	Union Catalogue of Clemens Letters, NN
UHP	Uriah Hunt Painter Papers (Unbound Documents), PHi
Upton	Francis Robbins Upton Collection, Special Collections Series, NjWOE
Vail	Vail Papers, Special Collections Series, NjWOE
Villard	Henry Villard Papers, MH-BA
Vouchers	Vouchers and Attached Correspondence Series, NjWOE
Vouchers (Household)	Mrs. Thomas A. Edison Vouchers [series 6], NjWOE
Vouchers—Lab.	Laboratory Vouchers [series 1], NjWOE
WJH	William J. Hammer Collection, DSI-AC
WOL	West Orange Laboratory Records, NjWOE

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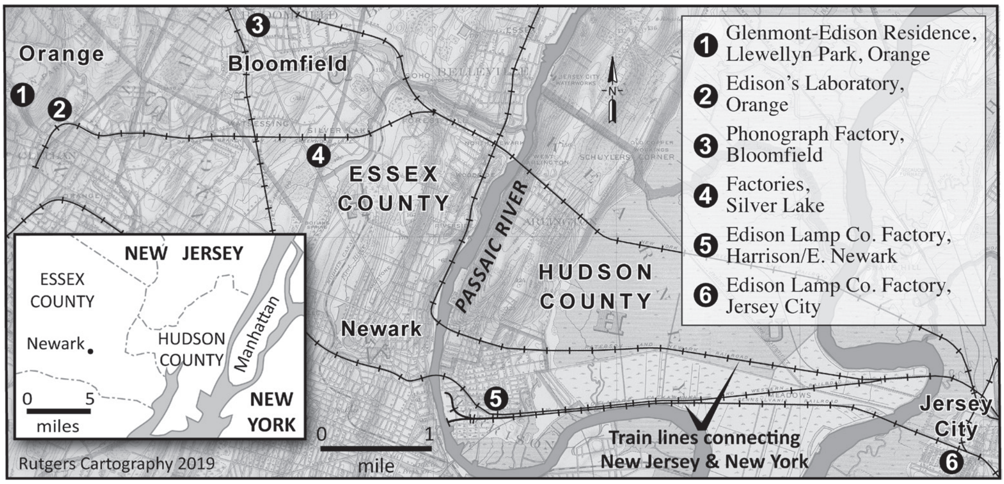
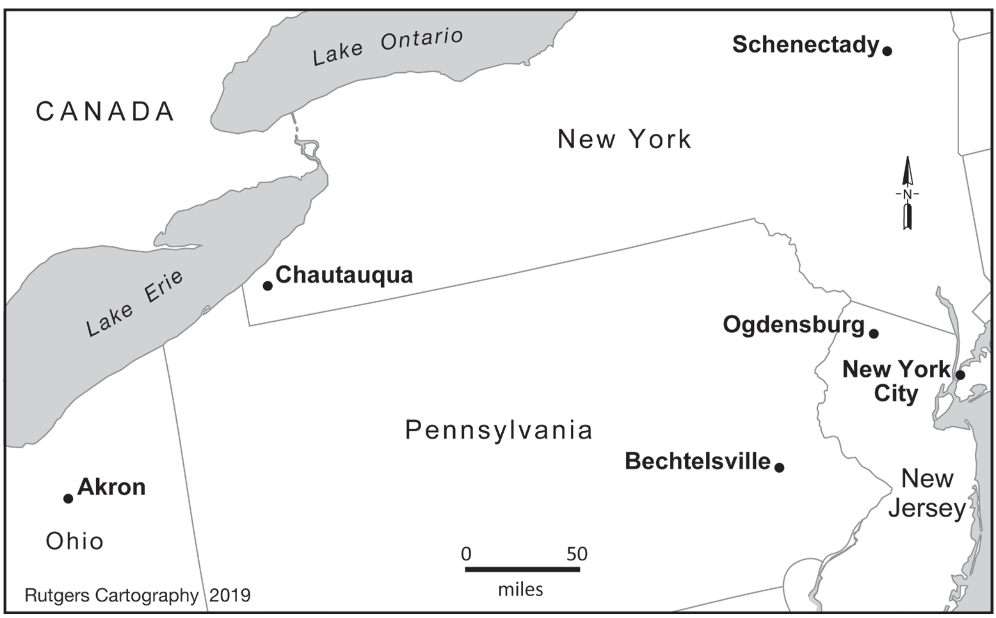
COMPETING INTERESTS
JANUARY 1888–DECEMBER 1889



Edison in metropolitan New Jersey, 1888–1889.



Edison's travels in the wider region.

–1– January–March 1888

Edison returned to work with a flourish on 3 January. In five closely written notebook pages, he itemized about a hundred "Things doing and to be done," setting an agenda for the new year and the new laboratory.[1] Many projects were extensions of past research or inventions, and they generally fell into a few categories. Those included phonographs (both the machine itself as well as materials for recording on and processes for duplicating recordings); metallic ore separation and refining; incandescent lamps and filaments;[2] electric power generation (including responses to alternating current transmission); artificial materials; telephone receivers and transmitters; and batteries. Other ideas are harder to categorize, such as new photographic techniques and machines for picking cotton or clearing city streets of ice and snow.[3]

Edison hoped the laboratory would create opportunities for manufacturing, without which the lab's expenses stretched his financial resources. Edison proposed a partnership with financier Henry Villard, a receptive figure whom he had similarly courted in 1887, to create and develop a string of marketable new products.[4] Edison enjoyed a considerable income from royalties, investments, and manufacturing profits.[5] But his expenses, including a laboratory payroll of about $1,200 weekly, created some anxiety for secretary Alfred Tate, who dealt with bills and creditors.[6] When his hopes for Villard did not materialize, Edison looked to the profitable electric light manufacturing shops for regular stipends to cover the experimental work done for them at the laboratory.[7] He expected additional income from the manufacture of phonographs, even as his legal claim to make and sell the machine remained the subject of divisive controversy with a faction of the original phonograph investors.[8] Rights or no, Edison's friend and business partner Ezra Gilliland took increasing responsibility for the prospective manufacturing business.[9]

The success of the three electrical manufacturing shops (Edison Machine Works, Edison Lamp Company, and Bergmann & Company) confirmed that incandescent electric lighting was a sought-after new appliance. One market to which Edison paid particular attention was East Asia. He defended his agents' plan for promoting the Edison lighting system there as a whole against efforts by Edison manufacturing companies to circumvent them (and their commissions) with direct but piecemeal sales at discount.[10]

As an inventor, Edison made his living by selling or leasing patent rights to investors or end users. But hard experience and long hours of legal testimony had made him, as he reportedly told a New York newspaper, "so thoroughly convinced of the uselessness of patents, that one of my objects in building my present laboratory is to search for trade secrets that require no patents, and may be sources of profit until some one else discovers them."[11] Some such secrets apparently were used at a "New Carbon Factory" that Edison's longtime assistant Charles Batchelor helped set up in January on the border between Orange and Bloomfield. Its unstated purpose likely was to sequester new manufacturing processes for carbon filaments away from the main lamp factory.[12] Edison's skepticism aside, his name continued to show up at the U.S. Patent Office, where his attorneys filed at least eighteen applications in the first three months of the year. Of these, ten or more had to do with sound recording, including one for a process of duplicating recordings such as might be done on a commercial scale.[13] There were also two pertaining to waxes as recording materials, the goal being to create a compound neither too hard nor too soft in a wide temperature range so as to capture sonic details without causing scraping sounds.[14] Edison's favorable disposition towards carnauba wax, obtained from a tropical palm, as a hardener for beeswax came from a long series of experiments begun by laboratory chemist Jonas Aylsworth on New Year's Day that eventually stretched through the summer. Though Edison sought to patent the use of carnauba, he almost certainly wished to keep to himself the exact mixture of it and other ingredients.

Unlike the freewheeling sharing of notebooks among Edison and his assistants at the earlier Menlo Park laboratory, Aylsworth and other principal experimenters often kept their own books at Orange. Others doing so in early 1888 included Charles Batchelor, William K. L. Dickson, Osgood Wiley, James Gladstone, Arthur Payne, Erwin von Wilmowsky, and Arthur Kennelly. (Reginald Fessenden, who came to Orange in January and became a prominent figure there, used this practice later.)[15] Edison's own record-keeping changed in a significant—and unexplained—way as well. Formerly meticulous about writing dates on notebook entries (usually with at least one witness signature), he now did so only erratically. His many entries in a personal pocket notebook from this period are mostly undated but cover a range of subjects that show up in his patents or the laboratory's work. This notebook also provides evidence for how materials research at the laboratory overlapped in a variety of projects. Edison began the book with notes on compounds to try as insulating materials but soon suggested using some of them for lamp filaments. In another entry he suggested that lead chloride, if it could "by manipulation be got into a soft shape.... would be the finest insulation," and by mid-April Jonas Aylsworth was experimenting with lead chloride "with a view to its use as a phonograph recording medium an insulator and other uses provided it has the qualities expected."[16]

As befitted Edison's status and reputation, anyone seeking to confer with him (even at his request) typically came to Orange rather than he to them. Still, he did go to New York on occasion, as when he joined other luminaries for the formal opening of New York's Electric Club on the last day of January.[17] In the second week of February, he spent three or four days in Chicago for a meeting of the Edison Illuminating Companies.[18] Invited to a Press Club dinner at New York's famed Delmonico's restaurant soon after his return, he instead gave the ticket to his journalist friend George Parsons Lathrop.[19] Eadweard Muybridge, a pioneer of instantaneous photography, gave a public exhibition of his zoopraxiscope in Orange on 25 February; two days later, he reportedly visited Edison at the laboratory and suggested using the phonograph in concert with magic lantern projections of moving-image photographs.[20] Three weeks later, there was very little travel of any kind as a blizzard ("The Worst Storm the City Has Ever Known") crippled the region with "a tornado of wind and snow"; roads and rails were blocked for days.[21] According to laboratory time sheets, about a third of Edison's men missed at least one day of work, one man's absence being recorded laconically as "Bad weather (non attendance)."[22] Reginald

Fessenden recalled years later the wonders of Edison's store room which, while he and Jonas Aylsworth were "marooned in the laboratory," enabled them to subsist comfortably on "buckwheat cakes, maple syrup, stews of dried beef and pemmican, macaroni with olive oil, dried fruits, zwieback, coffee which we roasted and flavored with vanilla beans, and condensed milk."[23]

1. See Doc. 3129; also cf. Doc. 3144.

2. Edison continued to search for better filament materials, both natural and artificial. To that end, in February he dispatched James Ricalton, a local teacher and aspiring traveler, to examine and collect plant fibers in South Asia. (More than a dozen of Ricalton's photographs of places and people from his travels were later reproduced in Dickson and Dickson 1894a, chap. 14.) Ricalton's expedition was one of several similar ones underway at this time. Alfred Tate to Francis Upton, 20 Feb. 1888, DF (*TAED* D8818AEL); "Searching for A Substance," *St. Louis Globe-Democrat,* 10 Feb. 1888, Clippings (*TAED* SC88004A); "J. Ricalton Dies; World Traveller," *NYT,* 29 Oct. 1929, 39; see Doc. 3230.

3. Edison or his staff assigned a unique number to each experimental project. A list of projects and their numbers can be found in N-87-11-24, Lab. (*TAED* NL002).

4. See Doc. 3144.

5. Income included at least $3,000 monthly from royalties and investment interest and perhaps another $2,000 or so from stock dividends of the Edison Lamp Co. and Bergmann & Co. Ledger #5:101, 463, 447, 475, 695, WOL (*TAED* NL011); shop dividends estimated from Cat. 1318:32, 143, Batchelor (*TAED* MBA001).

6. Samuel Insull, Tate's predecessor as secretary and Edison's de facto business manager, continued to help ensure the liquidity of Edison's operations from his new position at the Edison Machine Works in Schenectady, N.Y. Laboratory Ledger #5; see, e.g., pp. 44, 447, 463, 476, 510, 516, WOL-Accts. (*TAED* NL011A1); see Docs. 3129 (headnote, esp. n. 13) and 3153.

7. See Doc. 3145.

8. See Doc. 3149.

9. See Docs. 3153 and 3165.

10. See Docs. 3131 and 3137.

11. "The Phonograph Patents," *New York Evening Post,* 5 Jan. 1888, reprinted in "Mr. Edison on the Patent Law," *Electrical Engineer* 7 (Feb. 1888): 65.

12. The location and dimensions given by Batchelor match those of a building marked "ink factory" on a period map. Called the "ink factory" in Edison's correspondence and labor records, it was an adjunct to the Edison Lamp Works. In 1890, Edison created a secret factory nearby in Jersey City for a proprietary process of applying asphalt coatings to filaments before the final carbonizing heat. The relationship between the two plants is unclear. Cf. Doc. 3238; Robinson 1890, plate 20; Cat. 1337:40, 125 (items 536, 656; 28 Jan. 1888, 1 Mar. 1890), Batchelor (*TAED* MBJ004040A, MBJ004125); Howell 1923, 16–17; see Docs. 3012, 3039, 3041, 3109, and 3117; web pages of Glen Ridge (N.J.)

Historical society, glenridgehistory.org/the-mills, glenridgehistory.org/early-enterprises, accessed 9 Dec. 2019.

13. See Docs. 3152 and 3157.

14. See Docs. 3140 and 3141.

15. The experimental record for many projects is incomplete, possibly because some experimenters took all or some of their notebooks when they left the laboratory. In some instances the laboratory time sheets provide the best evidence for when work was done on certain projects. N-87-01-01 (Aylsworth), N-88-03-20.1 (Batchelor), E-2610 (Dickson), N-88-02-01.1 (Wiley), N-88-02-17 (Gladstone), N-88-03-06 (Payne), N-88-03-15.1 (von Wilmowsky), and N-88-01-19 (Kennelly); all Lab. (*TAED* NB001, NB029, NM031,NB021, NB025, NB026, NB027, NB019).

16. Edison likely began using the book for insulation experiments in March; one of the entries can be dated to 28 or 29 March by Arthur Payne's laboratory work on those days (see Doc. 3171 n. 5). Some of the later ones were made in April, and the sole dated entry (13 April) appears near the end of the book. Jonas Ayslworth's time sheet for the week ending 29 March indicates that he may have conducted the first insulation experiments using lead chloride at that time. During April, Arthur Kennelly tested wires coated with various materials (apparently for insulation experiments), including some mentioned in Edison's pocket notebook regarding phonograph cylinder experiments. PN-88-04-13; N-88-01-01:101; N-88-01-19; N-88-04-18, all Lab. (*TAED* NP032 [image 4]), NB001097 [image 54], NB019089A, NB019089B [image 92], NB019089D, NB019089E, NB019089G, NB035005, NB035006 [images 11–12], NB035010 [image 15); Time Sheets, WOL.

17. "New Home of Electricity" *New York Tribune,* 1 Feb. 1888, 7.

18. Doc. 3153 n. 3.

19. New York Press Club to TAE, n.d. [Jan. 1888], with TAE marginalia; Lathrop to TAE, 24 Jan. 1888; both DF (*TAED* D8812AAH, D8812AAG).

20. Doc. 3188 n. 3; Musser 1994, 62.

21. "In A Blizzard's Grasp," *NYT,* 13 Mar. 1888, 1.

22. Time sheet of Lawrence Tell, 15 Mar. 1888, WOL.

23. Fessenden 1925, 156.

–3128–

To Frederick Kaldenberg[1]

[Orange?][2] Jan. 3, 1888

Dear Sir:—

On Christmas Day in searching through various packages in my house for Christmas presents, I came across a package from yourself containing the beautiful samples[3] which you so kindly sent me, and which had been mislaid by one of my servants. I regret exceedingly that this should have occurred and beg the acceptance of my thanks now for the curiosities, which, I assure you, I prize very highly. Mr. English[4] tells me that you have the nearest thing to the eyeballs of a U.S.

Senator,[5] namely, the eyeballs of a mummy. The first time I am in New York I shall do myself the pleasure of calling upon you, when I trust you will be able to show me these; I am quite anxious to see them.[6] Yours truly,

T.A.E.

TL (carbon copy), NjWOE, DF (*TAED* D8818AAE1). Initialed for Edison by Alfred Tate.

1. Edison's typed letter was addressed to Frederick Julius Kaldenberg (1843?–1912), an inventor and president of F. J. Kaldenberg Co. It was apparently in reply to one that Frederick Julius's brother Frederick Robert Kaldenberg (1855–1923), the company vice president, sent on the firm's letterhead. The Kaldenberg Co., founded in New York in 1853, was a manufacturer of fancy and collectible tobacco pipes and smokers' articles, as well as billiard utensils and walking sticks. It traded in a variety of natural materials, including wood, rubber, mother of pearl, ivory, and rare or unusual specimens. F. Julius Kaldenberg, a native of Germany, is credited with introducing the manufacture of meerschaum and amber work to the United States. F. Robert Kaldenberg was a noted sculptor whose work was collected throughout the world. U.S. Census Bureau 1982? (1900), roll 1175, page 8A (Greenburgh, Westchester, N.Y.); ibid., 1967? (1860), roll M653_789, p. 13, image 571 (New York Ward 2, New York, N.Y.); "Obituary," *New York Sun,* 22 Feb. 1912, 7; F. R. Kaldenberg to TAE, 5 Jan. 1888, DF (*TAED* D8856AAH); F. R. Kaldenberg passport application, 6 June 1881, *U.S. Passport Applications,* online database accessed through Ancestry.com, 23 Oct. 2014; "Frederick E. Kaldenberg," *NYT,* 11 Oct. 1923, 21.

2. Typed letters such as this one were prepared by secretary Alfred Tate, who handled the great majority of Edison's correspondence. Tate had been working at Edison's New York City office until about this date, but Samuel Insull, who preceded him in the job and wrote him frequently from the Edison Machine Works in Schenectady, N.Y., began addressing letters to Tate at the new Edison laboratory in Orange by 7 January. Insull to Tate, 4 and 7 Jan. 1888, both DF (*TAED* D8850AAB, D8835AAH).

3. The Kaldenberg Co. specialized in minerals and other natural materials such as ivory and tortoise shell. Edison may have wanted samples for display in his library at Orange; he had begun collecting anatomical models for display in 1887. Millard, Hay, and Grassick 1995, 1:119–120; cf. Doc. 3453.

4. John C. English (b. 1855?) was a New York dealer in chemicals and chemical equipment with whom Edison had done business for years. He entered Edison's employ sometime in early 1888 as a purchasing agent for the laboratory, where he was a storekeeper by mid-year. He became manager of the Edison Phonograph Works in 1889. Already in a 5 January reply to Edison, Kaldenberg referred to him as "your Mr. English." Doc. 3109 n. 6; Alfred Tate to English, 16 Apr. 1888; Kaldenberg to TAE, 5 Jan. 1888; both DF (*TAED* D8856ACP, D8856AAH); Time Sheets, 12 July 1888, WOL.

5. In an October 1887 interview in the *Washington Post* written by William A. Croffut (a veteran journalist who had written about Edison

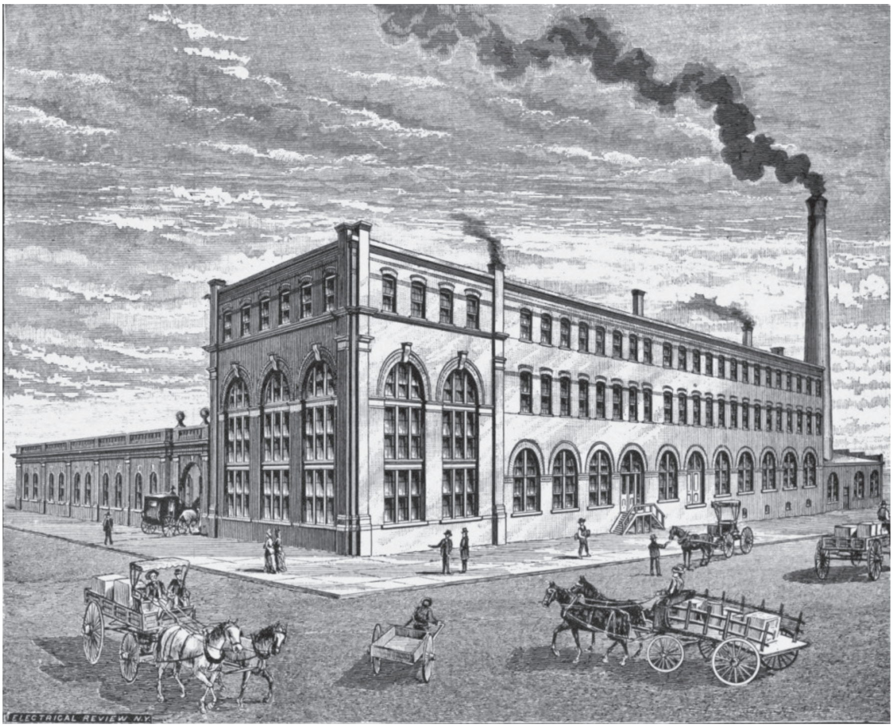
since 1878 and originated the “Wizard of Menlo Park” nickname), Edison was famously quoted saying that he had ordered for his laboratory “everything from an elephant’s hide to the eyeballs of a United States Senator.” The article was reprinted or adapted by dozens of papers across the country, and the quote has been republished many times since in books and articles about Edison (*TAEB* 4, chap. 2 introduction; Doc. 1266 nn. 1–2 [and headnote]; “Mr. Edison’s New Idea,” *Washington Post,* 9 Oct. 1887, 6; Croffut to TAE, 1 Sept. and 8 Oct. 1887, both DF [*TAED* D8704ACI, D8704ADI]). Edison does not appear to have claimed, even in jest, to have actually had a senator’s eyeballs in stock, as some historians and biographers have asserted (see, e.g., Hughes 2004, 33; Delano 2002, 40; Keller and Keller 1996, 162–63).

6. F. Robert Kaldenberg replied that he had mislaid the “petrified eye-ball” about which he had written previously but promised to give it to Edison when found. F. R. Kaldenberg to TAE, 5 Jan. 1888, DF (*TAED* D8856AAH).

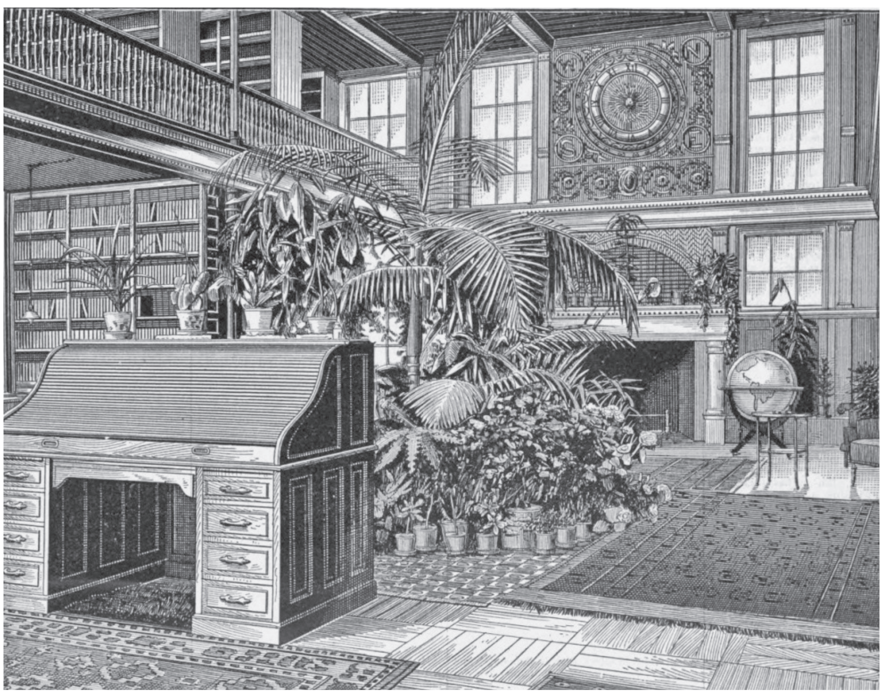
THE LABORATORY AT ORANGE Doc. 3129

The number and variety of items listed in Doc. 3129 give some sense of Edison’s ambitions for the laboratory he had started using at the end of 1887.[1] The facility’s size and equipment set it apart from any enjoyed by inventors (such as Edward Weston) or academic researchers (such as at Johns Hopkins University).[2] It was, according to the *Electrical Review,* “A Monument to Electricity” and “Probably the finest and most complete scientific and mechanical laboratory in the world.” The journal emphasized the laboratory’s superlative qualities in a flattering descriptive article (with four large engravings), characterizing it as an attainment as miraculous as any invention Edison might conjure there:

> Long ago, Mr. Edison, who, like other inventors, has suffered from want of facilities, determined he would one day build and equip a laboratory which should be a storehouse of everything, and from which any possible want might be almost instantly satisfied….He has not merely a laboratory of unequalled extent, but he has a storehouse of everything, a perfectly equipped machine shop…with workmen of the highest skill in every department…a scientific library of enormous proportions; and in short, he has a modernized Aladdin’s Lamp, by whose aid every wish almost can be at his bidding converted into an accomplished fact.[3]

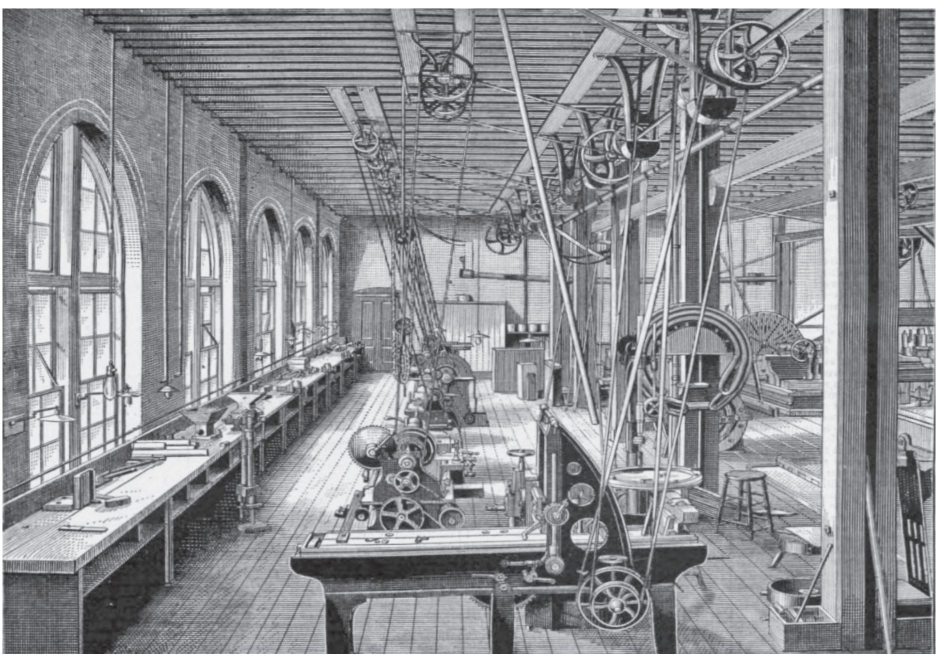


Laboratory main building (above) and library (below).



The main building covered about 13,000 square feet (excluding an attached powerhouse) and had three floors, the highest of which Edison had not yet fully occupied. It housed Edison's extensive library, which doubled as his office; his private experimental room; separate machine shops for heavy and precision work; various experimental rooms; a vast stock room; carpenter shop; and spaces for photography, drafting, lectures, and recording music. Four smaller outbuildings were devoted to specific purposes: the Galvanometer Room, delegated to Arthur Kennelly for electrical experiments; a chemical laboratory; one for mining and metallurgy; and a woodworking and storage area.[4]

Some idea of the laboratory's organization can be gained from the records of its employees. The exact number rose and fell as workers came and went, but during the first half of 1888, Edison generally had between eighty and a hundred men on the payroll. To keep track of them all, each man had a weekly time sheet on which was recorded his job title, hours worked, pay rate, wages earned, and often the project names and specific accounts to which his wages were charged.[5] Most of the staff was comprised of experimenters and machinists.



Heavy machine shop.

There were in addition a few pattern makers, carpenters, and draftsmen, several laborers, a blacksmith and his helper, engineers and firemen to run the steam engines and boilers day and night, storekeepers and their assistants to manage supplies and tools used by other staff, boys to run the elevator and errands, and a night watchman (see App. 4).[6] John Ott served as supervisor of experiments and mechanical engineer Charles H. Davids was superintendent of the mechanical department until he resigned in March 1888.[7] Edison's longtime assistant Charles Batchelor had a hand in the lab's business affairs, notably in coordinating orders of equipment and parts with the Edison Machine Works, the Edison Lamp Works, and outside vendors. Batchelor also carried out his own experiments and seems to have been exempt from keeping a time sheet.[8] A select few others, notably Kennelly and William K. L. Dickson, enjoyed considerable independence in their experimental work. Edison sometimes gave detailed assignments, many of them illustrated, on loose pieces of paper (such as Docs. 3168 and 3178 to Ott, and 3136 and 3151 to Kennelly), and principal experimenters apparently kept individual notebooks in which Edison could also write instructions.[9] Much information about the assignment of projects, their progress, and results doubtless was communicated verbally during Edison's daily rounds.[10] Curiously, Edison relaxed his heretofore meticulous practice of dating his own notebook entries, leaving a large number of laboratory records whose date of creation can only be surmised.[11]

Many (though nowhere close to all) of the projects listed in Doc. 3129 were taken up at least briefly in 1888; some, like the phonograph and its wax cylinders, were the subjects of intensive work. As the number of discrete projects proliferated, their titles were condensed into numeric codes and kept in a special book.[12]

Edison's big workforce had a proportionately large payroll. At $1,200 to $1,300 each week, wages were by far the largest item in Edison's lists of estimated laboratory expenses, which totaled from $60,000 to $90,000 yearly.[13] Though he had been somewhat staggered by the laboratory's construction costs,[14] Edison initially had no clear plan for sustaining its operation. He envisioned "a great Industrial works in the Orange Valley" fed by a stream of fresh inventions but, after floating several schemes to prospective investors, he hoped to recoup a sizeable chunk, perhaps $27,000 annually, from research and development work on behalf of various companies, especially the Edison Lamp Co. and the Edison Machine Works.[15] In addition, he pinned his expectations on income from manufacturing phonographs.[16]

1. Millard 1990 chap. 1 and Carlson 1991b address Edison's rationales and hopes for the new lab. Lists of prospective research projects are in Docs. 3090, 3109, 3111, and 3116; also cf. Doc. 3088 regarding expectations for manufacturing.

2. Regarding Weston, see *TAEB* 8, chap. 7 introduction (esp. pp. 735–36). The new physical laboratory at the Johns Hopkins University, fitted out by Henry Rowland, was the envy of American academic physicists. Its equipment, unsurprisingly, was suited especially for research in electricity, magnetism, and heat, but the building was substantially smaller than Edison's facilities, even before accounting for classroom space. By way of further comparison, Sibley College at Cornell University was home to the nation's second program in electrical engineering (1883), to which Edison had donated equipment in 1885 (see Doc. 2846). Its laboratory building for both mechanical and electrical engineering, though smaller and years older, was more in the character of Edison's lab, with its machine shop and distinctive work areas for pattern makers and carpenters. Unlike either the Edison or Johns Hopkins labs, it lacked provisions for making delicate electrical measurements away from the magnetic influence of iron building materials. "The New Laboratory at Johns Hopkins University," *Electrical World* 8 (17 July 1886): 24–25; "Sibley College, Cornell University," *Sci. Am.* 53 (17 Oct. 1885): 247–48; Rosenberg 1990, chaps. 4–5.

3. The *Electrical Review,* a journal with which Edison enjoyed good relations, proposed to present "a just conception of the magnificent monument your genius and efforts have produced," bearing all expenses except those of preparing the illustrations (some $150 to $250). It also proposed to allow republication in Great Britain by *Engineering.* One paragraph of its text was reproduced in a two-page description of the laboratory in an updated 1889 edition of an Edison biography. "A Monument to Electricity," *Electrical Review* 12 (7 July 1888): 1–7; Charles Price to TAE, 16 Apr. 1888, DF (*TAED* D8807AAY); McClure 1889, 24–25.

4. Israel 1998 (chap. 14) provides a valuable overview of the laboratory layout and the organization and training of Edison's assistants there. Carlson 1991b (p. 154) uses the dimensions of the main building provided by Edison (in Doc. 3078): 250 × 50, feet, or 12,500 square feet. A 1916 architectural floor plan shows a footprint of 257 × 53, or 13,621 square feet. Millard, Hay, and Grassick 1995, 1:13–25, esp. 2:329; see also Doc. 3077.

5. Edison had instituted time sheets at his Menlo Park laboratory. He would later insist on a more detailed method of cost accounting, one in which time sheets reflected not only wages but the cost of materials and apportioned charges for the laboratory's space and equipment. TAE to Alfred Tate, n.d. [1890?], DF (*TAED* D9064ABL).

6. The experimental staff generally fluctuated between thirty and

thirty-five men while the combined staffs of the two machine shops was usually twenty-five to thirty men. By comparison, at its height in 1880, the entire full-time staff of Edison's Menlo Park Laboratory never numbered more than sixty men. *TAEB* 5, App. 2; Finn 2002 [1989], 34–35.

7. Ott's title appears on his time sheets. The job title superintendent of the mechanical department disappeared from the time sheets after Davids resigned. However, in November 1888, machinist Charles Wurth was designated superintendent, presumably of machinists, and in August 1889 he began to share that duty with George Attwood. It is likely that the position of superintendent was split between the two machine shops. Davids to TAE, 16 Mar. 1888, DF (*TAED* D8855AAM); time sheets for Davids, WOL.

8. Batchelor recorded his own work in his journal; his work as a de facto purchasing agent is reflected in his correspondence of this period, especially with the Machine Works and lamp factory. Cat. 1234, Batchelor (*TAED* MBN005); *TAED,* s.v. "Batchelor, Charles."

9. Other instructions to Ott include a memorandum of 25 February and an undated one from about that time. Lab. (*TAED* NS88ABE); TAE to Ott, n.d. [Feb. 1888], DF (*TAED* NS88ABE). See also Edison's 22 March memorandum to Osgood Wiley, Lab. (*TAED* NS88ABK); regarding the individual notebooks, see Doc. 3109 esp. n. 1 and Israel 1998, 275.

10. Fessenden 1925, 276.

11. Many of Edison's own notebooks from this time contain draft caveats and patent applications or undated notes from research in books on chemicals and other substances rather than experimental records.

12. N-87-11-24, Lab. (*TAED* NL002).

13. See Doc. 3144 and App. 4; cf. the $130,000 annual laboratory expenses estimated by Edison in Doc. 3389. Weekly payroll totals are filed with Time Sheets, WOL. Individual payments and other transactions were recorded in laboratory journals, and running totals for specific vendors and internal accounts were kept in ledger books, but those granular records do not lend themselves to a broad understanding of the laboratory's expenses or work. Monthly summaries of expenses and payroll records kept from June 1890 are more conducive to overviews. See, e.g., Ledger #5, Journal #5, Abstract of Expenses #6, and Distribution of Labor #6; all WOL-Accts. (*TAED* NL011A1, NL016A1, NL020A1, NL023A1).

14. See, e.g., Doc. 3065.

15. See, e.g., Docs. 3078 esp. n. 4, 3080 (quoted), 3088, 3095, 3144, and 3145.

16. Docs. 3144, and 3153.

–3129– [Orange,] Jany 3 1888

Memorandum: Laboratory Projects[1]

Things doing and to be done:
Cotton Picker[2]
New Standard Phonograph[3]
Hand turning phonograph.
New Slow speed cheap Dynamo.
New Expansion Pyromagnetic Dynamo.[4]
Deaf Apparatus[5]
Electrical Piano
Long distance standard Telephone transmitter which employs devices of recording phonogh[6]
Telephone Coil of Fe by H in Parafine or other insulator[7]
Platina Point Trans using new phono Recorder devices.[8]
Grid Battery[9] for Telephones
" " " " Long distance
" " " " phonoplex
" " " jump telegraph[10]
" " " Volt meter.
Improved Magnetic Bridge for practical work[11]
Motograph Mirror[12]
" Relay[13]
" Telephone practical.[14]
Artificial Cable.[15]
Phono motor to work on 100 volt ckts[16]
Duplicating Phono Cylinders[17]
Deposit in vacuo on Lace gold & silver also on Cotton Molten Chemical[a] compounds of lustrous surfaces to imitate Silk— also reg plating system[18]
Vacuous Ore milling Large Machine.[19]
Magnetic Seperator Large[20] "
Locking material for Iron sand.[21]
Artificial Silk
Artificial filiments[22]
New 17s—[23]
Uninflammable Insulating material[24]
Good wax for phonograms[25]
Phonographic Clock[26]
Large phonograph for Novels etc[27]
Pig Iron Expmts with Electricity & Magnetism[28]
Malleablizing Cast iron in vacuo[29]
Drawing fine wire.[30]
Toy phonograph for Dolls[31]
Cable Motograph[32]
practical Motogh[b] Very[a] Loud Motograph Telephone, with

⅓ siz phonogh motor.[33]

Magneto Telephone nearly[c] actual contact end magnet compression of an adjustable rubber piece as in new phono

Snow Compressor[34]

glass plate water Ore Seperator[35]

Tinned[d] faced iron for Stove Castings[36]

Refining Copper Electrically[37]

Quad neutral relay[38]

Cheap low induct Cop[per] insulating material for Lead Cable people—[39]

Constant[d] mould for iron foundry[40a]

200 Volt 20 cp lamp[41]

Cheap[d] pressure Indicator[42]

Recording Volt Indicator[43]

Box balancing System[44]

Alternating Machine & Transformer[45]

Silver Surface Switches

Vulcanizing the 7c African Rubber adulterant.[46]

Platinum wire Ice cutting Machine.[47]

Silver wire wood cutting system

Silvering or coppering bolting Cloth in Vac for durability[48]

S Motor altered over with new devices for C speed[49]

Expansion Mirror Plat-Irid. wire in Vacuo[50]

Photoghg through Opaque Screens.[51]

Photoghg by causing heat alter Critical points—[52]

Boron fil.[53]

Hg out of Lamp[54]

Phonoplex Repeater[55]

Squirting[d] glass sheet tube etc Nickel moulds[56]

Artificial Mother Pearl.[57]

Red Lead[58] pencils equal to Graphite

India Ink[59]

Tracing Cloth

Ink for blind[60]

Fluffy Incandescent burner for gas[61]

Regenerative Kerosene burner[62]

Centralized Arc in Arc Lamp

Carmen Tesla Arc Lamp test[63]

Straightening alternating cts by [st crnt?][e] Dynamo[64]

ERR[d] continuous reducers[65]

Electroplating Machine for Schnectady[66]

Condenser Transformer[67]

Sqr ft defraction gratings on silver by 5000 inch dia tool

special precision lathe for ornamental purposes—[68]
Photo[d] Scintillations.[69]
Cheap plan produce Mimeograph Surfaces[70]
Miners battery & Lamp[71]
Sorting[d] Coal from Slate Machine[72]
Butter direct from Milk[73]
Burning[d] asphalt Candles by high chimney
Magnets RR signals[74]
Soften ink of books transfer to Cop plate & plate to obtain matrix
Telephone Repeater[75]
Substitute[d] for Hard rubber[76]
Artificial Ivory
Soften Vegetable Ivory to press in sheets[77]
Various batteries on Lelande Type[78]
Revolving Thermo[79]
Call or Indicator for Jump telegh
Marine[d] telegraphy[80]
Long distance speaking tube filled H_2O 2 dia [pressure?][e]
Lead plate battery for modifying alternating Currents[81]
Two revolving bands in battery Lead faced pass in Liquid close together & out into seperate chambers to peroxidize one & reduce by gas the other—
Siren phonogh—[82]
Perm mag like an electromag of discs hard steel high polish seperately magnetized & forced together powerfully 005 thick—
Telephone working molecularly[83]
Ear tubes formed [~~m~~—][f] crescent drawn wire[84]
Long strip 50 cp carbon under stress & index for Cheap Voltmeter
Chalk Battery.[85]
Dynamo or motor long tube in long magnetic field top & bottom contacts forcing water through generates current by its passage.[86]
Napthaline in Benzol in oil cups for Lubricant.
Diamagnetometer[87] Capilliarity tube liquid rising repelled by powerful magnet, also iron solutions to pump—
Thermo battery[88] slick Copper oxidized then plated over surface oxide a metal to make good contact Iron if possible—[g]
Disk phonogh[89]

TAE

ADS, NjWOE, Lab., N-88-01-03.2 (*TAED* NA021AAF). [a]Obscured overwritten text. [b]"practical Motogh" interlined in left margin with line drawn to insertion point. [c]Interlined above. [d]Line drawn to left margin. [e]Ilegible. [f]Canceled. [g]Entry enclosed by line on left and another line drawn to left margin.

1. See headnote above. The following list includes many projects or ideas Edison had worked on in the past, in some cases years ago. In the interest of brevity, the editors have elected to treat such entries as something of an index to his prior work and accordingly have briefly identified the projects and provided signal (but not exhaustive) references to their genesis or development. Other projects lay in the future and, given the cursory nature of these entries, the editors have provided either the briefest of introductions or none at all, allowing the subjects to appear in the volume in due course. Several of these projects are discussed in more detail in Edison's draft list of inventive projects prepared for Villard (App. 2). Many also appear in a numbered list of experiments at the laboratory (N-87-11-24, Lab. [*TAED* NL002AAA]) and in monthly accounts of laboratory expenses (Journal #5, WOL [TAED NL016A1]). A few of these items appeared in a summer 1887 list of proposed projects for the new laboratory (Doc. 3090). During the second half of November 1887 Edison laid out a series of experiments to be done at the laboratory with assignments to particular experimenters (Docs. 3109, 3111–13, 3116–17). Some of these proposed experiments are related to the items below and provide details on how the experiments should be carried out. For example, among the variety of proposed filament experiments are descriptions of hydrocarbon experiments that were likely among those undertaken by Drs. Johannes Braun and L. Cornice during the first months of 1888 (see Docs. 3109, 3116–17, 3148 n. 3). Additional information related to items on this list also may be contained in undated notebook entries conjectured as 1888 or 1889.

2. For Edison's prior work on a cotton picker, see Doc. 2924 and Unbound Notes and Drawings: c. 1887 (*TAED* NSUN10, images 15–17). On 29 May, H. B. Mitchell of Georgia wrote Edison to encourage him to work on a cotton picker, which he saw as offering immense labor savings for cotton farmers, and offered to do what he could to aid Edison's efforts. Edison wrote a marginal note for Alfred Tate, "Tell him I am already working at it," which became the basis for a formal reply that Tate sent on 6 June. Laboratory account records show $176.98 spent on the project in February and March, mostly for labor. Mitchell to TAE (with TAE marginalia), 29 May 1888; Alfred Tate to Mitchell, 6 June 1888; both DF (*TAED* D8822AAU, D8818AMA); Ledger #5:470, WOL (*TAED* NL011A1, image 158).

3. Edison had developed this instrument, which recorded on wax cylinders and was driven by an electric motor, in 1887. He expected to put it on the market at the end of January. See Doc. 3105 (headnote).

4. In 1887 Edison designed what he called a pyromagnetic generator that converted heat energy directly into electricity, without intervening steam engines or conventional rotary dynamos. It was intended to use alternate heating and cooling to vary a magnetic field around a conductor, thereby inducing a current. He also proposed a motor that would, by similar means, convert heat directly to mechanical motion. Edison renewed work on this generator the same day he wrote this list.

Doc. 3029 (headnote); N-88-01-03.1 (*TAED* NA020AAB).

5. Edison had worked on hearing aids in 1878 and renewed his interest in this subject in 1886. See Docs. 2906 (esp. n. 1), 2921–22, 2924, 2928, and 2933.

6. In November 1887, Edison had proposed making "a telephone transmitter with lampblack button like the recorder of phono." See Doc. 3111.

7. See the end of Doc. 3109 for a description of this device.

8. Edison later sketched such an instrument, from which John Ott completed a model on 25 February. Unbound Notes and Drawings, Lab. (*TAED* NS88ABE); see also Edison's undated notes, probably from winter or spring 1888, in N-88-01-03.1 (*TAED* NA020AAC; image 42).

9. This design may be related to Doc. 3151; see also Kennelly Notebook #1:54–55, Lab. (*TAED* NM023054B).

10. Edison referred to his wireless system of induction telegraphy (nicknamed the "grasshopper") for communicating with moving trains, developed with Ezra Gilliland in 1885 (see Doc. 2780 [headnote]). The design of a battery for this system is discussed in Doc. 2928 (esp. n. 3).

11. See Doc. 2936 (esp. n. 8) for Edison's early work on this device. On 7 May, Arthur Kennelly wrote to Alfred Tate that "Mr Edison has taken out a patent for the application of his magnetic bridge to the detection of flaws in iron and has done some work in that direction." He noted that "its use is technically speaking to compare the permeability of iron with known standards." The editors have not found a patent application for this device. DF (*TAED* D8968AAH).

12. See Doc. 774.

13. See Docs. 463 n. 2 and 1913 n. 1.

14. Edison first developed his electromotograph telephone receiver in 1877 and commercialized it in 1879. Docs. 873, 888–89, 908, 932, 962 (headnote); *TAEB* 5, passim, esp. Docs. 1681 (headnote) and 1784 (headnote).

15. Edison first experimented with and made artificial cables in 1873–74. See Docs. 351 (headnote), 361, 392, 412, and 602.

16. That is, a phonograph that could be run from an electric lighting circuit.

17. Edison began working on and filed his first patent on a record duplication process in 1887. See Docs. 3101 and 3119.

18. Edison had a long-standing interest in creating substitutes for fine materials or easier ways of working with them (see, e.g., Docs. 1701, 3020, and 3088). He included in a November 1887 list of projects for the new laboratory (Doc. 3109) his intention to use a vacuum process for depositing silver on muslin or lace. Such a process would have been like one he had developed for depositing a thin film of volatilized metal in a vacuum, which he planned to use for making copies of phonograph records (see Docs. 2587 n. 2, 3101, and 3119).

19. In spring 1887, Edison and experimental assistant William K. L. Dickson had made some preliminary investigations using a vacuum chamber to prevent a stream of ore from scattering as it flowed past a magnet (see Docs. 3032 and 3059 esp. n. 8). Dickson returned to the project in December with a model machine. About three weeks later, "Having succeeded in making a good separation in Vacuum &

proved that it could be done, this field was abandoned for a while." Dickson concluded that the process was "slow, expensive and perhaps impracticable on a large scale" (E-2610:36, 38; Lab. [*TAED* NM031036, NM031038]).

20. In 1880, Edison designed and patented a magnetic separator for isolating ferrous black sand (associated with platinum or gold) from a mass of crushed rock. After working intermittently to improve the machine and make a business of concentrating ferrous sands for their own sake, he turned the separator experiments over to William K. L. Dickson in 1887 (see Docs. 1776 n. 5, 1921, 2246, and 3059 n. 8). Dickson worked on and off through 1888, recording his work in a notebook into which he neatly transcribed and illustrated his rough experimental records from another book (E-2610, N-87-06-10; both Lab. [*TAED* NM031, NB005]).

21. The natural black sands concentrated by Edison's separator had proved too fine to use in commercial furnaces, and the finely crushed materials used more recently by Dickson seemed liable to the same objection. In late January, Dickson began mixing the powdered magnetite with binders such as clay, lime, and asphalt, and pressing the compound into briquettes. See Docs. 2393 and 2591 n. 7; E-2610:42–43, Lab. (*TAED* NM031042, NM031043, NM031043A).

22. Since 1881, Edison had sporadically tried to make incandescent lamp filaments by cutting, stamping, or extruding them from various homogeneous carbon compounds. See, e.g., Docs. 2057 n. 3, 2587 n. 2, 2892, 2921, 2927, 2994, 2995, 3117.

23. The editors have not determined what this number represents but see Doc. 3091 n. 9.

24. One of the first projects undertaken at the new laboratory was the search for a fireproof insulation for inside wiring. Laboratory assistant A. E. Cousens was placed in charge of the experiments and was soon joined by Reginald Fessenden. Years later, Fessenden recalled Edison's explanation of the experiments: "'We are having trouble with fires from electric light wires, and the Machine Works wants a fireproof insulation. What they want is something which is as good an insulator as glass, but as flexible as India rubber; not affected by acids or alkalis or oils; and fireproof, and'—his face relaxed for an instant—'it must not cost more than 15 cents a pound.'" Time Sheets, 5, 12, and 19 Jan. 1888, WOL; Fessenden 1925, 158.

25. In an 1878 caveat filed at the U.S. Patent Office, Edison had adapted the word "phonogram," which referred to a symbol (such as an alphabetic letter) representing a vocal sound, to mean the physical record (such as a tinfoil sheet) inscribed by a phonograph. Alexander Graham Bell and his associates at the Volta Laboratory used the word in that sense in connection with their own work on recorded sound (*OED,* s.v. "phonogram"; see Docs. 1341 [second paragraph] and 2993 n. 1).

On 1 January, chemist Jonas Aylsworth started what would become a long series of experiments (more than 800 by late summer) on compounds with various waxy bases for use in phonogram blanks. He transcribed his rough experimental records into separate notebooks spanning January to August 1888 and August 1888 to October 1889 (N-87-01-01, N-88-08-23; both Lab. [*TAED* NB001, NB050]). For Aylsworth's later testimony about his work on wax cylinders and his notebooks see *American Graphophone Co. v. National Phonograph Co.*, Lit. (*TAED* QP003046).

26. Edison first worked on a phonograph for use in clocks in 1878 under an agreement with the Ansonia Clock Co. Docs. 1168 n. 7, 1188, 1196, 1216 and 1265; regarding public interest in phonographic clocks see Gitelman 1999, 82–85.

27. Recorded novels were among Edison's initial ideas for the phonograph in his 1878 *North American Review* article and one that would be repeated in his 1888 article for the same journal (Edison 1878 and Edison 1888). In November 1887, a writer for the *New York Evening Post* reported, "The phonograms for the reproduction of books or long pieces of music will be entirely different from the commercial sizes, and will measure four inches in diameter by ten inches in length; each phonogram of this size will contain about 10,000 words, or perhaps more, and from tests made last week with 'Nicholas Nickelby,' that book will go into eight cylinders of this size" ("The Phonograph at Work," 18 Nov. 1887, p. 8; see also Rubery 2013).

28. Presumably this refers to Edison's proposal to work on "Decarbonizing pig iron electrically." See App. 2.

29. Edison tried in 1887 to patent an electrical and magnetic process for giving cast iron the more workable qualities of wrought iron, perhaps getting the idea from a newspaper clipping. See Doc. 3044 and App. 2.

30. See Doc. 3088, U.S. Pat. 563,462l; and App. 2.

31. Soon after inventing the phonograph, Edison had envisioned its use in toys, including dolls, and he signed a contract with Oliver D. Russell to exploit it for this purpose. Nothing came of this effort and in October 1887, Edison signed a new agreement with Lowell Briggs and William Jacques to manufacture and market talking dolls. Such dolls had been on the market for some time, but they used bellows and reed devices to imitate simple words like "mama" or "papa." One model sold in the early 1880s had a small reed organ that could "sing" various tunes encoded on perforated paper. See Docs. 1168 n. 7, 1190, and 3076; Rolfs and Rolfs 2004, 1–2.

32. Presumably the use of Edison's electromotograph for working cable telegraphs. This may be related to his interest in "Increasing the speed for signall[in]g on sub-marine cables to permit of the use of a cable direct from New York to London at ⅓ present cost." App. 2.

33. The electromotograph telephone receiver required power to rotate its chalk cylinder continually. The design of the motor is not known, but Edison had incorporated the electromotograph as a receiver in his phonoplex telegraph. In an 1885 patent application on that system, he declared that "The chalk cylinder of the motograph is kept in constant rotation by the electric motor, so that the instrument will be ready at all times to respond to induction signals." Laboratory time sheets listed considerable work on a "motograph motor" or "electric motor motograph" (especially by machinist P. Nielson) in the winter months. U.S. Pat. 422,072; Time Sheets, WOL; an older version of an electromotograph motor is in Doc. 774 (see esp. n. 1).

34. In 1886, Edison had suggested building a machine to form snow from the city's streets into blocks for easier removal. Charles Batchelor made experiments with compressing snow in February 1888. Doc. 2892 n. 15; Cat. 1337:42 (item 541, 20 Feb. 1888), Batchelor (*TAED*

MBJ004042A); Journal #5:30–33, Accts. (*TAED* NL016A1, images 17–18); App. 2.

35. It is unclear what Edison may have had in mind; possibly it was related to experiments that Dickson briefly undertook in March to wash the finest dust from the ore before roasting. E-2610:68, Lab. (*TAED* NM031068).

36. See Doc. 2918 for earlier experiments on tin facing of iron stoves.

37. See Doc. 2629 and App. 2; also cf. Doc. 3164.

38. In 1874, Edison had devised the quadruplex telegraph for sending two messages in each direction on a single wire. Part of his invention involved a patented modification of the standard neutral relay. See Doc. 449 (headnote).

39. Edison referred to Berthoud Borel & Co., which produced a lead-covered copper wire especially suited for underground lines wires for telegraphs, telephones, and electric lights. Doc. 2187 n. 2.

40. See Doc. 3044.

41. The editors have found no information about this form of lamp. Possibly it was related to a high resistance lamp, described in a February journal article, that required 150 volts to bring to normal intensity. It was intended, however, to be used as a night light that would create "but a dim light" in a standard 110 volt system. "New Lamps of the Edison Company," *Electrical Review* 11 (25 Feb. 1888): 1.

42. Regarding the development of pressure indicators see Doc. 2538 (headnote).

43. In a letter of 3 February, John Vail reminded Edison that he had "mentioned the need of a recording ampere and volt meter to you once or twice in the past; also, that you stated such an instrument had been made and tried.… If you can find the time to take this matter up, I feel that if a successful instrument is produced, it will be of vast benefit to our central station business. It seems to me the only missing link which we need in determining the economy of our stations." In his note for a reply to this letter Edison wrote, "I have a recording Volt meter but never gave it a test will attend to it." He also made a note to have "John Ott set that Volt Recorder up & have somebody work at it." Vail to TAE (with TAE marginalia), 3 Feb. 1888, DF (*TAED* D8830AAC).

44. See Doc. 3089.

45. See Doc. 3002 (headnote).

46. By "7 c," Edison may have meant seven percent. Unacknowledged adulteration of raw natural rubber was a common commercial problem, but the use of standardized adulterants would soon become standard practice in the manufacture of vulcanized rubber insulation. Brannt and Hoffer 1883, chap. 30; Del Mar 1907.

47. This and the following item on the list are in App. 2.

48. See App. 2.

49. The editors have no information about the "new devices" or what Edison intended with them. The letters may refer to now-obsolete dynamo models which would have been easy enough to modify as motors; the medium-size S machine for isolated lighting ran at 1,300 revolutions, while the far larger central station C dynamo was rated at 350 rpm. *TAEB* 6 App. 2 and *TAEB* 7 App. 2.

50. Edison may have been seeking a visual indication of the thermal expansion of a wire by having the wire move a mirror so as to deflect a

beam of light. He had previously considered designing a detector of the elusive XYZ force along roughly similar lines. See Doc. 2873 esp. n. 10.

51. See Doc. 3109.

52. See Doc. 3117.

53. Edison had experimented with boron for filaments as early as 1877 and had investigated it as a coating for his carbon filaments in 1886. See Docs. 1044 (headnote), 1098, 2892, and 2970.

54. Edison spent considerable time in 1886 trying to remove from his lamps the residual mercury left from the vacuum pumps. See Doc. 2962 (headnote).

55. See Doc. 2867 n. 7.

56. See App. 2.

57. See Doc. 3020 and App. 2.

58. Red lead (Pb_3O_4) is a higher oxide of lead. Vinal 1955, 21.

59. See App. 2.

60. See Doc. 1452 and App. 2.

61. During January, David Marshall conducted experiments on incandescent mantles for gas burners like those of the Welsbach mantle. For Edison's efforts to develop such a mantle see Doc. 3058.

62. See Doc. 2892 and App. 2.

63. William Carman (1849–1926), formerly a member of Edison's Menlo Park office staff, was connected with the Tesla Electric Light and Manufacturing Co. in 1887, when he provided some of Nikola Tesla's arc lamps to Edison. Charles Batchelor began testing them in March 1888. Doc. 3068 nn. 2–3.

64. Regarding Edison's efforts to transform alternating into direct current see Docs. 3103 and 3126.

65. See Docs. 3142 and 3320.

66. Edison meant the Edison Machine Works, organized in 1881 to manufacture dynamos and other electrical equipment. It moved from Manhattan to Schenectady, N.Y., in December 1886. Docs. 2343 (headnote) and 3018.

67. The editors have not found a context for understanding Edison's intent for a "Condenser Transformer." Possibly he sought to smooth the output from converting (rectifying) alternating into direct current, a use for which condensers (capacitors) would later become common.

68. In a crossed-out portion of App. 2, Edison referred to a "Defractive surface for Ornamental uses."

69. Edison's interest in the study of scintillations dated to his experiments with etheric force in 1875 (see Docs. 680, 690, 855, and 988–89). In November 1887, he proposed having William K. L. Dickson photograph electric scintillations (see Doc. 3109). Time Sheets for the week ending 19 July 1888 indicate that Arthur Kennelly and F. Bergh conducted etheric force experiments; during the spring and summer of 1889, Kennelly (assisted by Theodore Lehmann) undertook more extensive experiments titled "Electrical Oscillation" and "Electrical Radiance" but listed in Time Sheets as etheric force (Kennelly Notebook # 2:99, 101–4, 35, 40, Lab. [*TAED* NM023098, NM023099, NM023101, NM023101A, NM023101B, NM023101C, NM023102, NM023103A, NM024035, NM024040]).

70. This likely refers to Edison's experiments for A. B. Dick Co. "on a new process of 'coating' thin fibrous paper and displacing such

‘coating’ in the form of Type-written stencils.” A. B. Dick Co. to TAE, 6 Apr. 1888; Alfred Tate to A. B. Dick Co., 10 and 12 Apr. 1888; Albert Dick to TAE, 5 May 1888; Tate to Dick, 8 May 1888; all DF (*TAED* D8803AAG, D8818AIE, D8818AIF, D8803AAH, D8803AAK, D8818AKC).

71. See Docs. 2794 and 2796.

72. See App. 2.

73. Edison first became interested in such a process in 1882. See Docs. 2361, 2622 n. 5, 2935, and App. 2.

74. See Doc. 3072 and App. 2.

75. See Doc. 2787 n. 4 for Edison’s earlier work on telephone repeaters.

76. In April 1889, Arthur Kennelly conducted tests on a “Hard Rubber Substitute”; a “Substitute for Rubber” is among the items listed among his numbered experiments. Kennelly Notebook #1, Lab. (*TAED* NM023094A); N-87-11-24 (*TAED* NL002AAA, image 9).

77. Vegetable ivory was produced from the fruit of *Phytelephas macrocarpa,* a palm tree native to South America and known as tagua, and it was used as a replacement for small ivory objects. Other South American palms also produced fruit that could be used for this purpose (Prance and Nesbitt 2012, 344). Edison may have been considering producing sheets of artificial ivory for ornamental purposes in the same manner he proposed producing sheets of artificial mother of pearl (see Doc. 3020).

78. Edison referred to the primary battery designed by Felix de Lalande and Georges Chaperon and patented by them in France in 1881 and in the U.S. two years later. It used an alkaline electrolyte, typically caustic potash, and produced a modest but reliably steady voltage for an unusually long period without servicing, in part because of the effectiveness of its copper oxide depolarizer. Originally constructed with porous pots (like a gravity cell), the Lalande-Chaperon design evolved during the 1880s into a closed trough with a cathode made of powdered and granular metal (principally copper oxide) on an iron mesh. It was adapted for commercial electric lighting in Britain by the middle of the decade and was also favored for railroad signals. Edison likely had it in mind when describing an “Improved Battery for general service” in App. 2. U.S. Pat. 274,110; Schallenberg 1982, 328–30; Benjamin 1893, 241–44; Nursey 1888, 193–96; *Ency. Brit.* 14, s.v. “Battery.”

79. Edison had sketched rotating thermoelectric generators in 1885 and 1886. See Docs. 2812, 2918, 2928.

80. This and the following item on the list are likely related to Edison’s ideas for conducting sound through water for telegraphic and telephonic communication with ships. See Doc. 2935.

81. Edison proposed this idea in a draft patent application in 1887. Doc. 3103.

82. See *TAEB* 8, chap. 3 introduction (n. 2) and Doc. 2929.

83. See Docs. 2928 n. 7 and 2935.

84. This may be related to the idea Edison drew in Doc. 2935 n. 17.

85. That is, a battery based on the electromotograph principle (see Docs. 1738 n. 5 and 3109). Edison made undated notes, probably between 3 January and late May 1888, on such a battery and the

motograph generally (N-88-01-03.1, Lab. [*TAED* NA020AAC; images 40–42]).

86. This idea may be related to Edison's pyromagnetic generator. See Doc. 3047.

87. The editors have learned nothing further about this device. Diamagnetic materials produce an induced magnetic field of short duration in a direction opposite to an externally applied magnetic field. Edison may have conceived his capillary diamagnetometer as analogous to the Lipmann mercury meter, a capillary electrometer that is especially useful for detecting small electrical charges of short duration, and with which he planned to experiment in his new laboratory (see Doc. 3090).

88. See Doc. 3133.

89. Edison began to imagine recording on a flat disk or plate soon after he hit on the idea of the phonograph. While working to develop a practical machine of this type in early 1878, he included the idea in two caveats and his first British patent exclusively on the phonograph (see, e.g., Docs. 1161, 1164, 1174, 1196, 1203, 1207, 1227, 1265, 1268, 1341; Brit. Pat. 1,644 [1878], Cat. 1321, Batchelor [*TAED* MBP012]). Charles Tainter and his associates at the Volta Laboratory experimented seriously with disk designs in the early 1880s and again in 1887 but focused their commercial efforts on cylinders (Newville 1959, 73–75; Tainter [1931?], 24–39, 97). Emile Berliner did successfully design a disk machine, which he patented and introduced to the public as the gramophone in late 1887. Berliner overcame the mechanical challenges of a spiral recording track, but his more significant innovation was to inscribe the vibrations parallel to the surface (rather than cutting or impressing into it) to improve the sound quality of recordings (Berliner 1888; Morton 2004, 34–35; "Berliner's Gramophone," *Electrical World* 10 [12 Nov. 1887]: 255–58; "On the Gramophone," *Proceedings of the American Philosophical Society* 24 [18 Nov. 1887]: 420–21; U.S. Pat. 372,786).

–3130–

Draft Patent Application: Pyromagnetic Generator

Orange Jany 4 1888

Dyer—[1]

Here is something new Prepare an[a] application Its in the line of the pyromagnetic Dynamo—[2]

The object is to transform the heat energy of coal etc directly into electricity without the intervention of a steam Engine or other prime motor. The invention Consists in causing heat to expand rods tubes, sheets etc of metals or expansible material in such a way as to open & close a magnetic circuit,[b] which magnetic circuit is surrounded with a coil of wire upon which the lines of force acts inductively

The invention further consists in arranging a number of such simple devices together to obtain continuous Electric Currents by commutating, the Electric Current, & alternately cooling & heating a portion of the devices but continuously

The invention further consists in various details. Many attempts have been made to construct prime motors by utilizing[a] the expansion & contraction of solid matter, but the expansion & contraction between [-----][c] practicable limits is so small that mechanical means are of no avail to obtain motion sufficient for practical purposes.[3] The problem is to get motion or energy capable of use from the exceedingly small movements due to expansion. I have solved this problem and am enabled to utilize barely perceptiable motion for obtain Light &[d] [----][c] & power for running machinery with great economy of fuel. I have found that the resistance of air to magnetic lines of force or stress is about 1200 times that of soft iron, That stout short magnets divided in two parts with Their faces acurately ground to fit together like two surface plates and magnetized nearly to saturation can scarcely be pulled apart by the direct put[4] of two Oxen, but if the faces are seperated 1/200 of an inch The attraction is reduced enormously on account of the sudden interposition in the magnetic circuit of [~~a re~~?][c] a layer of air whose specific resistance to magnetic streess is 1200 times greater.

If one ½ of the magnetic circuit be covered with wire it can be magnetized to saturation, while the other ½ being also coiled with wire, This coil will receive a powerful induction wave at the moments when the ~~forces of~~ magnetic circuit is opened or closed 1/200 of an inch or less, Which movement is produced by the expansion of streatched metals. By this means I am enabled to obtain the full value of the almost irresistable force of Expansion in solids for practical purposes

Fig 1 shews one single unit of the ~~E~~Generator K K ~~with~~ are sheets of say Nickel secured to the End pieces H. L. L being secured to the Central hub M[d] of the Generator. The magnet & Central hub are rigidly connected together by radial arms shewn by dotted lines fig 2 A is the magnetizing coil, B the generating Coil. The magnetic break occurs within the helix B at c. d. The part of magnet moveable [~~is provid~~?][c] has a bearing at N. F is a nut connected to a right & left handed tightning screw for adjusting the tension on the Expanding device.

Fig 1[5]

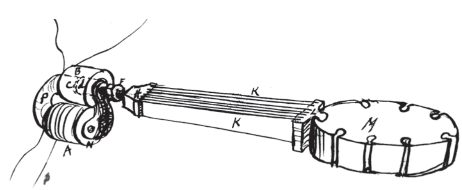


Fig 2[6]

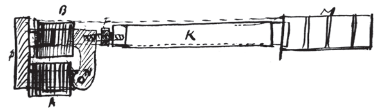


Fig 3 shews a section of the Generator over a furnace. [-][c] X fig 3 & 4 is the revolving guard plate etc Dyer the action is the same as pyromagnetic Generator. instead of having Commutator[a] wheels right over furnace I use Spur gear & take the Com devices away from the heat, both shafts making Same revolutions allows me to do this I have shewn no smoke stack, or regeneration devices mention that these would complicate the description & will be the sub matter of another application.[7g]

Fig 3

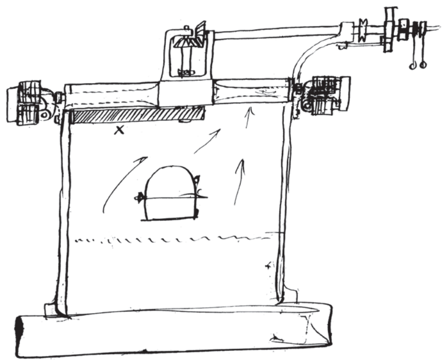
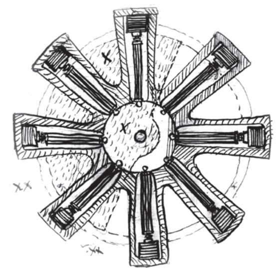


fig. 4.



When no heat in furnace the contraction of K. K. etc opens magnetic circuit & the charging of the magnet [h--][c] is insufficient to draw the [-----][c] circuit closed but when the furnace is started the heat soon reaches a point where the Expansion is sufct to allow closing whereupon we get a powerful induction wave in B

By starting the ~~field magnets~~ Induction magnets[e] with a small battery They may be made to build up & it may be disconnected. Of course horse shoe magnets can be used

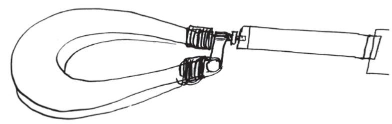
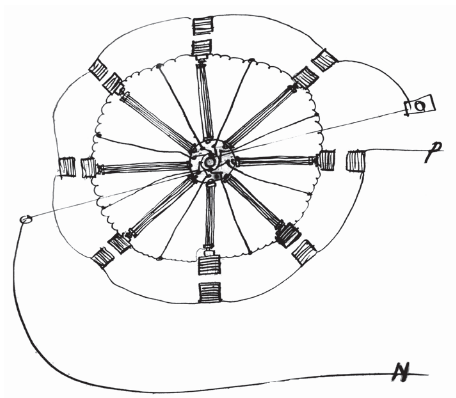
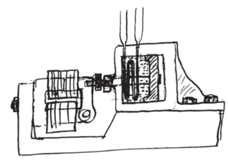


fig 5[8]



Mention that I do not confine myself to sheets of metals for expansion but tubes with thin walls, wires, and other forms can be used— fig 6 shews The method of using liquids the Expansion being produced by hot water or steam through copper pipes coiled in a small closed chamber with piston, the coils being immersed in the liquid used

fig 6



a number of fig 6 being arranged with a rotating wheel which serves to open & close the steam cocks of the various devices Successively, The details of which will be shown in another application

Dyer— I suppose we had better call this the pyromagnetic Dynamo, ie[f] Improvements in

Very broad claims ought to be obtained The only instance where currents have been generated by breaking actual contact between iron & armature is in the Breguet Exploder[9] but This was done by hand & moved an inch or more; doing it through comparatively[d] infinitely small [r--][c] distances by Expansion is I think entirely new. The use of a magnetizing coil is new The arranging with Commutator is new. The devices are new. The Liquid[a] Expansion device with Mag is new all the devices are new Let me see what you can do—

Edison

ADfS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAA). Drawings made on separate sheets. [a]Obscured overwritten text. [b]Multiply underlined. [c]Canceled. [d]Interlined above. [e]"Induction magnets" interlined above. [f]Circled. [g]Followed by dividing mark.

1. Richard Nott Dyer (1858–1914), a Georgetown University law graduate, became Edison's principal patent attorney in 1882. Since 1884, he practiced in partnership with Henry W. Seely. Docs. 2440 n. 6, 2429 n. 3.

2. Edison's draft was received by his patent attorneys (according to Dyer's notation) on 6 January. It was largely incorporated into a patent application for an electric generator that was signed on 21 January and filed nine days later. When the specification issued (with minor alterations) in August 1890 as U.S. Patent 434,586, it included six drawings based on those below (except that marked as figure 2) and eight combination claims.

3. In turning to relative motion, however small, between two parts, Edison was suggesting a variation on his pyromagnetic generator designs of 1887, which relied solely on varying temperature to cause changes in magnetic fields. The minuscule physical motion proposed here was akin to that which Edison proposed as the basis of an "expansion engine" discussed in Doc. 2932.

4. Edison seems to have used "put" in its meaning as a push or shove, particularly from an animal. *OED,* s.v. "put" n. 1.

5. Figure labels, moving clockwise around the magnet from the bottom, are "A," "P," "B," "c," "d," "F," and "N"; then left to right, "H," "K," "K," and "M." Edison drew figures 1 and 2 on one sheet of paper and each of the remaining figures on a separate page.

6. Figure labels, from the bottom of the magnet, are "A," "P," "B," "K," and "M."

7. Edison's allusion to a future application covering similar mechanical arrangements for a somewhat different purpose—controlling the supply of hot and cold water to the piston mentioned below—was removed during the examination process. Pat. App. 434,586.

8. On a separate sheet, Edison made faint drawings of what appear to be alternative versions of this drawing. It was pinned to the draft following the page with figure 5. Cat. 1153, Lab. (*TAED* NM022AAA; image 11).

9. The so-called Breguet exploder, properly named the coup de poing Breguet (literally, a punch or a blow of the fist), was a small magneto used in mining to detonate charges. According to an 1875 description, it consisted "of a piece of soft iron which one separates suddenly, by a blow of the hand, from the armature of a magnet which carries two induction coils," the relative motion inducing a brief but strong electrical current. "On Electrical Apparatus Used in Modern Blasting Operations," *Electrical News* 1 (9 Sept. 1875): 131.

–3131–

To Samuel Insull

[Orange,] Jan. 5, 88.

My Dear Insull:—[1]

I have seen your letter to Tate.[2] He did not not exactly express what I wanted to convey.[3] I find that these Japanese gentlemen have come over from Japan[4] for the purpose of buying a Central Station outfit either in New York or England, or buying such things as they can't buy in England here, and engines, boilers &c. in England. These men propose to put up their own Central Station. They pay cash for all the goods F.O.B. New York. They have been around and obtained estimates from all the competing Companies. They are very much prejudiced in favor of our system. They don't want any system but ours, but are met by an estimate from Mr. Frazar[5] which is abnormally high—an estimate that will, sooner or later, kill all our Japanese business. I never understood that Mr. Frazar was to buy goods of us at our shop prices and then add such a tremendous percentage. I supposed that if[a] we gave him the goods at shop prices that he would put his prices down to a decent profit. You can easily see that these Japanese gentlemen, who leave for England soon, will be able to buy Edison-Hopkinson[6] and other English machines, quite as good as ours, for very near the price that we charge Mr. Frazar; that they are not going to pay $1,500 for a machine that we sell for $800. Neither are they going to pay 85 cents for lamps to Mr. Frazar, when they will be able to purchase all the lamps they require in London, Berlin and Paris for very much less money;[7] neither will they buy Babcock[8] boilers or engines from Mr. Frazar as they have already got prices here from the manufacturers. I think Mr. Frazar is making a great mistake.

My idea of this business is that when parties like these smart Japanese come here to buy machinery and pay cash for it in New York, where there is no risk whatever for Mr. Frazar, that if Mr. Frazar makes 20% clear profit, it should be very satisfactory to him, and we certainly should take pains to restrict him to a moderate profit for the sake of our future business.

I recognize the fact that where Mr. Frazar takes a contract to put up a Central Station, with all the risks of shipment, that it is a different basis and that he must charge a large margin, but I am speaking now about people who come here to buy and pay cash for machinery. Without some arrangement like this is made they will not, although they want to very much, buy our machinery.

They already have our price list, got from some Central Station.

Please give me your ideas on the subject.[9] Yours truly,

T.A.E.

TD (carbon copy), NjWOE, DF (*TAED* D8818AAJ). Initialed for Edison by Alfred Tate. [a]Interlined above by hand.

1. Samuel Insull (1859–1938) became Edison's personal secretary in 1881 and, in short order, his trusted associate and business manager. At the end of 1886, Insull moved with the Edison Machine Works to Schenectady, N.Y., as its as secretary, treasurer, and de facto general manager; he officially assumed the manager's duties (and relinquished those of secretary) in late 1887. Docs. 1947 n. 2, 2420 n. 51, and 3018; Insull to Charles Batchelor, 3 Nov. 1887, DF (*TAED* D8757ACE); "Men of the Industry," *Electrical World* 77 (28 May 1921): 1269.

2. Alfred Ord Tate (1863–1945), a Canadian-born former telegrapher and railroader, entered Edison's employ in 1883 as an assistant to Samuel Insull. He also promoted Edison's phonoplex telegraph and electric light systems and had acted as a business agent for the Edison Machine Works. With Insull's departure from New York, Tate took over Edison's correspondence at the start of 1887 but does not seem to have taken the title "private secretary" until later that year. Docs. 2456 n. 17, 2850 esp. n. 2, 2862; Tate to George Gouraud, 22 Oct. 1887, Lbk. 25:227 (*TAED* LB025227).

3. Insull had responded to Tate's 3 January letter, which enclosed a more detailed one from Edison to Francis Upton (written by Tate) on the same subject: the prices to be charged Japanese and Korean buyers of Edison central station lighting equipment made in the United States. The letter to Upton argued that sales proposals for those countries were "so loaded down with commissions that it is absolutely impossible for us to compete with other manufacturers" and that central station plans were larded with unnecessary items as well. Edison (in Tate's words) proposed that "all material should be furnished at as favorable prices as are given in the open market, and commissions obtained by means of special discounts" from the manufacturing shops. In his cover letter to Insull, Tate referred to a seven percent discount allowed by the Edison Machine Works for cash sales. Tate to Insull, 3 Jan. 1888; TAE to Upton, 3 Jan. 1888; both Lbk. 26:154, 160 (*TAED* LB026154, LB026160).

Insull's response reflected a different view. He agreed that "a dynamo sold by us at $800. should not be billed at $1500" but rejected the idea that "the Japanese business can be run by special discounts being obtained from shop prices." Analogous to the illiquid experience of the Edison Construction Dept. in building central stations in the U.S., Frazar & Co. "have to keep up an establishment in Japan.… It is not as if they sold the goods here in New York, simply handling the money and have nothing more to do with the business; they have to put up the plant and start it. They have to keep men so as to nurse any plants that they put up, and I know that we cannot pay any special discount which will cover any such expense as this." Tate had a long meeting on the subject with Everett Frazar (at Edison's request) on the evening of 5 January, after which he suggested that he should join any discussion of it that

Insull and Upton might have. Insull to TAE, 4 Jan. 1888; Tate to Insull, 6 Jan. 1888; both DF (*TAED* D8839AAA, D8818AAN).

4. S. D. Niwa of Tokyo was in the United States with his uncle, S. G. Niwa, to investigate central station equipment, apparently with an eye toward a plant in Nagoya. The younger Niwa was an electrical engineer recently employed by the Tokyo Electric Light Co. who subsequently had a long career with the Nagoya Electric Light Co. The Niwas returned to Japan in April. Frazar & Co. (Yokohama) to Everett Frazar, 24 Feb. 1888, DF (*TAED* D8839ABB); "Personals," *Electrical World* 10 (17 Dec. 1887): 324; *Electrical Trades' Directory* 1889 (262) and 1905 (1556); "Passengers," *Japan Daily Mail* 10 (28 Apr. 1888), 402.

Edison learned of the Niwas' visit in December through Edward Johnson, who, after meeting with them, conveyed their desire to do business with Edison directly. Edison telephoned instructions to "Have Sammy [Insull] deal with them, ~~and~~ but tell him see Frazar first." He arranged to meet them at the laboratory on 29 December along with Everett Frazar, his son Everett Welles Frazar, and Wallace Peck, a Frazar clerk. Johnson to TAE, 14 Dec. 1887; TAE to Johnson, 16 Dec. 1887; both DF (*TAED* D8732ABW, D8704AFS); TAE to Frazar & Co., 27 Dec. 1887, Lbk. 26:139 (*TAED* LB026139); Edison Laboratory Visitors' Register, WOL (*TAED* NL009AAA); see also Doc. 3137.

5. An American merchant and diplomat whose career abroad reached back at least to his establishment in 1858 of a trading company at Shanghai, Everett Frazar (1834–1901) was deeply involved in efforts to bring Edison's telephone and electric light into commercial use in East Asia. His business was based in New York City as Frazar & Co. and conducted through associated houses in China, Japan, and Hong Kong. Frazar was the consul-general for Korea at New York, a prominent resident of the Oranges in New Jersey, and an influence in the trans-Pacific business of the Canadian Pacific Railway. Docs. 2678 n.1, 2887 n. 1; see also Doc. 3137 n. 3; Whittemore 1896, 283–84.

6. The "Edison-Hopkinson" dynamo was based on Edison's bipolar design as modified by engineer and physicist John Hopkinson in Britain in 1882–1883 and semi-independently by Edison in 1883. The most visible change was a shortening of Edison's distinctively tall field magnets to increase the machines' efficiency and reduce their size and cost of manufacture. The Edison Machine Works built the new short-core dynamos under Edison's name alone, but those made and sold in Britain under license of Edison's patents were referred to as Edison-Hopkinson machines. Doc. 2419 (headnote).

7. See Docs. 2819 n. 5 and 3013 nn. 5–7 regarding arrangements between the Edison Lamp Co. and the Compagnie Continentale Edison for competitive lamp sales in much of Europe.

8. A major manufacturer of stationary boilers, Babcock & Wilcox Co. was a principal supplier for Edison's electric lighting installations, including the one at his new laboratory. Docs. 1897 n. 4, 2423 n. 1, 2437 (headnote) n. 11, 3077 n. 11.

9. Insull replied the next day that his understanding had changed and he was now "fully in accord" with Edison's views. Noting Frazar's frequent requests for lower prices from the Edison Machine Works, Insull suggested that Frazar had been, "to put it vulgarly 'playing us.'" Cf. Doc. 3137. Insull to TAE, 6 Jan. 1888, DF (*TAED* D8839AAC).

–3132–

Samuel Insull to Alfred Tate

SCHENECTADY, N.Y., January 7th. 1888.[a]

Dear Tate.

I have your favor of the 6th inst.[1] in which you ask me to send $9020.45 of our paper to Mr. Edison's order, in ~~half~~ part[b] payment of our loan from him. The last time I saw Mr. Edison, which was about Dec. 1st. I showed him what we had paid out for his account up to that date. During the month of Dec. we rendered to him bills amounting to $18,168.95. We have here in the office to start out Jan. bills amounting to $4045.12, so that adding these 2 amounts together, it will show a total of $22 214.17 paid Mr. Edison practically within 30 days. If I send you the Notes he now asks for it will bring this total up to $31 234.62 paid back to him in this short period. The large and rapid calls that he has made upon us for money simply puts me in the position of being compelled to refuse to assume any further liability, until I have balanced up my books for the year 1887,[2] and am enabled thus to get a clear idea of exactly how we stand. I am sorry to have to write this letter, but of course my first duty is to meet the liabilities that we have already incurred.

I wrote Mr. Edison about 5 weeks ago that his demands on us began to scare me.[3] They are now growing so heavy that I must call a halt until I can see him[b] and show him the exact situation.[4] Very truly yours,

Saml Insull General Manager

Please show this to Mr Edison[c]

TLS, NjWOE, DF (*TAED* D8835AAI). Letterhead of Edison Machine Works. [a]"SCHENECTADY, N.Y.," preprinted. [b]Interlined above by Insull. [c]Postscript written by Insull.

1. Tate had written on Edison's behalf to ask the Machine Works to provide promissory notes to cover three specific laboratory expenses: $2,650.00 for an Armington & Sims engine; $4,135.59 for Babcock & Wilcox boilers; and $2,235.06 for rubber from B. F. Goodrich Co. Tate to Insull, 6 Jan. 1888, DF (*TAED* D8818AAM).

2. Insull sent Edison a detailed financial report for the Machine Works on 26 January showing that the company had made a net profit of $172,092.76 in the previous six months. While finances had been "comparatively easy" during that period, Insull expected to have "considerable difficulty" in meeting "liabilities within the next few months, unless business takes an immediate turn for the better." Nevertheless, he promised to consider the debt to Edison "as one to be discharged at the earliest possible moment," even though that "was not the original intention." Insull to TAE, 26 Jan. 1888, DF (*TAED* D8835AAP).

Edison seems to have made at least three personal loans to the Machine Works since June 1886, including $45,000 for the purchase of its new property in Schenectady. In February 1887, he agreed to a further $80,000; about the same time, Francis Upton loaned $6,000 on Edison's behalf from proceeds on the sale of Edison Lamp Co. stock. By Insull's tabulation, the Machine Works owed $149,343.66 to Edison on 1 June 1887, of which $54,886.22 had been repaid by the first of January 1888, leaving a balance of $94,457.44. See Docs. 2956 n. 4 and 3028; Insull to TAE, 26 Jan. 1888, DF (*TAED* D8835AAP).

3. The editors have not found such a letter from late November or early December 1887. Insull had protested in October when Edison's demand for $8,000 on short notice hit him "almost like a thunder clap." He had been concerned for some time about Edison's expenditures for the new laboratory and the absence of an advisor to help "curtail" his spending. See Docs. 3087 and 3096.

4. Insull sent a letter to Edison on 26 January (in addition to his formal financial report; see note 2), about repaying Upton's $6,000 loan, a matter that he had "entirely overlooked…until a few days ago." Not having cash on hand, he enclosed three notes of $2,000 each, payable in four, five, and six months, which he anticipated Edison could have discounted immediately and in one and two months, respectively. Insull to TAE, 26 Jan. 1888, DF (*TAED* D8835AAO).

–3133–

Draft Patent Application: Thermoelectric Battery

Orange NJ Jany 10/8~~7~~8

Dyer Patent.

Improvement in Thermo electric batteries

Object of this invention production of Electricity direct from heat.

Invention consists in rotating or moving[a] the two Thermo electric metals[1]

2nd Consists in heating one Element direct to a high temperature while the other is only heated by conduction.

3rd Keeping one Element at a high temperature at[b] its contact surfaces & the opposite metal at a low temperature where the two come in contact & maintaining these great dif of temperatures continuously

~~As the Current Electromotive force depends up the diference of temperature~~ The small wheel is say of Copper the large of Iron a blow pipe flame for Illustration Keeps the Copper wheel red hot, while the iron wheel being a poor Condr of heat & being Exposed to the air while in rotation remains Comparatively[b] Cool, any loss of heat from the Copper wheel is continuously supplied by the flame The large wheel is run by an Electromotor supplied by Current generated or by other motor. The small Copper wheel being in bearings on a moveable arm is held against the wheel with

Considerable force & rotates with it= Spring contacts serve to make good contact with the Respective Shafts—

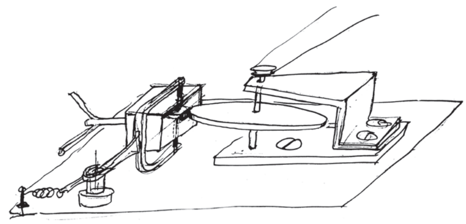


fig 1[2]

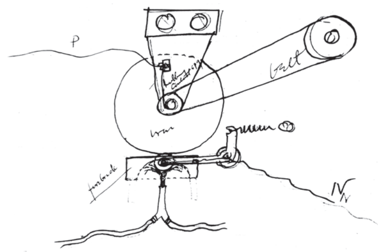
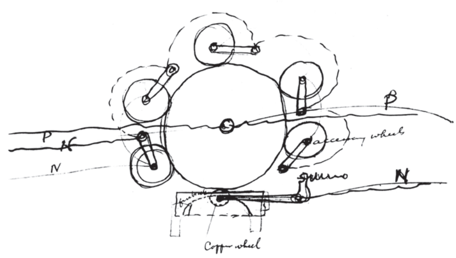


fig. 2. shows several accessory wheels of Copper which are not heated but serve to keep the iron wheel cool & at the same time generate a Current while Cooling which can also be utilized but which is small Compared to the Current from the heated wheel— It is obvious that many modifications can be made and that any of the suitable Thermo Electric metals may be used.

fig 2[3]



The application of this invention for Various purposes will be the subject matter of other applictns—

Dyer: rotating or rubbing[c] Thermo surfaces is I think new

2nd Heating one continuously & keeping the other at a lower temperature at points of Contact is new fig 3 shews rubbing Contact heated on one side & arranged so flame or copper not in contact doesnt give heat to wheel by conduction or radiation.[d]

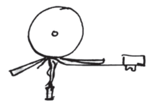


fig 3[4]

This arrangement gives 35⁄100 of a Volt—

Claim Everything—as this is intended as a base patent[5e]

T.A.E.

ADfS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAC). Drawings made on two separate sheets. [a]"or moving" interlined above. [b]Obscured overwritten text. [c]"or rubbing" interlined above. [d]Paragraph circled. [e]"as…patent" added diagonally.

1. Edison had periodically explored thermo-electricity batteries since at least 1879 (see, e.g., Docs. 2271 esp. n. 2, 2812, and 2920). Of the many materials having thermo-electric properties, he had supposed that those able to dissipate a charge quickly might work best (see Doc. 3111).

2. Figure labels are "P," "Rubbing Contact sp[rin]g," "belt," "iron," "firebrick," and "N."

3. Edison had sketched roughly similar rotating thermocouple devices in 1886; see Doc. 2928 (near nn. 13–14). Figure labels are "accessory wheels," "firebrick," "Copper wheel," and several iterations of "N" and "P."

4. Figure labels are "1," "2," and "1 & 2. firebrick."

5. The application prepared from this draft by Edison's attorneys was signed on 21 January and filed nine days later with three drawings based closely on Edison's numbered figures. After modest amendments to several of the seven claims, the application issued in August 1890 as Edison's U.S. Patent 434,587. The first claim was broadly for "A thermo-electric couple or battery wherein a moving contact is maintained between the two metals which touch each other at a single point."

–3134–

To Charles Brown

[Orange,] Jan. 12, 88.

Dear Mr. Brown:—[1]

In reply to your letter of the 10th instant,[2] I would say that at present I am so busy, getting my Laboratory in running order, that I scarcely get time to sleep. A little later on I will be very glad to have one of your representatives come over and have a chat with me as to the "Possibilities of Electricity." I have so much actual work in front of me just now that I really have not room in my brain to speculate on the possibilities of the future. Yours truly,

T.A.E. M[aguire].[3]

TL (carbon copy), NjWOE, DF (*TAED* D8818AAX). Initialed for Edison by Thomas Maguire.

1. Charles R. Brown was an editor for the Central Literary Press (the "New York Syndicate Bureau") at 1 William St. in New York City. He boasted that the audience for the agency was the "finest in the country being composed of the leading journal in most of the large cities in this country & Canada." He had unsuccessfully solicited Edison to write an article on "The future of Electricity" in 1887. Brown was also an editor of the *American Magazine* but resigned about the end of 1888 to devote his time fully to the Syndicate Bureau, of which he was then the owner. Brown to TAE, 11 July 1887 and 10 Jan. 1888, both DF (*TAED* D8705AAI, D8807AAA); TAE to New York Syndicate Bureau, 14 July 1887, Lbk. 25:38 (*TAED* LB025038); "Books and Bookmakers," *American Bookseller* 25 (15 Jan.–15 Feb. 1889): 75.

2. Brown acknowledged receipt of a recent letter (not found) in which Edison stated that he "would rather have 7 teeth pulled than write an article" about the "Possibilities of Electricity." Brown offered to dispatch a writer to interview Edison and draft an article for his signature, but the editors have found no evidence that Edison participated. Brown to TAE, 10 Jan. 1888, DF (*TAED* D8807AAA).

3. Thomas Maguire (d. 1894) was a stenographer and secretary at the Orange laboratory. He remained connected with Edison the rest of his life and apparently was working at the North American Phonograph Co. at the time of his death; the company and Edison jointly paid his funeral expenses. Maguire to George Campbell, 22 Oct. 1887; TAE to James Kearney, 4 Oct. 1894; Lbk. 25:91G, 62:50 (*TAED* LB025091G, LB062050); Maguire to John Randolph, 1 Feb. 1894; Kearney to TAE, 1 Oct. 1895; both DF (*TAED* D9437AAC, D9505AAD); North American Phonograph Co. voucher, 20 Aug. 1894, Vouchers—Lab. (*TAED* VC94061D).

–3135–

From Francis Upton

Harrison, N.J., Jan. 12, *1888*[a]

Dear Sir,—

Regarding the wiring of plants, where our lamps supersede Arc lamps, your instructions to Mr. Card[1] was to sell the lamps and sockets, and to leave the wiring in the hands of the local electrician. We have not done this in the case of Altman Miller & Co.,[2] as it was the opinion of Messrs. Card, Jenks[3] and Steringer[4] that it would be highly dangerous to do so.

There is very much more danger of fire, from these municipal circuits,[5] than from ordinary Multiple Arc, and those who have had the most experience with wiring for these, feel that it would be highly dangerous for us to place our lamps on such circuits, unless they were installed by thoroughly competent persons; for, if these were caused by bad wiring, the public would attribute it[b] to Edison Light, though the Edison Company[6] were in no way responsible for such, beyond advising the purchaser to do his own wiring. This, we do not care to do without your authorization. We prefer to take the safe course, and in work which Mr. Card solicits, and secures upon our account, we would advise that it be put in by thoroughly competent men, who have been accustomed to wiring for high tension currents. Yours truly

The Edison Lamp Co.,[7]

By Francis R. Upton,[8] Treas. Dic[tated].

<Why not print thoroughly competent instructions It seems to me this kind of wiring with proper book of instructions can be done by man already in charge of arc circuits— It isnt so complicated as Regular Explain by any means>

TL, NjWOE, DF (*TAED* D8833AAA1). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.,*" and "*188*" preprinted. [b]Interlined above by hand.

1. Benjamin F. Card (1838?–1921) became an agent for the Edison Co. for Isolated Lighting in New York City and Long Island about 1882. In late 1887, Edison named him to lead a sales push to replace arc lighting with the Edison municipal system. Card arrived at Aultman, Miller & Co. in Akron, Ohio, for that purpose on 23 January. See Doc. 3106 esp. n. 3; Lewis Miller to TAE, 23 Jan. 1888, CEF (*TAED* X018C6A3).

2. Aultman, Miller & Co. was organized in 1863 by Cornelius Aultman and Lewis Miller (now Edison's father-in-law) to expand the capacity of C. Aultman & Co., of Canton, Ohio, to manufacture Miller's Buckeye mower and reaper. With Aultman having left the firm, Miller served as president and superintended its factory in nearby Akron. Miller had recently asked Edison about replacing the plant's arc lights. See Docs. 2826 n. 17 and 3106.

3. William Johnson Jenks (1852–1918) was involved with setting up and running Edison central station plants since 1883. He became manager of the Edison Electric Light Co.'s Municipal Dept. in July 1886 and was named to head the company's new Standardizing Bureau at the end of 1887. Docs. 2475 n. 1, 2963 n. 3, and 3124 n. 3.

4. Luther Stieringer (1845?–1903) started what would become a distinguished career as an illuminating engineer by designing interior lighting for Edison in 1881. He had some contractual relationship (since February 1884) with the Edison Electric Light Co., with which he was associated as an "expert" in 1887. Among his recent projects were construction of an illuminated fountain on Staten Island and, at the end of 1887, installation of electric lighting fixtures at Edison's house. Docs. 2840 n. 12 and 3043 n. 3; Charles Batchelor to Stieringer, 28 Dec. 1887; Philip Klein to Alfred Tate, 24 Feb. 1888; both DF

(*TAED* D8717ACI, D8802AAH); Charles Batchelor to Bergmann & Co., 24 Dec. 1887, Lbk. 26:125 (*TAED* LB026125).

5. Edison's "Municipal System" was designed to minimize electrical distribution losses to street lights spread sparsely over a relatively large area. The system's lines carried small currents at relatively high pressure (1,200 volts) to special low resistance lamps. Doc. 2877 n. 1.

6. The Edison Electric Light Co., organized in 1878, owned and licensed Edison's U.S. patents for electric light, power, and heat. See Docs. 1494 n. 4 and 1576.

7. The Edison Lamp Co. manufactured incandescent lamps in East Newark (Harrison), N.J., under license from the Edison Electric Light Co. Formed in 1880 as a partnership among Edison and several close associates, it was incorporated in January 1884. See Docs. 2018, 2343 (headnote), 2536 n. 2, and 2650 n. 2.

8. Francis Robbins Upton (1853–1921), trained as a mathematician and physicist, joined Edison's laboratory staff in 1878 and made essential contributions to the development of the incandescent lighting there. Associated with the Edison Lamp Co. since its inception, he was its general manager and treasurer. *TAEB* 5, chap. 9 introduction; Docs. 1568 n. 1 and 2260 esp. n. 2; Letterhead, Upton to TAE, 6 Jan. 1888, DF (*TAED* D8856AAK).

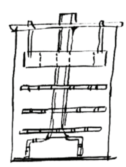
–3136–

Memorandum to Arthur Kennelly: Batteries

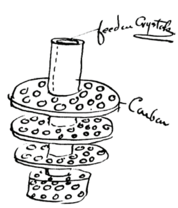
Orange 13 Jany 1888

Kennelly[1]

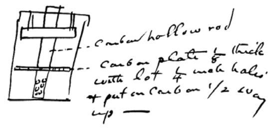
Chromic acid by a new process recently discovered is now obtained in fine crystals and as <u>cheap</u> as Cupric Sulphate. This being the Case perhaps we can [—][a] now make a Gravity Cell.[2]



[A][3]



John Ott[4b] can design you a simple cell to test Experiment Amalgamated Zinc, 15 pct SO_4 and after battery set up feed in Chromic acid Crystals a single plate would answer at first[5]



AD, NjWOE, Lab., Unbound Notes and Drawings (*TAED* NS88AAZ). [a]Canceled. [b]Obscured overwritten text.

1. Arthur Edwin Kennelly (1861–1939) was born in Bombay, the son of the colonial harbor master, but was sent away at a young age, following the death of his mother, and educated in several countries—mainly at the University College School in London. He left school at the age of fourteen, worked briefly as a secretary and stenographer for the Society of Telegraph Engineers, then joined the Eastern Telegraph Co. as a signalman. Hired without any formal electrical training, Kennelly gained a working knowledge of the subject while posted at several cable stations and then on the company's ships. He rose quickly to chief electrician on several ships, where he diagnosed and repaired submarine cables. While in the U.S. in September 1887, he applied to Ezra Gilliland for a position in Edison's laboratory; by December, he had resigned from Eastern Telegraph and was in the galvanometer room at the Orange laboratory, reportedly charged with setting up the instruments there. He served as Edison's chief electrician at the laboratory until 1894, when he quit to start a consulting business with Edwin Houston. He subsequently discovered (with Oliver Heaviside) the layer of the Earth's ionosphere that bears their names, and he had a distinguished later career in teaching, as professor of electrical engineering at Harvard (1902–1930) and of electrical communications at MIT (1913–1925). Bush 1943; Kennelly to Reginald Fessenden, 14 Feb. 1894, Fessenden, Nc-Ar; *NCAB* 32:22–24; "Kennelly, Arthur Edwin," Pioneers Bio.; Kennelly to Gilliland, 16 Sept., 11 Oct., and 5 Nov. 1887; all DF (*TAED* D8713AAH, D8713AAS, D8713AAZ); "A. E. Kennelly Dies; Ex-Aide of Edison," *NYT,* 19 June 1939, 15.

2. Edison possibly had in mind a new method of producing chromic acid crystals published in Germany by G. Kliebhan and then abstracted in the *Journal of the American Chemical Society* in 1887 ("Preparation of Crystalized Chromic Acid from Lead Chromate," 9:222–23). In a gravity cell, different depolarizing electrolytic fluids, each specifically suited to combining with oxygen or hydrogen to prevent the buildup of an insulating layer of gas bubbles on the electrodes, were kept separated by their different specific gravities. (The dissociation of water by an electric current produces oxygen, which collects at the positive terminal, and hydrogen, which gathers at the negative terminal.) Such batteries, usually filled with sulfates of copper and zinc, were common in the telegraph industry. In non-gravity type batteries, such as the Grove and Bunsen cells, depolarizing fluids (often nitric and sulfuric acids, the latter a building block of chromic acid), were segregated by an earthenware container through which liquid and gases could slowly

diffuse. One variation on this type was the so-called chromic acid battery, which generally employed solutions of common salt in water and the bichromate of potash in sulphuric acid. All such batteries with semipermeable internal vessels, however, were relatively heavy and complex in their construction (*KNMD,* s.v. "Gravity Battery"; Prescott 1888, 1:45–60, 64–73; cf. Nursey 1888, 208).

Edison's suggestion to exploit the cheapness of crystalline chromic acid was not original with him. In a report on primary batteries for the Society of Engineers in London in November 1887, Perry Nursey described a "marked improvement" made by Albert Friedlaender of Berlin, who "took advantage of the circumstance that chromic acid is now manufactured by a new process at a price at which it can be used for this purpose" (reportedly a fraction of the former cost). Readily soluble in water, powdered chromic acid could form a more concentrated depolarizer and was less prone to clogging the plates than the bichromate used previously. Nursey also praised the simple construction of Friedlaender's cell, in which five pairs of zinc and carbon plates were immersed directly in the single depolarizing fluid in a way that allowed for close regulation of the electric current. Nursey 1888, 208.

Edison was seeking to improve the standard Grenet cell (a single-fluid bichromate of potash battery) using chromic acid mixed with sulfuric acid and water for use with the phonograph and phonoplex telegraph (see Doc. 3213; N-88-01-19:73; 88-06-0:89; N-88-09-28:51; Kennelly Notebook #1:10, 41a; N-88-03-15.1:72–90, 101–9; all Lab. [*TAED* NB019073, NB045089A, NB056050, NM023009A, NM023041A, NB027053 (images 7–12), NB027089, NB027090, NB027103, NB027109A]). By August, Alfred Tate was recommending replacement of the troublesome Bunsen cells on the Edison phonoplex telegraph system with a two-fluid type chromic acid battery. One fluid was a mixture of diluted sulfuric acid with chromic acid, while the other was merely diluted sulfuric acid. The chromic acid, Tate advised, could be bought for twelve to sixteen cents per pound, thanks to the cheaper process of making it. This new battery was in limited use on phonoplex lines by October, when it performed "splendidly," and it seems to have entered wider service by early 1889 (Tate to William Logue, 30 Aug. 1888; Logue to Tate, 6 and 15 Oct. 1888 and 18 Feb. 1889; Tate to Charles Selden, 17 Oct. 1888; all DF [*TAED* D8818ASK, D8853AEP, D8853AEV, D8966AAU, D8818AUY]; see Doc. 3351 n. 2).

3. Figure labels are "feeder Crystals" and "Carbon."

4. John F. Ott (1850–1931) was an expert machinist employed by Edison from 1870 to 1920. He was a trusted laboratory assistant and Edison's principal experimental instrument maker on a full range of projects. Doc. 2781 n. 1.

5. Figure labels are "carbon hollow rod" and "carbon plate ⅛ thick with lot ¼ inch holes & put on Carbon ½ way up—."

–3137–

From Joseph Hutchinson

New York, N.Y. Jan. 13, 1888.[a]

Dear Sir:—

I saw Mr. Upton after leaving you this morning[1] and have just conversed with Frazar's chief clerk[2] through the telephone, and it seems to me that in view of the situation we are in duty bound to let the Japanese deal with Frazar and Company[3] or let ~~us~~ them[b] not deal at all in this Country for the Edison Plant. Frazar and Company have sold about $75,000 of the product of the Edison Shops in Japan[4] and outside of them we have done no business there[b] whatever. They have hired two experienced men in the interest of the Edison Light and now have them in Japan at work and under salary.[5] They have sufficient amount of experience in Japan business to justify them in claiming that, in comparison, we know absolutely nothing about the Japanese business. The importance of keeping up a good trade in Japan is of much more moment to them than it is to you or any of the Edison Shops. It seems to me, for us to be led into opposing Frazar and Company as to their methods of doing business, by two strange Japanese,[6] whom we know nothing about, is paying a poor compliment to Frazar and Company. It is not alone the interest of the Edison Machine Works which is involved, but it also involves Bergmann and Company[7] and the Lamp Company. When the Japanese went to Bergmann's Shop they had to go with a representative of Frazar and Company, and Bergmann refused to quote any prices except list, leaving the discounts to be arranged entirely by Frazar. We stand in the position of claiming to exercise better judgment than Frazar and Company in dealing with these Japanese and I think it is preposterous for any of us to think that we can do it better than Frazar and Company. This aside from the just claim which Frazar and Company has in the premises, that their Agency should be respected. It is utterly useless to attempt to carry on business in such a territory, if any stray "Jap"[8] who happens to be in New York can go behind our Agents and get prices less than quoted by our official recognized Agent. We have no assurance whatever that the price quoted by Frazar and Company is more than he can get, and it is utterly unreasonable for us to suppose that we can keep the European manufacturers out of Japan by quoting low prices. Siemens & Halske[9] have their representative ~~in~~ already in Japan, and as far as low prices will bring business, that far they will go and we can do nothing to prevent it. The only thing which will be most likely to sustain the volume of our business in Japan, is to be represented on the ground by a reputable Agent.[10] This is worth ten times as much as to have a poor Agency and to sell goods cheap in New York. Frazar and Company assure me that they cannot carry out the policy which they have in doing our business, unless they are permitted to do it their own way. If they had taken hold of our business in a half-hearted manner, there might be some excuse for our attempting to dictate to them, but in view of the fact that they started and have carried on our business in a most liberal and systematic manner, it is certainly very bad grace for us to put up our judgment as to what they ought to do, as against their own, and our insisting upon having our method adopted, will result in paralizing and demoralizing the Agency. Frazar and Company expressed themselves very strongly and you may be sure that unless they are permitted to handle this Niwa case, in their own way, it will throw a wet blanket on our Japanese business. I think there is only one course to take and that is for you to tell Niwa that the provisions of your contract with Frazar give them exclusively the Japanese business, and that not being familiar with the details of your contract you failed to remember this when you conversed with them. They will probably want you to give them your assurance that Frazar and Company's figures are not too high and I think you can conscientiously do this, for they made considerable of a reduction from their first figures. Niwa said that he considered Frazar and Company's figures only about 11% higher than they would be if the cost were taken and 12% added.

If you will write a letter to me telling me to go to them and explain that you were in error in failing to remember that Frazar and Company's Agency gave them exclusive rights and that you think their figures right,[11] I will go to them as soon as I get the letter and settle it in this way, which seems to me the only right course for us to take. Yours very truly,

J. Hutchinson, Sec'y[12]

TL, NjWOE, DF (*TAED* D8839AAE). Letterhead of Edison Machine Works; J. Hutchinson, secretary. [a]"*New York, N.Y.*" preprinted. [b]Interlined above by hand.

1. After consulting Hutchinson, Everett Frazar, Samuel Insull, and Alfred Tate, Francis Upton had unequivocally recommended that Frazar & Co. should handle the Japanese electric light business. Upton to TAE, 10 Jan. 1888 (*TAED* D8839AAD).

2. Probably Wallace Peck (1857?–1928), who had visited Edison's laboratory with the Frazars in December 1887. Peck was also a humorist and illustrator whose publications included (by the end of 1888) *The Golden Age of Patents: A Parody on Yankee Inventiveness* (Peck 1888).

Edison Laboratory Visitors' Register, WOL (*TAED* NL009AAA); U.S. Dept. of State n.d., roll 269, passport issued 18 Feb. 1885; "Obituary," *Brooklyn Daily Eagle,* 14 Dec. 1928, 24; Peck to Tate, 19 Feb. 1889, DF (*TAED* D8941AAG); Twain 1979b, 610.

3. Everett Frazar established Frazar & Co. as merchant and commission agents in Shanghai in 1858. The firm's Yokohama house became the sole agent for Edison's light in Korea and Japan in 1885 and was responsible for electric light installations at palaces in Seoul and Tokyo. The firm also maintained branches in Hong Kong and Nagasaki, all of them represented personally in New York by Everett Frazar. Doc. 2678 n. 1.

4. By February there were already "five [isolated] plants in operation and two central stations ordered" through Frazar & Co.'s Yokohama branch. Frazar & Co. (Yokohama) to Everett Frazar, 8 Feb. 1888, DF (*TAED* D8839AAX).

5. Frazar's men in Japan for electrical matters included W. H. Brenner, former superintendent of the Edison Illuminating Co. at Cincinnati, and Albert W. Congdon, a graduate of Yale's Sheffield Scientific School and an associate of Frazar & Co. (Yokohama) for about three years. Both men worked on lighting the Imperial Palace in Tokyo, with some assistance from S. D. Niwa. Congdon and Niwa also worked on the the Boseki Mills, probably under Brenner's supervision. William T. Payne, Frazar's clerk at Yokohama, managed administrative matters. John Lindsley, Frazar's brother-in-law and a Harvard graduate, was the senior partner in Shanghai, Hong Kong and Yokohama. "Electric Lights for Japan," *Daily Alta California* (San Francisco), 5 June 1887, 5; Everett Frazar to TAE, 30 Apr. 1888, DF (*TAED* D8849AAK); "Senior Class," *Yale Pot-Pourri* XIV (1878–79), 22; Yale University 1900, 575; S. Terada to Payne, 4 Feb. 1888; Everett Frazar to TAE, 18 Apr. 1888, both DF (*TAED* D8839ABA, D8805ACF); Poole 1950, 15, 21–22; Harvard College 1913, 30–31.

6. S. D. Niwa and S. G. Niwa; see Doc. 3131.

7. Edison was a silent partner in Bergmann & Co., the New York–based manufacturer of electrical equipment and fixtures headed by German-born machinist Sigmund Bergmann (1851–1927), whose career in America had started in Edison's shop in Newark. Docs. 2343 (headnote) and 2787 n. 2.

8. An unkind American slang term for a Japanese person. *NPDS,* s.v. "Jap."

9. Founded in 1847, Siemens & Halske was the Berlin manufacturing firm for the constellation of Siemens family enterprises and a major fabricator of telegraphic, telephonic, and electric lighting equipment. The Siemens representative in Japan, engineer Hermann R. Kessler, had arrived during 1887 to assess and cultivate the market for electrical goods. Docs. 1851 n. 1 and 2955 n. 1; Wilkins 1989, 434; Takenaka 1996, 55–57.

10. The Yokohama branch of Frazar & Co., while defending their rights and accomplishments as representatives of Edison's electric light, also sought to temper expectations raised by the Niwas. "Beyond two or three towns here, say Kioto, Osaka, Tokio, there is little or no chance of introducing electric light," and only a handful of isolated plants were likely to be sold. "We are surprised," they noted, "that

many people can be so deceived by Japanese abroad." They also cast S. D. Niwa's mission in New York in an unfavorable light, alleging some political favoritism on his uncle's part and questioning both his credibility and his authority to negotiate. Frazar & Co. (Yokohama) to Everett Frazar, 8, 20, and 24 Feb. 1888, all DF (*TAED* D8839AAX, D8839AAY, D8839ABB). Frazar & Co. (Yokohama) to Everett Frazar, 8 Feb. 1888, DF (*TAED* D8839AAX).

11. Alfred Tate promptly informed Hutchinson that Edison "does not wish to have anything more to do with this business. It will be left entirely in the hands of Mess. Frazar & Co." At the same time, Edison sent a letter (prepared by Tate) to Niwa endorsing Frazar's estimated price of $26,386 for a Nagoya plant, explaining that he had been unaware of expenses that reduced Frazar's profit on the deal to "only about 11%." Tate to Hutchinson, 14 Jan. 1888; TAE to Niwa, 14 Jan. 1888; both DF (*TAED* D8818ABE, D8818ABB).

12. Joseph Hutchinson (b. 1853?) succeeded Samuel Insull as secretary of the Edison Machine Works prior to the end of 1887, having held increasing managerial responsibilities in Edison lighting enterprises (including the Edison United Manufacturing Co.) since 1881. Docs. 2420 n. 23 and 2958 n. 3; Edison Machine Works agreement with Edison Electric Illuminating Co., 24 Oct. 1887, Misc. Legal (*TAED* HX87012).

–3138–

Draft Patent Application: Incandescent Lamp

Orange Jany 1~~34~~ 1887[8]

Dyer Patent:

The object of this invention is to construct incandescent Lamps of a candle power generally in use 16 candles[1] of very high resistance, so that high electromotive force can be used and thus diminish the investment in the Copper Conducting wires in[a] the manner now very well known.[2]

The invention consists in the employment of ~~lo~~a single very long filiment of carbon supported in the center of its incandescent part or the use of [~~two o th~~?][b] two or more[c] filiments ~~in two or more parts one part being~~ & causing them be[d] mechanically connected to ~~the~~ one another[e] by a non conducting medium

It is now[f] well known that there is a very considerabl attraction between the Electrified surface of the glass globe in the filiment which of course is charged statically in the opposite way and this tends to draw the filiment if very long & flexible towards the glass distorting it & many cases causing the filiment to touch the glass when the lamp is destroyed. On the other hand when we [-----][b] put two filiments in the globe the mutual repulsion & attraction of the Currents traversing the filiments increases the distortion. The object I have in view is the prevention of this distortion.[3]

Dick— I think I have this already patented <Yes, 242 896>[4g]

fig [2?][f]

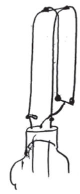


fig 2[5] side view

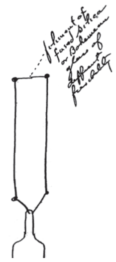
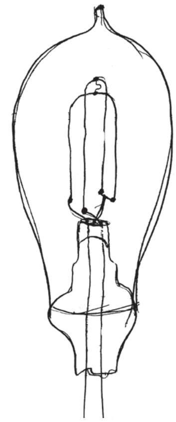


fig. 2

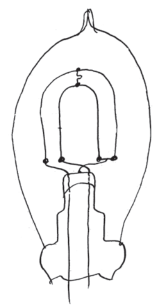
These filiments of insulating material are secured to the carbon by a carbon paste, filiments of pure Silica[a] melted by the Oxyhydrogen blow pipe— ~~Asbestos or thread of alumina squ~~ or the most infusible bohemian glass can be used without danger of melting. The small quantity of carbon paste at the juncture of the filiment of[a] carbon & thread of insulating material serves by its increased radiating surface to reduce the temperature at that point below the fusing or softening point of the glass—

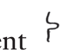
The form I prefer to use is thus[6] fig 3 Top view

filiments at right angle one 3⁄16 inch longer than the other & connecting thread between This makes a very stable combination.[7]



This is another form—



This shews its better. The filiment of Silica is bent  to allow of Expansion

These various forms especially figure 3 gives a very pleasing form of radiating surface very much superior to the method of getting a long filiment by Coiling as is sometimes done. another advantage ~~of~~ [–][b] over the coiling arrangement is that the filiment is not unequally heated by radiation from one spiral to[a] another, that better filiments can be made in the Carbonizing process with filiments not coiled.

Make good strong claims in view of what I ~~h~~already have—

claim the mechanical nonconducting support for holding two or more filiments to prevent distortion. The Right angle arrangement. ~~The u~~ The use of a paste in this connection—

Now Dick here is a fine point. No one but myself has ever constructed a lamp giving 200 volts across its terminals within a single vacuum chamber.[h]

All makers used flashed Carbons,[8] this would bring volts down to 125 or so by using an unflashed Carbon[a] I can use 200 or more. No one before myself has ever used two filiments to get 16 candles of unflashed Carbon in one vac chamber— No one has ever been able to make a 16 cp lamp requiring 200 volts to give 16 candles—

Isn't it possible to Cook up a claim that will hold Lamps of this character— Think it over & let me hear from you—[9]

E[dison]

ADfS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAD). [a]Obscured overwritten text. [b]Canceled. [c]"two or more" interlined above. [d]"& causing…be" interlined above. [e]"one" interlined above; "an" inserted before "other." [f]Interlined above. [g]Marginalia written by Richard Dyer. [h]Multiply underlined.

1. That is, the standard sixteen candle-power Edison lamp.

2. Edison signed the application created from this draft on 2 February. It was filed four days later and issued in September 1888 as U.S. Patent 389,369. The specification referred to an application filed eight years earlier (Edison's Case 202) but still pending at the Patent Office and the subject of wholesale revisions at this time. That application was for a lamp of high resistance produced by having two filaments in series. The filaments had to be very slender, which made them prone to bending. U.S. Pat. 389,369; TAE revised application Case 202, 2 Feb. 1888, PS (*TAED* PT010AAN).

3. Figure labels are "platinum U to prevent distortion" and "glass rod fused to inside part=." Edison had long identified unequal static charges inside the lamp bulb with what he called "carbon carrying" (the blackening of a bulb's interior), one of the related phenomena widely understood at this time as part of the Edison Effect. See Docs. 1898 (and headnote), 2025, 2313, 2346, 2892 n. 6, 2922 n. 12, and 2976.

4. This patent, issued in 1881, pertained to a physical support to prevent the filament from bending over.

5. Figure labels are "filiment of fused silica or Bohemian glass of different fusibility."

6. Figure label on left-most sketch is "filiment silica."

7. The patent resulting from this draft (see note 2) included two drawings based on the sketches below.

8. "Flashing" (or "treating") was a manufacturing process for standardizing resistance by heating a filament in a hydrocarbon vapor to deposit a uniform coating of carbon. Howell and Schroeder 1927, 79–81; Webber 1887, 67.

9. The broad principles of such a high-resistance lamp were not addressed in the ten combination claims of the final specification. They were referenced in revised text submitted on 2 February for Edison's languishing Case 202 but not in the new claims for that application (see note 2).

–3139–

Mina Edison to Mary Emily Miller

[Orange,] Edison Laboratory, Jan. 16/88

My dear Mame.[1]

Mr. Edison is working down here tonight, not even coming up for dinner. He begged so hard to stay so I went up to the house, prepared a lunch for five down here, put on Lena's[2] cap and a large white apron and served them a little lunch on a table here in the office. The lunch consisted of cold Ham and roast beef, baked potatoes, bread and butter, quince jelly, olives, cheese, mince pie, coffee and ~~chocolate~~ milk.[a] Brought down one of the girls[3] table cloth and really made quite a tempting feast for them. Had numerous compliments so felt highly repaid. The hour of the night that will find us sleeping is impossible to predict. They are still working on phonograph so I for one will be heartily glad when they get to manufacturing them letting experiments have a rest. Mr. Edison felt quite pleased to see me in my cap and apron really kissing me before all the workmen. Such little acts go a great way when shown by a husband to his wife.

Tomorrow I have to go into New York again and dread to as ~~you~~ usual. Miss Johnson[4] is coming out to see me on Thursday and I have written Helen Nichols Hall[5] to come and make me a visit.

Mr. Marvin[6] was out to see me last Thursday and said he had sent you a pen hoping you received it all right. He also said that he was going to Boston soon and wanted you and Marion[7] to come in and take dinner with him. We had quite a pleasant visit together, I really enjoyed it about as well as any time I ever spent with him.

Anna Studebaker[8] is visiting Jennie[9] now so I suppose they are having good times at home. Mr. Edison have only been out once since you left for college and that was to hear Thomas concert.[10]

Dear Mamma[11] she is not careful of herself, always looking out for every body else but never once thinking of her own dear little self. I think I let her do too much for me but she is not satisfied unless she is doing something constantly for some one. She is a dear good mother and I only wish that I lived nearer that I might see her occasionally.

I am very careful of myself Mame and I think I am getting on famously. My only hopes are that there are not two. I should feel terribly disappointed if there were.[12]

It is indeed nice to think your French teacher[13] asked you to go to Europe with her. I hope Papa[14] will allow you to go and I think he will. You must try and feel happier at college Mame.

Of course you will do well, why worry about it. You will not regret going through college after once you have finished your course. It may seem hard now but when you get older and look back upon the days of college you will remember them very pleasantly, I know. You are not too old Mame, get that idea out of your head. No body seems contented but always wanting something different than what they have. We must try to be contented.

I will make a bargain with you. If you stop thinking yourself old and worrying over that I will stop thinking myself young. Let us both think we are doing the best we can and be happy.

I am tired and ready to go home but I am booked for this place half past twelve at least and then we will have the pleasure of lodging Mr. Gilliland[15] all night. He seems like an unhappy man and I think it is because he is so susceptible, his own wife[16] does not seem to satisfy him. But it is wrong of me to write this for I have made up my mind never to say anything about anyone and positively never to write anything about a person.

I was going to send your shawl today, but decided to wait until I can send a box of Hylers[17] with it which will be Wednesday.

My Dear Mame I wish you were here with me now but I am terribly selfish with you, wanting you all the time when there are so many who want you at home.

That woman[18] to is[a] coming tomorrow to help me on some of those baby articles. I am not going to New York until afternoon. I am going to have her embroider one or two of my sheets, etc. If there is any pretty thing you see in my line let me know and I will try and have it. I hope my little one will be beautiful in every conceivable way and above all extremely intelligent. Homely people if intelligent are nice looking.

You must not let your studies be a bore for you will be derive no good from them if you do. Please Mame know that you are coming out all right and you will make an accomplished woman.

Dont let your ambition make[b] you unhappy. Still Napoleon was not happy in his youth by a great ways so it may be the right feeling to have if you become anything great.

I think this my second year of married life is going to be my happiest. But I am happy now and I am going to enjoy it while I ~~I~~ may. I only want to gain a little more confidence in this dear kind husband of mine and then I think all will be right.

I think I have followed your request very well indeed. I think the cord Miss Lee[19] is now making for Mamma's [napper?][20c]

will be much prettier. I am going send some books to Grace[21] for her graduating present. Expect your things[b] soon for I am going to send them. I am glad that you love me a little Mame and I hope it may ever grow stronger and I will ever be more worthy. Good night, my sweet, dear sister imagine a good strong kiss from both Mr. Edison and myself. He loves you very much too Mame. Your loving sister,

Mina.[22]

ALS, FFmEFW, EMFP (*TAED* X104P2B). [a]Interlined above. [b]Obscured overwritten text.

1. Mary Emily Miller (1867?–1946), a younger sister of Mina Edison, was often called "Mame" or "Mamie" by family members. She was enrolled at Wellesley College from 1887 to 1888. Jeffrey 2008, 173; Wellesley College [1912], 179.

2. Helena McCarthy (b. 1866?) was a domestic servant at Glenmont, the Edison home in Orange. Doc. 2983 n. 3.

3. Not identified; presumably other members of the household staff.

4. Abby H. Johnson (d. 1908) ran the Boston boarding school formerly attended by Mina Edison. Doc. 2824 (headnote); *Newspaper Extractions from the Northeast, 1704–1930,* online database accessed through Ancestry.com, 22 May 2018.

5. This may be Helen F. Nichols Hall (b. 1865), who married New Haven grocer Edward E. Hall in 1887. She and Mina were the same age and may have been classmates at Abby Johnson's school. U.S. Census Bureau 1982 (1910), roll T624_140, p. 2B (New Haven Ward 9, New Haven, Conn.).

6. Richard Pratt Marvin, Jr. (1848–1906), the son of a former member of the U.S. House of Representatives, was born in Chautauqua, N.Y., but had lived in Akron, Ohio, since at least 1880 and evidently was a friend of the Miller family. Jeffrey 2008, 170.

7. Marion Estelle Edison (1873–1965) was the eldest child of Edison and his first wife, Mary Stilwell Edison. She had been enrolled at the Bradford Academy in Bradford, Mass., near Boston, since the previous fall. *TAEB* 1, chap. 11 introduction; Jeffrey 2008, 161; see Doc. 3094.

8. Anna (or Anne) Studebaker (1868?–1931) was the daughter of Clement Studebaker and his second wife, the former Anna Milburn Harper. The father was a principal of Studebaker Brothers Manufacturing Co., a major producer of carriages and wagons in South Bend, Ind., and the Studebakers knew Mina's family through the Chautauqua Institution. The family was strongly connected to the Republican Party, and the daughter, known in adulthood as Anne, was active in party affairs throughout her life. See Docs. 2974 n. 6, 3030; "Mrs. Anne S. Carlisle, Civic Woker is Dead," *Indianapolis News,* 5 Jan. 1931, 12; U.S. Census Bureau 1970 (1880), roll T9_309, p. 406B, (enumeration district 162, South Bend, St. Joseph, Ind.); *ANB,* s.v. "Studebaker, Clement"; *DAB,* s.v. "Studebaker, Clement."

9. Jane Eliza Miller (1855–1898), Mina's older sister, was known to her family as Jennie. Doc. 2871 n. 3.

10. Mina presumably referred to renowned orchestral conductor

Theodore Thomas (1835–1905), who at this time directed both his own ensemble and the New York Philharmonic. Thomas presented the first in a short series of Philharmonic public rehearsals and concerts at New York's Steinway Hall in early November; the most recent event took place on 12 January. *ANB* s.v. "Thomas, Theodore"; "The Thomas Concerts," *NYT,* 4 Nov. 1887, 5; "The Thomas Concerts," *NYT,* 13 Jan. 1888, 5.

11. Mary Valinda (née Alexander) Miller (1830–1912) was a native of Illinois. She married Lewis Miller in 1852, settled in Akron, Ohio, and had eleven children with him, of whom Mina Miller Edison was the seventh. Jeffrey 2008, 173.

12. Mina Edison had an unsuccessful pregnancy in 1887, during which she apparently felt some concern about having twins. She was now about halfway through another pregnancy, one that resulted in the birth of her first child in May. *TAEB* 8, chap. 7 introduction, esp. n. 26.

13. Probably Adele M. Constans (1856–1926), a native of Alsace and an instructor of French at Wellesley. Constans was engaged to be married to a U.S. Army officer in 1891. Find A Grave memorial no. 180227755, accessed through www.findagrave.com, 23 May. 2018; *Transactions of the Modern Language Association of America, 1884–85,* 1 (1886): xcix; "West Point, N.Y.," *Army and Navy Journal* 19 (19 Sept. 1891): 62.

14. Lewis Miller (1829–1899), Mina's father, was a prominent inventor and manufacturer of agricultural equipment in Akron, Ohio. He was also an educator, philanthropist, and co-founder of the Chautauqua Institution. Doc 2853 n. 1.

15. Ezra Torrance Gilliland (1848–1903) had renewed an old friendship with Edison in October 1884. He and his wife Lillian successfully orchestrated Edison's search for a bride in 1885, and the two men began building adjacent winter homes in Fort Myers, Fla., late that year. Edison playfully nicknamed him "Damon," an allusion to the loyal friendship personified by Damon and Pythias of Greek mythology (see Docs. 2730 n. 6, 2824 [headnote], 2826 n. 3, 2860). Gilliland collaborated professionally with Edison and was now intimately involved with developing, manufacturing, and marketing the phonograph (see Docs. 2743 and 3123).

16. Lillian Gilliland (b. 1858?), the daughter of Sidney Johnson, a carpenter and machinist of Madison, Ind., became Ezra Gilliland's second wife in 1880. Doc. 2824 n. 4

17. Huyler's was a prominent manufacturer and retailer of chocolates and other candies, based in New York. The business dated to 1874 and was incorporated in 1881. "John S. Huyler Dies in 65th Year," *NYT,* 2 Oct. 1910, 13.

18. Not identified.

19. Not identified.

20. Mina perhaps referred to a tool or device for raising the nap on cloth. "Napper" was also a colloquial term (chiefly British) for one's head. *OED,* s.v. "napper."

21. Grace Miller (1870–1952), Mina's youngest sister, was at Miss Porter's School in Farmington, Conn. She later earned an A.B. degree from Wellesley College. Doc. 2974 n. 12; "Grace Miller Hitchcock Dies at 81 in Florida," *Akron Beacon Journal,* 23 Apr. 1952, 34; "Personals,"

Summit County (Ohio) *Beacon,* 8 Jan. 1890, 3; "Private School," *Akron Beacon Journal,* 1 Sept. 1899, 6.

22. Mina Miller Edison (1865–1947), originally of Akron, became Edison's second wife in 1886. Doc. 2824 n. 2 (and headnote).

–3140–

Draft Patent Application: Phonograph

Orange Jany 17 1888

Dyer Patent—[1]

The object of this invention is to produce a good material for the Phonogram[a] Cylinders which will give Loudness &[b] clearness of articulation & freedom from excessive ~~no~~ scraping sounds. I have ascertained from a large number of experiments that to obtain these results The ordinary waxes of Commerce are not sufficient. ~~They are too soft to~~ [----][c] ~~either too hard or too~~ mostly too soft[d] and it is essential to use a hardening material mixed with them. For this purpose I have discovered that Carnauba Wax is the best hardener for mixing with the various soft waxes, and it may be used in various proportions up to the point where it is such quantity as to cause [~~excess~~? ~~e~~-------][c] scraping sounds.[2] Carnauba Wax itself is very ~~b~~hard & brittle & utterly unfit for material for phonograms. [~~What~~? --][c] The Various qualities of Beeswax Spermaciti, Cerosin[3] may have from 10 to 50 percent [---][c] of Carnauba Wax mixed with them without practically increasing the scraping sounds in the phonograph The increasing percentages continuously increasing the Volume of Sound clearness of articulation & Convenience of turning off the face of the cylinder up to the point where the Carnauba Wax is in such Excess as to evince its presence by scraping sounds. Some waxes such as parafine cannot be made to disguise the hard scraping ~~p~~Sound producing properties of Carnauba, But beeswax perfectly disguises it up to 50 percent or more according to the temperature of the phonogram cylinder when manipulated. The percentage of Carnauba wax to be added will depend on the shape of the recording point. If very fine a large percentage can be added than if not so fine. I do not wish to confine myself to any particular proportion of Carnauba with the other waxes as they may be varied & produce proportionate results according to the character of the phonograph in which the cylinders are used—

I desire to claim the use broadly of Carnauba ~~or similar wax~~ wax or wax of like composition[e] as a general hardener of the softer waxes for phonograph[a] Cylinders

Edison

ADfS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAE). [a]Obscured overwritten text. [b]Interlined above. [c]Canceled. [d]"~~either too~~...too soft" interlined above. [e] "or wax...composition" interlined above.

1. This draft did not result in a patent for Edison. At least two numbered Edison applications completed between 21 January and 20 February are missing, and their subjects are unknown (see App. 5). It is likely that one of these applications was based on this draft and was entered into interference with a November 1887 application of Charles Tainter. Tainter recalled years later that he learned from the Patent Office that the interfering application was Edison's. As Edison was the second to file and could not prove an earlier date of "invention," Tainter was awarded the patent (U.S. Pat. 393,190) in November 1888. When Tainter recounted the episode in his memoir, he pointed out that "At that period there was strong suspicion among inventors that there were leaks in the patent office, and that all patent applications were not being kept secret, as they should have been. The filing of interfering applications was a favorite method of getting an invention away from an inventor. It forces him to prove when the invention first occurred to him, which is usually difficult to do"—as well as expensive. Tainter implicitly blamed this particular "leak" on a "Capt. Seely" at the Patent Office, whom he mistook for Henry W. Seely, one of Edison's patent attorneys at the time. Tainter likely meant former Union army officer Franklin Austin Seely, now the principal Patent Office examiner for instruments of precision and for trademarks, who was either the father or an uncle of Henry Seely (Tainter n.d. [1931?], 89–90; see Doc. 2695 nn. 2, 5); see note 2 regarding Edison's experimental work with carnauba.

2. Edison had conducted experiments with mixing carnauba wax into a recording medium since September 1887 (see Docs. 3093 and 3112). When Jonas Aylsworth began his experiments at the beginning of 1888, the standard mixture was in the proportion of 30 grams carnauba and 100 grams paraffin. Within a short time Aylsworth, substituted 100 grams of cerosin and described the resulting wax compound as "'Bang up.' can be molded No scratch, scarcely, Mr Edison adopts it as Regular" (N-87-01-01:7, Lab. [*TAED* NB001001, image 4]). Aylsworth's subsequent experiments through 20 March "comprised chiefly an admixture of natural waxes, gums and resins in various proportions, together with some miscellaneous experiments on treating carnauba wax to partly saponify it, and mixing the same with ceresin; experiments with natural asphalt, and some few experiments on crystallization." During March and April, Arthur Payne also conducted wax cylinder experiments using carnauba wax as part of the compound (Aylsworth's testimony, p. 14, *American Graphophone Co. v. National Phonograph Co.,* Lit. [*TAED* QP003046, image 90]; N-87-01-01:7–95; N-88-03-06; both Lab. [*TAED* NB001001 (images 4–50), NB001095, NB026AAA–NB026AAF1, NB026AAK]).

3. A waxy substance obtained from some varieties of sugar cane. *OED,* s.v. "cerosin."

Draft Patent Application: Phonograph

Orange NJ Jany 17/88

Dyer Patent.

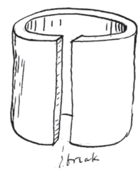
The object of this invention is the economical production of perfect phonogram Cylinders—

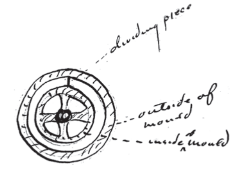
The invention consists in the method of moulding the same and finishing to a perfected article.

Cylinders formed of Waxes, Gums or mixtures of the same when poured from a melted state into a mould contract enormously on cooling especially those mixtures suitable for phonogram cylinders hence it is a very difficult matter to mould hollow tubes or cylinders wholly of ~~the~~ such material, The great shrinkage causing the same to Crack notwithstanding the[a] various devices Employed— The moulds are also complicated & Expensive and experts must be Employed To obviate the great expense for apparatus and to produce cylinders of great perfection, I divide the circumfrential Continuity of the cylinder by a narrow strip placed in the mould. on pouring the liquid in the same the same is not continuous around the circumference on cooling instead of the cylinder contracting inwardly & thus cracking it contracts both directions from the dividing piece, ~~when~~ [-][b] without the slightest danger of distortion or cracking. It may be left to cool in the mould. When cold the [-----][b] shell has contracted in thickness sufficiently to be easily[c] removed from the mould. As it comes from the latter there is a break of about ¼ of an inch principlly due to contraction. The Cylinder is then put on a mandril or cylinder of metal, tapering[a] until it fits. End pieces are fitted at the Extremities of the break. This break is poured full of hot wax which perfectly fuses to the Edges of the break, quickly cools & the Cylinder is made continuous and ready for the shaping Lathe. The Cylinder is clamped Lightly in a Chuck & a Cutting tool set on a taper bores it out to a uniform taper corresponding to the taper of the Cylinder of the phonograph afterwards the cylinder is placed on a mandril & its face is turned off true. The phonogram blank is now ready for use—

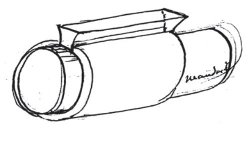
Will it be necessary to take out 2 patents. This is good thing so draw broad claims[1] These terrible contractions dont seem to have been encountered in any other industrial operations.

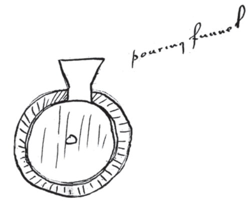
1st operation[2]





2nd operation[3]





Edison

ADfS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAB). Drawings made on separate sheet. [a]Interlined above. [b]Canceled. [c]Obscured overwritten text.

1. This draft was the basis for a patent application (Case 756) on a "Process of Making Phonograph Blanks" that Edison executed on 24 January (PS [*TAED* PT032AAS]). The application contained two claims and six drawings, the first four of which correspond to Edison's sketches. Both claims were swiftly rejected by the Patent Office on the ground that they covered familiar processes applied to new materials. Edison amended the application on appeal; when this, too, was rejected, he abandoned it in 1892 (Alfred Tate to Dyer & Seely, 26 Feb. 1892, PS [*TAED* PT032AAS1]). In the meantime, Edison had filed in short order at least two other applications for molding or pressing phonogram blanks from hot wax. One was executed on 30 January 1888; Edison signed the other, which referred specifically to the problem of thermal contraction, on 28 April 1888 (U.S. Pats. 382,417 and 393,462). At least four other numbered applications completed between 21 January and 20 February are missing, and their subjects are unknown. See App. 5.

2. Figure label in the first drawing is "break"; labels in the second drawing are "dividing piece," "outside of mould," and "inside of mould."

3. Figure label in the first drawing is "mandril"; label in the second drawing is "pouring funnel."

–3142–

To Arthur Kennelly

Orange, N.J., [c. January 18, 1888][1a]

Kennelly—

Sir Frederick Bramwell[2] desires to deliver a lecture before the Royal Institution[3] on some of my inventions— He desires descriptions, and such apparatus as I can furnish him[4] Mr Hamilton[5] will leave for England in about 3 weeks with phonograph to learn my agent[6] there— Mr H can be shewn here before he goes how to work the apparatus The following I want got ready with descriptions—[7]

Motograph Mirror Galvanometer now making[b] Test this for maximum sensibility & give its good and bad points— See that Mr Ott has the old hand screw press set up an couple dozen chalk cylinders made.[8] a Lampstand and scale should be sent with it— The spot of Light should be clearly defined to show Audience This apparatus is to be run by one of The new motors now making—[9c] <Mr Ott>[d]

Motograph Relay now making— get greatest resistance it works through with one Daniel—[10] A Sounder goes with this also Key and one of the new motors drive it—[c] <Mr Ott>[d]

Put up that Magnetic Bridge and if you find it gives acurate results, we will send that— <Mr Ott>[d]

The Motograph Telephone now making arranged to talk very loud & provided with a good Edison transmitter.[11] Talking should be heard 500 feet away otherwise we will not send it—[c] <Mr Ott>[d]

Volt Indicator zero method now in use in Engine room & made by the Lamp factory[12c] <Mr Edison>[d]

The phonoplex system consisting of 3 stations with phonoplex & morse at each station. We have these instruments already set up— Hamilton understands this sytem—have him explain it to you— Tate will give you printed matter relating to it also data as to number of Railroads using in it in this country— <Mr Tate>[d]

Railroad Induction system—[13c]

get apparatus for this. it consists of a regular telephone at both ends for receiving two induction coils with vibrating diaphragms in front of them and a key to control the vibrations <Mr Edison>[d] Two paralell wires are put up a few feet from Each other. Hamilton also understands this sytem— Gilliland can get you all the printed matter relating to this system.[c] <Mr Gilliland>[d]

New municipal Lamp with central wire[14]—get ½ dozen from Lamp factory= Get ½ dozen new 15 per hp lamps[15] tested for spots ie[e] put down at dull red to see if there is any spots— New 200 Volt candle power lamps[16] ½ dozen we are making a few for test here— <Mr Edison>[d]

Continuous[b] Current transformer, one of the new motors driving a commutator, with a dozen Induction[b] Coils in circle like a gramme ring & commutated.[17] Speak to me about this so I can get John Ott to design it—[c] <Mr Ott>[d]

Get through Batchelor[18] who will obtain from Machine Works the data about new rotating Continuous Current transformer tested at Machine Works[c] <Mr Batchelor>[d]

New system of working tram car Railroads by using continuous current[f] transformers with 2000 Volts all arranged in multiple arc and reducing the tension down to 15 volts & connecting this direct to traffic rails at intervals.[19] I will Explain this to you— <Mr Edison>[d]

Small models (working) of the pyromagnetic Generator and also the pyromagnetic motor, to illustrate the principle— See me about this Ott will have to design them.[c] <Mr Ott>[d]

Better set up that long magnet 100 feet long I think & see if what I stated is correct[20] we can probably work this in— <Mr Ott>[d]

Edison

ALS, NjWOE, DF (*TAED* D8805AAJ2). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" preprinted. [b]Obscured overwritten text. [c]Followed by dividing mark. [d]Marginalia written by Kennelly. [e]Circled. [f]Interlined above.

1. Edison likely prepared this list within a day or two of a "most urgent" cable sent by Frederick Bramwell on 17 January. Bramwell asked for information "without delay" for an exhibition he proposed to make, and Edison drafted a reply promising to send apparatus in about three weeks. Bramwell to TAE, 17 Jan. 1888; TAE to Bramwell, n.d. [c. 18 Jan. 1888]; both DF (*TAED* D8805AAG, D8805AAH).

2. Sir Frederick Bramwell (1818–1903) was a mechanical engineer highly respected for his legal and consulting work. He was a vice president of the Royal Institution of Great Britain and a Fellow of the Royal Society, and he had rendered important legal advice on Edison's British electric lighting patents in 1882. Doc. 2258 n. 16; "Weekly Evening Meeting, Friday, March 23, 1888," *Proceedings of the Royal Institution of Great Britain* (12): 262.

3. The Royal Institution of Great Britain was chartered in 1799 amid social and economic crisis to cultivate and distribute scientific knowledge, particularly in agriculture, manufacturing, and other practical endeavors. The Institution provided public lectures as part of its educational mandate and these, especially in the gifted hands of Michael Faraday, solidified its reputation from the 1820s onward as a relatively democratic and public-spirited scientific organization, notably in contrast to the patrician Royal Society. Berman 1978, chaps. 1, 4, 5.

4. Bramwell had solicited Edison's help in November 1887 for a lecture that he wished to deliver in the winter, for which Edison pledged his cooperation and enlisted the help of George Gouraud. Little seems to have happened until 17 January, when Bramwell cabled an urgent request for Edison to send information and apparatus quickly. Edison drafted a reply that apparently miscarried, leading Bramwell to ask George Barker to "Rouse Edison" and to a subsequent flurry of correspondence (Bramwell to TAE, 16 Dec. 1887 and 17 Jan. 1888; TAE to Gouraud, 30 Dec. 1887; TAE to Bramwell, 18 Jan. and 13 Feb. 1888; Barker to TAE, 6 Feb. 1888; Alfred Tate to Barker, 7 Feb. 1888; all DF [*TAED* D8704AFT, D8805AAG, D8717ACO, D8805AAH, D8805AAT, D8805AAO, D8818ADA]). As late as mid-February, Edison planned to dispatch Hugh de Coursey Hamilton with apparatus and illustrations before the end of the month. However, as problems with the phonograph delayed Hamilton's departure, on 29 February Edison instead mailed (in care of Gouraud) "diagrams and descriptions" of a small subset of the items listed in this document: the phonoplex, recording voltmeter, magnetic bridge, induction telegraph, and pyromagnetic generator. He also sent technical journal articles, "as many popular descriptions of these devices as I can gather together," and copies of a recent *New York Sun* article on the phonograph. All this was too late or too little for Bramwell, who evidently never delivered his planned lecture (Tate to Barker, 13 Feb. 1888; TAE to Gouraud, 29 Feb. 1888; both DF [*TAED* D8818ADV, D8818AFL]).

5. Hugh de Coursey Hamilton (1864–1928) entered the Edison orbit in 1882 partly through the intercession of George Gouraud, working first at the Pearl St. central station and then, from November 1882, in Edison's laboratories (Docs. 2425 n. 9 and 2817 n. 2; contrary to the editors' previous biographical statements, Hamilton was a native of Pennsylvania, though he appears to have had family ties to England and Scotland. His father, Hugh Hamilton, was also connected with Edison. *Pennsylvania Death Certificates, 1906–1963,* online database accessed through Ancestry.com, 14 Apr. 2016; U.S. Census Bureau 1982 [1910], roll T624_1328, p. 21A [Tredyffrin, Chester, Pa.]; U.S. Census Bureau 1992 [1920], roll T625_1550, p. 2A, image 1161 [Tredyffrin, Chester, Pa.]). Hamilton had assisted with a variety of inventive projects and spent parts of 1886 and 1887 abroad in search of materials for lamp filaments before joining the staff at the new Orange laboratory in late 1887 (see Doc. 3077). In December of that year, Edison designated him (at Gouraud's suggestion) to carry the first improved phonograph to Britain (Gouraud to TAE, 30 Nov. 1887; TAE to Gouraud, c. 15 Dec. 1887; both DF [*TAED* D8751AAJ, D8717AAW]).

6. George Gouraud.

7. Many of the items mentioned below are referred to and briefly described in Doc. 3129.

8. The motograph cylinders were formed by forcefully pressing the chalky alkaline compound in a mold.

9. Likely one of the new motograph motors mentioned in Doc. 3129 (see n. 33).

10. The Daniel battery cell, widely adopted in the telegraph industry, produced a reliably steady voltage and was often used as an electrical standard. Doc. 334 n. 3.

11. That is, a carbon telephone transmitter.

12. Edison referred to the type of voltage indicator that had been standard in Edison central station systems for several years. It accurately measured voltage in one circuit relative to another circuit, rather than against an absolute standard (Doc. 2538 [headnote]). A helpful contemporary explanation is "Instructions for Operating the Edison System of Central Station Lighting," an instructional pamphlet published by the Edison Lamp Co. (pp. 2–3), n.d. [1887], PPC (*TAED* CA041J1).

13. That is, the wireless railway ("grasshopper") telegraph.

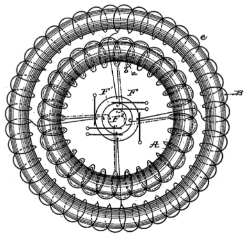
14. This type of lamp was designed specifically for Edison's "municipal" direct current incandescent street lighting system. Because the lamps were connected in series, they required a "cut out" device (energized by a central electrode in the bulb) to bridge the circuit around a broken lamp. The lamp design, introduced in 1887, was now standard for Edison street lighting systems. See Docs. 2877 n. 1 and 3055.

15. The "new" lamp was the latest iteration of the standard incandescent lamp resulting from the ongoing search for higher efficiency by Edison and the Edison Lamp Co. The new 16-candlepower lamps, guaranteed to operate at sixteen lamps to the electrical horsepower, seem to have made their commercial debut just about this time and were supplanting older styles (the best of which ran at fifteen to the horsepower). Doc. 3050 nn. 3 and 5; "New Lamps of the Edison Company," *Electrical Review* 11 (25 Feb. 1888): 1.

16. Possibly the lamp mentioned in Doc. 3129 (see n. 41).

17. Edison seems to have had in mind not a conventional motor-generator but what he termed (in February) a "peculiar transformer" for "reducing continuous Current from high to Low tension." According to the patent application that he filed on 21 May for an "induction-converter," the device was a variation on the rotary converter (transformer) covered by his U.S. Patent 287,516. The essential difference was that both the armature and field coils remained stationary so as "to avoid the necessity of rotating such heavy parts as the armature…and to do away with sparking at the commutators, whereby the necessity for having an attendant at the transformer is done away with, and the apparatus can be left to itself, as an alternating current transformer is." Instead of turning the mass of metal and wire through a magnetic field, Edison rotated brushes across commutators of both the armature and the field coils. The armature itself was an iron ring, like that of a Gramme dynamo, with primary and secondary coils wound continuously around it. The field magnet, also a ring, was positioned concentrically around the outside of the armature. Commutating the current through the armature 90 degrees out of step from the current through the magnets in effect produced a changing magnetic field with respect to the armature; as a result, "the inductive effect of the field magnet and the fine coil, when a high tension continuous current is introduced into them, produces a low tension continuous current in the coarse or secondary coil." The brushes, moreover, were positioned inside the commutator so that centrifugal force would ensure good contact with the bars to minimize sparking.

TAE marginalia on J. Tariner to TAE, 6 Feb. 1888, DF (*TAED* D8828AAH); U.S. Pat. 534,208; see Doc. 3189.



*Schematic drawing from Edison's U.S. Patent 534,208 for a DC "induction converter" or transformer. Field magnet **B** and its coils lie outside the stationary armature **A** with primary and secondary windings; stationary commutators for each (with their rotating brushes) are drawn concentrically in the middle.*

Zénobe Gramme constructed an armature with the induction wires coiled around a ring; he incorporated it (about 1870) into the first commercially successful dynamo. The coils could be wound to produce either alternating current (collected through a slip ring) or direct current (collected through a commutator). Edison had long experience with the basic Gramme design and had considered using it as a motor in electrical meters. Doc. 2931 n. 4; Schellen 1884, 221–29; Thompson 1905, 151–52; see also Docs. 2143 n. 4 and 2418 n. 1.

18. Charles Batchelor (1845–1910) was Edison's longtime principal research assistant and one of his most trusted associates in business and manufacturing, domestically and abroad. Presently the de facto manager of the Orange laboratory, he had until recently been treasurer and general manager of the Edison Machine Works (and was evidently still its vice president). Batchelor played a key role in Edison's renewed interest in the phonograph in 1887 and in subsequent experiments. Docs. 264 n. 9, 3018, 3042, 3051 nn. 2–3; Letterhead, Samuel Insull to Batchelor, 3 Nov. 1887, DF (*TAED* D8757ACE).

19. The editors have not found more information about this idea but cf. Doc. 3320.

20. It is not clear what statement Edison had in mind, but he had a longtime interest in the properties of unusually long or large magnets. On his honeymoon in 1886, he designed but was unable to try an experiment to correlate the field strength of long magnets with the period of a needle oscillating within the field (see Doc. 2918 esp. n. 2). That line of inquiry may be related to a series of experiments that Arthur Kennelly began on 20 January in Edison's new galvanometer room at the laboratory. Kennelly used an 80-foot length of iron telegraph wire magnetized by a thin insulated conducting wire coiled around it, through which a dynamo current passed. He brought the ends of the iron wire (the poles of the magnet) close to a suspended needle and observed its oscillation. Kennelly's description does not specify what would cause the needle to swing, but he used the period of oscillation to "represent the magnetic force of the poles" at different points in time as the magnet gradually discharged over the course of many days (p. 4). On 26 January, he made a table plotting the magnet's loss of strength against elapsed time and the increasing period of the needle's swings. Kennelly sporadically continued these experiments through February with magnetized iron wires of various lengths, at times assisted by Osgood Wiley, Johannes Cuntz, and Walter Thompson. His records of these trials overlap those of similar experiments (notably with a magnetic pendulum, a "pyromagnetic induction apparatus" [p. 20], and Edison's magnetic bridge), and the distinctions among them likely would be very confusing if not for an index that he created on unnumbered pages at the front of the notebook (N-88-01-19:1–45, Lab. [*TAED* NB019003]; Time Sheets for Wiley, Cuntz, and Thompson [all 26 Jan. 1888] and Kennelly [23 Feb. 1888], WOL; see also Doc. 3146).

–3143–

To Mary Shine

[Orange,] Jan. 18, 88.

Dear Miss Shine:—[1]

In reply to your letter of the 13th instant,[2] I regret to say that I do not employ girls in my Laboratory. You might write to the Edison Lamp Co., East Newark, N.J., where a great many girls are employed.[3] Yours truly,

T.A.E.

TL (carbon copy), NjWOE, DF (*TAED* D8815AAK). Initialed for Edison by Alfred Tate.

1. Mary Shine (b. 1867?), born in New York to Irish parents, wrote to Edison from Orange (see note 2). U.S. Census Bureau 1970 (1880), roll 780, p. 128D, image 713 (Orange, Essex, N.J.).

2. Inquiring "if girls are employed in your Laboratories," Miss Shine told Edison she would "be delighted to obtain work in your Factory." Following the suggestion Edison made in reply, she applied to the Edison Lamp Co. but was unsuccessful. Alfred Tate then referred her to the Edison Phonograph Works where, in November, she was again unsuccessful. Shine to TAE 13 Jan. and 16 Aug. 1888; Tate to Shine, 17 Aug. 1888; all DF (*TAED* D8814AAN, D8814ADK, D8815ABX); Tate to Shine, 17 Nov. 1888, Lbk. 27:84 (*TAED* LB027084).

3. The Edison Lamp Co. was situated to draw on the Newark region's large pool of low-wage youthful and female workers (see Docs. 2061 and 2297). In 1889, several girls or women were paid through the laboratory payroll system for unspecified work in making musical recordings, though they were not necessarily Edison employees (see App. 4).

–3144–

To Henry Villard

Orange, N.J., Jany 19 *1888*[a]

Friend Villard—[1]

I have been so busy getting my Laboratory in order that I have not had time to take our matter up. I send you some data which you can read over. I should like to see you for a couple of hours either at your house in the evening, or if it would be convenient should very much like to have you come over some afternoon before dark and see what a fine Laboratory I have; bring your wife[2] and stop for dinner or stay all night would be still better.[3] Yours,

T A Edison

ENCLOSURE[4b]

Orange, N.J.,[c] [January 19, 1888?]

I understand from Mr Tomlinson[5] that you prefer a partnership, say for 5 years and go in on everything except

Ore Milling, phonograph (but mfg) ~~&~~Telephone & Electric Light We to divide even on inventions—You pay all experimental Expenses and own half of the invention— If we sell the invention outright to others we share Equally. But if you furnish money to manufacture you get 30 pct I 30 percent, and 40 pct goes to the money of the profits But in case of the phonograph I get 40 and you 60 of the Manufacturing profits as I have mostly paid the experimental expenses[6]

Cost Laboratory Bldgs, Land & fixtures about $90,000. Cost machinery & Supplies—$90,000. Total Cost estimated when all complete, $180,000.—[7]

Running Expenses estimated $60 000 yearly of this amount The following will probably be paid for experiments yearly[8]

Lamp Company	$10 000
Edison Electric Light Co	5000
Edison Machine Wks	6,000
Phonograph Co.	3000
Ore Milling Co[9]	3000
	27 000
Total Cost	60 000
Receive	27 000
	$33 000. to be provided for

Following are the things I propose working—[10]

1 A Cotton Picker to do for Cotton what the mowing machine has done for Cereals—

2 Apparatus for Deaf people to increase Audition, (enormous demand)

3 Improved Battery for general Service (nothing in the market is satisfactory—the demand is enormous)

4 Increasing the speed of signalling on Submarine Cables to permit of the use of a Cable direct from NY to London at ⅓ the present cost

5 Electrodeposit in high Vacuo for commercial use to Replace the present Electrotype system—

6 Artificial Silk

7 Malleabilizing Cast iron cheaply

8 Drawing fine sizes of Brass wire & sizes where there are 40 pct duty

9— Snow compressing Machine for cleaning streets.

10 Refining Copper Electrically

11 Cutting Ice & wood[d] ~~for~~ by Electricity.

12 Manufacture of cheap Bolting Cloth.
13 Manufacture of sheet glass & tubes.
14 Artificial Mother Pearl
15 Cheap India Ink
16 Ink for the blind
17 Regenerative Kerosene burner
18 Defraction surface for Ornamental uses
17 Coal Sorting Machine.
18. Butter Direct from Milk
19 Artificial Ivory
20— Magneto RR signal system
21— Electricity Direct from Coal
22 Decarbonizing pig Iron Electrically
Phonograph—

About 15 000 has been spent so far in shop at Bloomfield[11] and at Laboratory making tools, patterns, etc and manufacturing the parts for a considerable number of machines— We should have had the Phonograph on market before this, but we saw so many things that could be changed to make it more convenient to the Customers that we have altered them from time to time so that now we are perfectly satisfied and hope to have them on sale by Feby 20th— With 6 or $7000 more spent in machinery in the little Bloomfield shop we shall probably be able to turn out 25 to 30 daily working nights[e] until a new factory can be built which cannot be Commenced until the frost is out of the ground, say May 1st— This factory can be put up & in running order by August 1st if not sooner The success we have with the sales up to May 1st will determine the size of the factory= My[f] impression Is that the factory should have a capacity of 200 machines daily and supplies for same— Roughly the Land will cost $5000—The buildings $30,000. The machinery complete with 3 months supplies $65 000— The machinery is mostly standard and can be used for almost any kind of mechanical manufacturing— About $15 000 in Current cash would be required to carry stock & wages on machines during process of construction—

The contract with the phonograph Co[12] is for an allowance of 20 percent profit on the cost of machines. The Cost being Labor material & general Expense. The $15 000. current cash & $10,000.[13] supplies would be the money outside of investment we should have to turn, we ought to turn this ~~1~~20 times a year. The Contract with the general Agent[14] is that he pays the factory for all machines in 40 days from date of shipment.

ALS, Villard, Box 51, Folder 551 (a copy, likely written by Mina Edison, is in DF [*TAED* D8805AAI]). On letterhead of Edison laboratory. [a]"*Orange, N.J.,*" and "*188*" preprinted. [b]Enclosure is an AD on letterhead of Edison's laboratory; a copy, likely written by Mina Edison, is in DF (*TAED* D8805AAI). [c]"*Orange, N.J.,*" preprinted. [d]"& wood" interlined above. [e]"working nights" interlined above. [f]Obscured overwritten text.

1. Financier Henry Villard (1835–1900) was an early backer of Edison's development of electric light and motive power in the United States and abroad. He had been a director of the Edison Electric Light Co. but resigned after suffering bankruptcy in 1884. He moved back to Germany, settling in Berlin, where he became associated with the Deutsche Bank. In 1886, after helping Edison to harmonize the interests of the French and German Edison electric companies, he returned to New York as the American investment advisor and manager for Deutsche Bank. Docs. 2959 n. 1, 2965, 2975.

2. Villard married Helen Frances Garrison (1844–1928) in 1866. Fanny, as she was known, was the daughter of Helen Eliza Benson and William Lloyd Garrison, the famous Boston abolitionist and publisher. She was a philanthropist and activist in her own right, especially after her husband's death in 1900, on behalf of women's rights and peace causes. *ANB,* s.vv. "Villard, Fanny Garrison," "Villard, Henry."

3. Villard responded a few days later that he hoped to visit but could not set a date; in the meantime, however, he wished to talk over Edison's ideas with John Tomlinson, Edison's attorney. On 6 February, Villard wrote that he wanted to come to Orange with Tomlinson and "devote the day to you and your interests." Edison was in Chicago at the time, but upon his return he invited Villard to meet with him and Tomlinson; after several abortive attempts, they finally convened in Orange on 28 February. The editors have learned nothing more about that meeting. Villard to TAE, 23 Jan. 1888, letterbook 58:330, Villard; Villard to TAE, 6, 13, and 24 Feb. 1888; TAE to Villard, 13 Feb. 1889; all DF (*TAED* D8805AAM, D8805AAS, D8805AAZ, D8818ADW); Josiah Reiff to Uriah Painter, 29 Feb. 1889, UHP (*TAED* X154A7BE).

4. Edison compartmentalized the various sections of this enclosure on separate sheets of unnumbered paper with no indication of their intended order; the editors have adopted the sequence of the copy in his files, in which the text filled each page irrespective of section divisions. The terms outlined in Edison's proposal were largely embodied in an undated draft five-year contract with Villard. Edison's proposal was a variation of his scheme for an Edison Industrial Co. that he had put to the partners of Drexel, Morgan & Co. and William Lloyd Garrison, Jr., in 1887. TAE draft agreement with Villard, n.d. [Jan. 1888?], Misc. Legal (*TAED* HX88036); see Docs. 3078, 3080–81, 3088, and 3095.

5. John Canfield Tomlinson (1856–1927), a partner in the New York law office of Ecclesine & Tomlinson, represented Edison for several years in a variety of business and personal matters beginning about 1883. He was also the patent attorney of the Edison Electric Light Co. A widower, Tomlinson married Dora Grant of Boston in July 1888. Doc. 2770 n. 1; Chamberlain 1903, 2:170; *Massachusetts, Marriage*

Records, 1840–1915, online database accessed through Ancestry.com, 27 June 2018.

6. In a draft list of inventions related to this proposal, Edison laid out a similar set of terms and also estimated his "Expenses to date about $20,000 Weekly expenses—600." He calculated his experimental costs as $90,100 annually based on interest ($9,200), insurance ($1,100), taxes ($1,200), depreciation ($9,200), supplies ($7,000), and labor ($62,400). TAE memorandum, n.d. [Jan. 1888?], DF (*TAED* D8805AAJ1, images 4–5).

7. According to his account books, Edison had already spent about $130,000 on his laboratory by the end of 1887: $53,132.59 for real estate and buildings, $26,629.94 on fittings and fixtures, $3,949.56 for appliances, $27,871.67 on machinery and tools, $1,595.13 for small tools, $7,403.99 on fine instruments, and $9,582.61 for raw materials. Ledger #5:423–35, 607, Accts. (*TAED* AB003, images 215–20, 301); see also Journal #5:1, WOL (*TAED* NL016A1, image 2).

8. In the draft contract with Villard (see note 4), the laboratory's estimated expenses totaled $90,100, of which Edison expected about $52,000 to be paid by outside parties. Regarding experimental expenses to be paid by the electric lighting companies, see Doc. 3145. Terms of contributions by the Edison Ore Milling Co. were covered by the fourth clause of the firm's 14 October 1887 agreement with Edison (Miller [*TAED* HM87AAU]).

9. The Edison Ore Milling Co. was incorporated in December 1879. It held broad rights to Edison's inventions for the extraction of precious and base metals from ores. Edison reorganized the company in 1887 and increased its capital stock to two million dollars. He also entered into a new contract with the company to replace the original agreement of January 1880. Docs. 1844 n. 5 and 3061 esp. n. 3.

10. The following list of commercial inventions closely resembles the two draft versions in App. 2; also cf. Doc. 3129.

11. In late 1887, Edison had Ezra Gilliland set up a shop in Bloomfield, N.J., a few miles from Orange, to manufacture on a modest scale for the Edison Phonograph Co. Doc. 3123 n. 4.

12. The Edison Phonograph Co. was incorporated in October 1887 to manufacture and sell phonographs in the United States and Canada, according to a contract with Edison (and subject to his arrangements with the antecedent Edison Speaking Phonograph Co.). Edison was president and Ezra Gilliland a trustee and the new firm's sole sales agent. Doc. 3102 n. 5; *TAEB* 8, chap. 8 introduction.

13. This amount was written in the copy as $15,000.

14. Ezra Gilliland. See Doc. 3123.

–3145–

To Samuel Insull

[Orange,] Jan. 30, 88.

MY DEAR INSULL:—

I am making arrangements with the Lamp Company, Bergmann & Co.[1] and the Light Co.[2] (and I wish to make a similar arrangement with the Machine Works) for a weekly advance to cover the cost of experiments which I shall conduct in the interests of each of the four concerns. These advances will be credited to their respective accounts and every quarter bills will be rendered from this office for such work as has been carried on during the preceeding three months and a balance struck which can be adjusted one way or the other.

In order to arrive at a basis for these advances I have made as close an estimate as it is possible to form at the present time, in connection with work now progressing, the Machine Works proportion of which is $350.00 per week, a check for which amount can be sent me on the same day as your own pay roll is met.[3]

You will readily see that my object in making this arrangement is to have each of the shops and the Light Co. provide Capital[a] for their own work, which I am unable to do, and the method of weekly remittances will I apprehend be more satisfactory all around than the payment of larger[b] sums at longer intervals. Yours very truly,

T.A.E.

TL (carbon copy), NjWOE, DF (*TAED* D8818ACE). Initialed for Edison by Alfred Tate. [a]Handwritten at the end of last line on the page. [b]"r" handwritten.

1. In similar letters to Sigmund Bergmann and the Edison Lamp Co., Edison asked them to provide $150 and $350 per week, respectively, toward experimental expenses at the laboratory. He prematurely stated to Bergmann that "The others have assented" (TAE to Bergmann, 28 Jan. 1888; TAE to Edison Lamp Co., 30 Jan. 1888; both DF [*TAED* D8818ABY, D8818ACG]; cf. Doc. 3155). Bergmann replied that he found "that the greatest part of our own experimental expenses is for improvement on our electric light apparatus and that it amounts to quite a large sum; and I think that $150.00 per week in addition to this will be too heavy a tax on us." He offered to pay $400 per month and reassess later whether an additional $50 per week would be justified (Bergmann to TAE, 11 Feb. 1888, DF [*TAED* D8802AAE]). Francis Upton, general manager and treasurer of the Lamp Co., agreed to the arrangement but asked Edison to provide statements at monthly rather than quarterly intervals (Upton to Edison Laboratory, 31 Jan. 1888, DF [*TAED* D8833AAD]). The Lamp Co. seems to have begun making weekly payments of $350 on 18 July; Bergmann & Co. appears to have made $400 payments in March and April; that amount does not appear in records for subsequent months but cf. Doc. 3198 (Ledger #5:41, 45–46, WOL [*TAED* NL011A1]); cf. Doc. 3198.

2. Edison wrote separately to the Edison Electric Light Co. on 7 February that investment in "my new Laboratory (upwards of $150,000) has been such a heavy drain upon my private purse, I find it necessary to make an arrangement with you whereby I may receive a regular weekly remittance to provide for experiments which will be conducted on your

behalf." He asked for $150 per week. TAE to Edison Electric Light Co., 7 Feb. 1888, DF (*TAED* D8818ADD); Edward Johnson's reply is Doc. 3155.

3. Insull replied the next day that while he understood the rationale for the weekly advances, "The amount you state as now being spent for our account simply appalls me. It is so very much higher than the amount you spoke of when I was at the Laboratory Friday last." He suggested instead that the laboratory should send a weekly bill for actual work done for the Machine Works, which he estimated might average less than $200 per week (Insull to TAE, 31 Jan. 1888 [*TAED* D8835AAT]). Edison countered that he intended to furnish the Machine Works "with all the models for new machinery which I may get up and relieve you entirely of your experimental expense account at Schenectady." Since Insull had only mentioned outlays for new dynamos and insulation, Edison urged him to "look up your expenses in connection with transformers &c. and see what it has cost you for experiments. It may be that you will then not consider the amount mentioned in my letter of Jan. 30th as high as you do at present." He also offered to reduce the weekly remittances to $250 by sending drawings rather than models, adjusting the payments later if needed (TAE to Insull, 2 Feb. 1888, DF [*TAED* D8818ACM]). Insull rejected the idea of the laboratory doing more work on behalf of the Machine Works, pointing out that with both a drafting department and a pattern shop, the Schenectady factory needed only rough working drawings; in any case, much of the material for making models at the laboratory would come from the Machine Works. He also pointed out that the Machine Works routinely conducted small experiments, which it would be "absurd" to send to Orange because "we have all the parts here." Despite these objections, Insull did agree to remit $250 weekly to the laboratory for experimental work. He enclosed a check for the first payment, provided the amount could be revised in subsequent weeks if it were found to be too high. "You must remember however," he cautioned, "that $13,000. a year is a very large amount to add at one lump to our fixed charges" (Insull to TAE, 3 Feb. 1888, DF [*TAED* D8835AAX]).

–3146–

Memorandum to Arthur Kennelly[1]

[Orange, c. February 1, 1888][2]

Kennelly—

Have Wiley[3] try & see if he can plate Copper Silver or any other metal on a film of Sulphide or Oxide of Copper[4a]

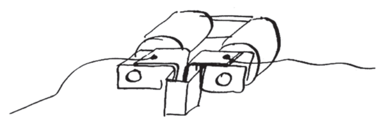
Make a magnet with Cores formed of Iron reduced by Hydrogen mixed with Parafine ~~or Cerasine~~ I think. This kind of a magnet would always give the same deflection or strength with a definite Current & leave no residual if so it would be valuable for Indicating instruments—[a]

Get say 80 feet soft charcoal No 4 Iron telegh wire same as the long magnet & see if it will hold its charge if charged by a magnet without any coils around it— If not put its poles in contact with our 80 ft magnet I think this will charge it—[5a]

If that long magnet after[b] charging gradually loses its charge the lines of force should cut the wire & if the same is connected to a very delicate Thomson[6] it [--- --][c] ought to show a current for an hour or so—

Kennelly[7] Try Red Oxide of Copper in Lelande & Chaperon cell with iron electrodes ie[d] grid—use only a little in each trough say 1 oz all together in place of the Copper Salt—[8a]

Take a small cell say of Hard rubber (we have some) 1 inch wide 2 inch broad & 3 deep or near that polish two iron plates with Emery paper put them in Solution of Caustic Soda & put them between poles of powerful magnet Note any change of Emf in charging magnet



AD, NjWOE, Lab. (*TAED* NSUN11 [images 7–8]). [a]Followed by dividing mark. [b]Obscured overwritten text. [c]Canceled. [d]Circled.

1. The editors have assembled this document from two loose-leaf pages that Edison addressed to Kennelly on related subjects. Both sheets were similar to a coherent set of instructions that he wrote to Kennelly on undated but numbered loose-leaf pages. Those latter directives were for a series of "Pendulum Magnetic Experiments" involving moving wires through a magnetic field on a swinging pendulum. Edison's interest seems to have been less in any practical result than an investigation of magnetic phenomena such as induction, polarization, and the effects of different diamagnetic materials on lines of magnetic stress. At some point, those latter instructions were placed in a notebook into which Kennelly copied related notes and tables throughout the late winter and spring, interspersing them with his notes on other experiments. TAE memorandum, n.d. [Jan. 1888?], N-88-01-19, Lab. (*TAED* NB019089H, NB019 [passim]).

2. The editors have not found firm evidence to corroborate this date but have reason to think Edison drafted these instructions at the very end of January or the start of February. Kennelly undertook the experiment described below with the 80-foot magnet on 13 February, which marks the latest possible date for Edison's directive. At the earliest extreme, Kennelly started a related experiment to measure the time to discharge an 80-foot long magnet on 21 January (see Doc. 3142 note 20). That was probably the "long magnet experiment" that was "nearly complete" on 31 January, and it seems likely that Edison was now suggesting an alternative way to measure the discharge time. (His method seems to have been to measure a current induced in the wire by the changing field as the wire itself demagnetized.) Osgood Wiley's start of copper electroplating experiments, probably like those

outlined below for him, considerably narrows the plausible window of time. Wiley began on or before 3 February and seems to have finished a week later. 88-01-19:3, 10, 20, Lab. (*TAED* NB019004, NB019010, NB019020); Wiley Time Sheets, WOL; also cf. Doc. 3147.

3. Osgood S. Wiley (1855–1903) did not fully enter into the Wiley & Sons publishing business headed by his father and older brother. Aspiring instead to be an electrician, Wiley had worked on and off for Edison since at least 1876, including a stint installing and troubleshooting telephones in England in 1879. After a few years in publishing (during which he solicited contributions from Edison), he returned to Edison's employ by early 1888. U.S. Census 1970 (1880), roll 780, p. 498B, image 0258 (East Orange, Essex, N.J.); Wiley and Chaves 2010, 25–26; Wiley to TAE, 30 July 1883, 18 July and 11 Nov. 1887; all DF (*TAED* D8306ZAJ, D8704ABI, D8713ABB); see Docs. 682, 1808 n. 2.

4. Wiley spent the first working week of February engaged on copper and zinc plating experiments. Kennelly noted that an experimental line identified as number 101 for "Coating copper with Non conductor" was assigned to Wiley on 18 February. Wiley Time Sheet, 9 Feb. 1889; N-88-01-19, Lab. (*TAED* NB019089F, NB019026).

5. Kennelly made this magnet and experimented with it on 21 January; he continued experiments over the course of the next ten days, noting on 31 January, "The long magnet experiment is nearly complete, the % at the end of the day being 52." On 2 February he noted, "Long magnet appears to be regaining rather than losing charge, at the end of the day is still about 55%" but on 13 February recorded, "The charge of the long magnet fell today to below 50% definitely after a lapse of time of 20 days." The following day the 80-foot electromagnet was cut in half for further experiments. N-88-01-19:4, 10, 12, 20–21, Lab. (*TAED* NB019004, NB019010, NB019012, NB019020, NB019021).

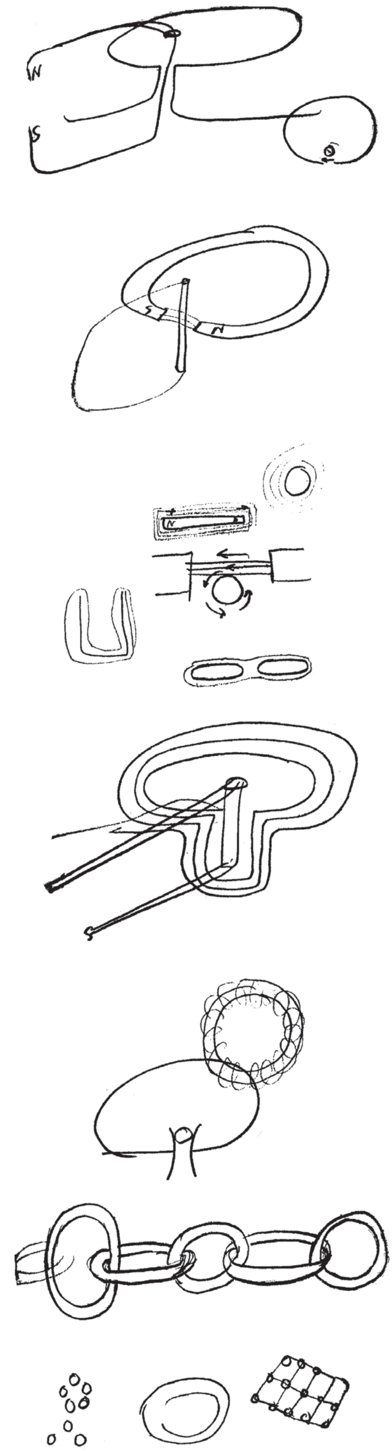
6. Kennelly used a "delicate Thomson astatic Galvanometer" in experiments with the long magnet on 13 February. This form of William Thomson's mirror galvanometer, which indicates electric current by deflecting a light beam with a mirror, uses magnetized needles balanced so as not to be affected by the earth's magnetic field. N-88-01-19:20, Lab. (*TAED* NB019020); *Ency. Brit.* 9, s.v. "galvanometer."

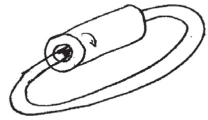
7. "Kennelly" marks the start of the second loose sheet of instructions.

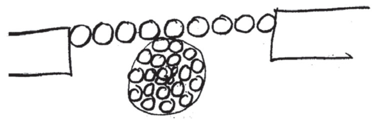
8. Kennelly began experiments with "potash cells (Lalande)" on 10 February. There is no evidence for this battery arrangement, but see Doc. 3151. N-88-01-19:18, Lab. (*TAED* NB019018).

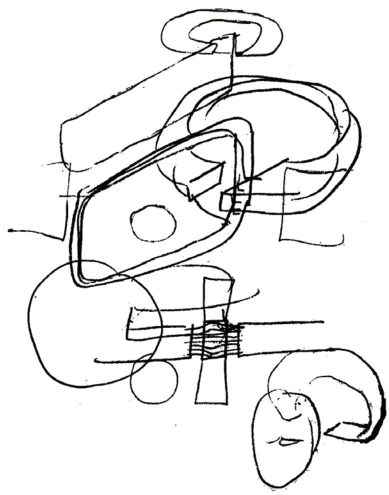
–3147– [Orange, c. February 2, 1888][1]

Notebook Entry:
Energy and Matter

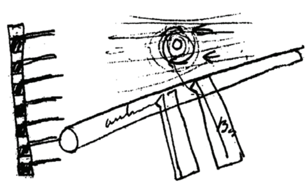


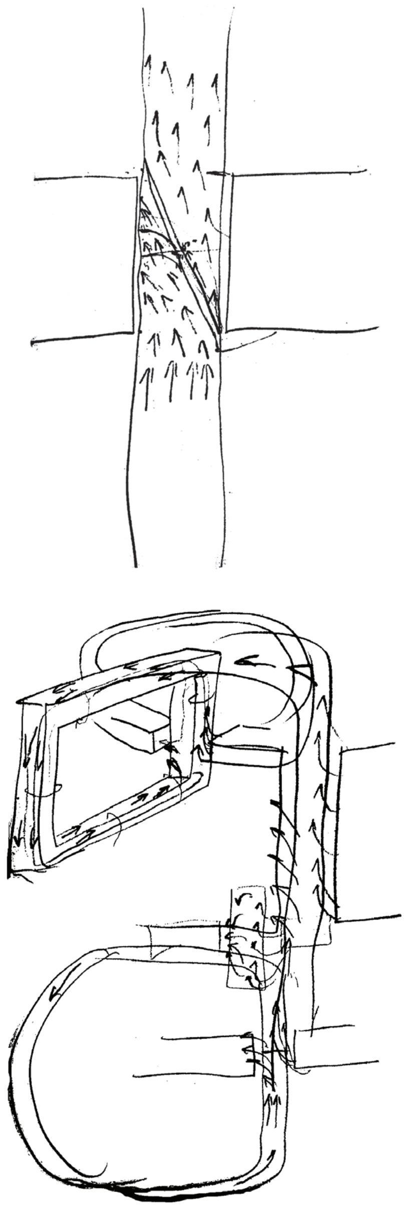






a wire pushed thro a magnetic field has matterless friction. not gross friction of matter but friction of Molecules— The ether is condensed by The magnetic stress across it.[2] if the ckt of[a] wire be a closed one we have a current & an electric stress and the friction is increased[3]





X, NjWOE, Lab., N-88-02-02 (*TAED* NA022AAA). [a]Obscured overwritten text.

1. Edison used portions of this notebook in both directions. This entry appears near the front of the book, after 2 February notes for a motograph telephone experiment; it is followed (after several intervening pages) by instructions for a battery dated the same day. The intervening pages contain a number of unclear drawings, some of which may be related to this document. Also cf. Doc. 3146.

2. Edison's reference to the ether seems to be his first explicit invocation of that hypothetical medium, a subject he mentioned again in

undated notes probably from later in 1888 and to which he would refer repeatedly in later years (N-87-12-10.2; images 43 ff). It is impossible to know exactly what he meant in this context. The "ether" (sometimes multiple forms of it) was posited to explain physical actions (such as magnetism or the transmission of light) across space without benefit of air or other perceptible conducting medium. The concept was an ancient one and notoriously plastic. Although ether was generally accepted as a necessary idea, the nineteenth century's best scientific minds used the word with varying degrees of skepticism and literal-mindedness. Michael Faraday, whose work influenced Edison (see, e.g., Doc. 2912 [headnote]), mainly stuck to explaining induction in terms of observable "lines of force" disturbed by a moving conductor. Though he shied from suggesting more speculative underlying causes, Faraday conceded to "those who entertain in any degree the aether notion" that a conductor would create "vibrations" or "a state of tension" in such a medium. He also allowed that the actions of a magnet "may be a function of the aether; for it is not at all unlikely that, if there be an aether, it should have other uses than simply the conveyance of radiations" (Faraday 1965 [1855] 2001, arts. 3075 [quoted], 3269 [quoted], 3277, 3301 [quoted], and related commentary in Faraday 2001). The late James Clerk Maxwell, whose mathematical extension of Faraday's insights still dominated theoretical physics in the Anglophone world, had quoted that statement in his own work. In his article on the ether for the *Encyclopaedia Britannica,* Maxwell added that Faraday's "conjecture has only been strengthened by subsequent investigations" (*Ency. Brit.* 9, s.v. "Ether"). According to historian and biographer Peter Harman, Maxwell went farther and sought to develop "a theory of the ambient ether as the substratum of the [electromagnetic] field." Whatever the ether might be in reality, Maxwell believed he could model it as an array of vortices or cells transmitting their spinning motion from one to another through "idle wheel particles." Such a mechanistic conception is at least loosely consistent with several of Edison's sketches here and his notion of the "friction of molecules." Edison's choice of the word "stress" also echoes Maxwell, who used it to convey an idea similar to Faraday's "tension" in a magnetic field (B. Hunt 2010, 94–104; Harman 1982, 30–33, 72–73, 78–79, 89–94, 98–103; on the ether generally, see also Forbes and Mahon 2014, 107–9; and C. Smith 1998, 229–32).

3. Figure labels are "[antimony?]" and "[Bis?]."

–3148–

From Johannes Braun

Orange, N.J., Febr. 4 *1888*[a]

Dear Sir

Several gentlemen working in this laboratory expressed to me the wish, to have lectures here in the Elements of chemistry.[1] I am ready to keep a course of lectures on the above named matter and should like to get allowed to use the lecture room for this purpose. I should like to be able in the next lecture of Mr. Kennelly to talk to the said gentlemen about the time of this lecturer.[2]

If you will be kind enough, dear Sir, to allow me this you will very much oblige Yours respectfully

Dr. J. Braun[3]

<All right If you lecture illustrate it with Experiments otherwise these Lectures are no use>[4]

ALS, NjWOE, DF (*TAED* D8855AAE3). Letterhead of Edison laboratory. [a]"*Orange, N.J.*," and "*188*" preprinted.

1. Evening technical lectures by staff members became a weekly event, held in what a newspaper described as a "spacious lecture-room" on the third floor. Another source described the room this way: "A raised platform, with experimental tables and blackboards for illustrations, occupies the center of one of the sides, and at the walls are the terminals from the distant dynamos and batteries ready to supply current for all sorts of experiments or demonstrations" ("Gotham Gossip," *New Orleans Times-Picayune,* 22 July 1888, 10; McClure 1889, 25). Passes were issued to Edison employees (including those of the Edison Lamp Works); on at least one occasion, someone outside the Edison orbit sought admission but was rebuffed (Charles Heely to Alfred Tate, 11 and 18 Feb. 1888; William Latus to TAE, 23 Feb. 1888; Tate to Charles Renshaw, 16 June 1888; all DF [*TAED* D8833AAI, D8833AAM, D8833AAP, D8818AMV]). By the summertime, laboratory lectures and demonstrations were also a feature of the Junior Edison Association, a group of Edison Electric Light Co. engineers that met there monthly "in the nature of a general school" ("Edison's Very Latest," *New York Herald,* 16 June 1888, 8).

2. There is no record of Kennelly's lectures, but books he borrowed from the laboratory library suggest possible topics. For example, on 4 March, he borrowed a *Text Book on the Method of Least Squares* (Merriman 1884) and a lecture series *On the Conversion of Heat into Work* (Anderson 1887). N-88-01-30:3, Lab. (*TAED* NL003AAA [image3]).

3. Dr. Johannes Braun (b. 1858?) was a German chemist who came to the United States in 1886. He first appears in the time sheets on 10 January, although Alfred Tate, who described him as an "efficient and capable chemist" in a 19 April letter of recommendation, claimed he had been employed at the laboratory for six months. Braun and another experimenter, Dr. L. Cornice, had been experimenting with hydrocarbons for filaments and both were dismissed in mid-April when their project ended. U.S. Census Bureau 1982? (1900), roll T623_990, p. 6A (Passaic Ward 4, Passaic, N.J.); Time Sheets for Braun and Cornice, WOL; Tate letters of recommendation for Braun and Cornice, both 19 April 1888, DF (*TAED* D8815ABB, D8815ABA).

4. The editors have not found a formal reply or records of Braun's lecture, but between late February and mid-March he borrowed from Edison's library several volumes of three standard chemical reference works (by Henry Roscoe and Carl Schorlemmer; Leopold Gmelin; and Lothar Meyer) in addition to the more specialized books he probably used for his research. N-88-01-30:1–5, Lab. (*TAED* NL003AAA [images 2–4]).

–3149–

Uriah Painter to Edward Johnson[1]

Washington, D.C. 2, 12, 1888.

My Dear Mr. Johnson:[2]

Your endorsement of my letter to you covering the proposition to collect $4800. for Mr. Edison[3] from the Graphophone,[4] together with his endorsement of it, I find on my return from Maine.

The endorsement of Mr. Edison is signed "Edison, G."

From the slovenly manner in which a proposition involving a large sum of money, is endorsed in pencil, leads me to suppose that the "G" is Gilliland.[5]

Mr. Edison says he does not want to be "coerced"!![6] Neither do I.

Do you know any one who has been, or is now endeavoring to "coerce" him?

Do you know any one?[a] or any interest that he, Edison, is endeavoring to "coerce."

Are we muddying the water that he would drink from his eminence[b] above us on the stream?[7]

About how long do you think it is my duty to follow him up with overtures of friendship and good will that he throws back in my face through the medium of a servant who writes with a lead pencil? Yours truly,

U H Painter[8]

<Edison Can we not get together & straighten this out? Or are you determined to stand by the deal you have made It is not a matter of money, but of wounded pride— Upon receipt of your ans. to this I shall take such action as will forever remove me from my present unpleasant position so that I can no longer be used as[c] a medium for unsatisfactory correspondence The burial of all my long cherished ambitions in this Phono. matter will cost me no slight regret—but better that than this sort of thing EHJ>[9]

ADDENDUM[e]

[Orange, February 12, 1888?]

E.H.J.—

You assume the position of strict neutrality in this matter.[10] Its not your fault in any way that the present condition of affairs have come about= I'll take care of Mr U.H.P. after he gets through his outburst of temper & damfoolery—The "G" is T. or Tate[11] Mr G. never saw the corrrespondence—[12]

E[dison].

TLS, PHi, UHP (*TAED* X154A7AU). [a] "?" written by hand. [b] "ce" written by hand. [c] Obscured overwritten text. [d] Marginalia written by Edward Johnson. [c]Addendum is an ALS written on letterhead of Edison laboratory.

1. After receiving this letter from Painter, Johnson forwarded it to Edison with his own remarks written in the margins. Edison replied in a hasty undated note to Johnson on a fresh sheet of paper. Although there is some question whether that response reached Johnson (see note 11), the editors have appended it to the original letter to preserve the immediacy and coherence of this sequence of messages.

2. Edward Hibberd Johnson (1846–1917), Edison's longtime friend and trusted business associate, had played important roles promoting or managing Edison's major inventions (including the phonograph, telephone, electric pen, and electric lighting) in the U.S. and Great Britain since 1876. He had been the general agent of the Edison Speaking Phonograph Co. and, as the company's secretary, he was a conduit for investor negotiations and information about the Bell-Tainter graphophone. At this time, Johnson's connections with Edison-related enterprises included serving as president of the Edison Electric Light Co., the Edison Wiring Co., the Electric Railway Co. of the United States, and the Sprague Electric Railway & Motor Co. *TAEB* 1–7 passim, esp. Docs. 272 n. 13, 2820 n. 6, 2998 n. 3; 3065 n. 5, and 3124; Wile 1991, 9.

3. Painter was seeking cooperation with backers of the graphophone—a rival machine developed over several years at Alexander Graham Bell's Volta Laboratory in Washington, D.C., notably by Chichester Bell and Charles Sumner Tainter. The device recorded and reproduced sound on removable wax cylinders, and it was emerging onto the market under control of the American Graphophone Co. According to Painter, that company's backers were willing to manufacture their first 300 machines under license from Edison and sell them as "phonographs," raising "no question about the validity of the Edison patents." Painter was the largest shareholder in the Edison Speaking Phonograph Co., to which Edison had assigned his early patents, and he pointed out that under the terms of the firm's 1878 contract, the proposed license arrangement would bring Edison a royalty of at least $16 on each of the 300 machines ($4,800 total). The editors have not found Johnson's reply, but neither he nor Edison had formed any specific opinion of the proposed terms by late January except for Edison's wish "to record my disinclination to submit to coercion." Docs. 2993 n.1, 3071 nn. 2–4; Painter to Johnson (with Johnson and Alfred Tate marginalia), 29 Jan. 1888, UHP (*TAED* X154A7AP).

4. Painter meant the American Graphophone Co., incorporated in June 1887 in Harpers Ferry, W.Va., which controlled the U.S. and Canadian rights to the Bell and Tainter patents. On-again, off-again discussions of a consolidation of interests had been held with representatives of the Edison Speaking Phonograph for several years, but direct negotiations started only in October 1887, when James Clephane approached Edison. Docs. 2993 n. 1 and 3071 n. 4; "The Graphophone," *Washington Post,* 26 June 1887, 8; Painter to Johnson, 9 Oct. 1887, UHP (*TAED* X154A6AR); Clephane to TAE, 5 Oct. 1887; Painter to Johnson, 6 Oct. and 20 Nov. 1887, all DF (*TAED* D8750AAE, D8750AAF, D8750AAJ).

5. Among his many connections with Edison, Ezra Gilliland had been among the earliest agents for the original phonograph, and he now was a director of the Edison Phonograph Co., its exclusive sales agent, and manager of the phonograph factory in Bloomfield, N.J. Docs. 2993 n. 1, 3102 n. 5, and 3123 nn. 1 and 4.

6. The editors have found no explanation for what Edison characterized as coercion but cf. Doc. 3120. Tate marginalia on Painter to Johnson, 29 Jan. 1888, UHP (*TAED* X154A7AP).

7. Painter's phrasing is vaguely reminiscent of a cautionary biblical passage (Ezekiel 34:18).

8. A business promoter, Washington lobbyist, and former journalist, Uriah Hunt Painter (1837–1900) had been acquainted with Edison since the early 1870s. He was a large shareholder in the moribund Edison Speaking Phonograph Co. (and its president after July), and he refused to participate in the new Edison Phonograph Company and remained skeptical of its legitimacy (which rested on the disputed legal status of Edison's patents). He persistently tried to maneuver Edison into making accommodations more advantageous to the original company's shareholders and was prolific in his ideas for reorganizing the phonograph trade, including the possibility of consolidating with the graphophone interests. Doc. 3120 esp. n. 2; Edison Speaking Phonograph Co. annual certificate, 14 Feb. 1888, Misc. Legal (*TAED* HX88018); Edison Speaking Phonograph Co. minutes, 25 July 1888, UHP (*TAED* X154A7DK); regarding Painter's proposals and negotiations, see 1888 correspondence to and from him in Unbound Documents, UHP (*TAED* X154A7). Also cf. Doc. 3248 for Edison's retrospective view of his dealings with the Speaking Phonograph Co.

9. Cf. Docs. 3102 esp. n. 7 and 3120.

10. Johnson had earlier expressed his unwillingness to "take up the Cudgels for Painter" but also thought it his duty to "try and show you [Edison] the other side of a case which so greatly affects your reputation for fairness." Johnson to TAE, 9 Dec 1887, DF (*TAED* D8750AAQ).

11. Alfred Tate wrote Edison's response on the 29 January letter from Painter that Edward Johnson had forwarded (see note 2). As he often did when signing something for Edison, he initialed the note with a looping "T." Tate's published memoir of Edison recalled some of the these negotiations, though not this correspondence specifically. Tate 1938, 135–38.

12. When Painter inquired a week later if Johnson had received this letter, Johnson answered, "I sent it to Edison & got no reply." Edison's remarks nevertheless found their way into Painter's collected papers. Painter to Johnson (with Johnson marginalia), 19 Feb. 1888, UHP (*TAED* X154A7AV).

–3150–

Malcolm McDowell to Alfred Tate

N.Y.C— Feby 15 1888[a]

My Dear Mr. Tate:

The ink which we[1] use for mimeograph[2] work is all right for our machine when the stencil is made on a Remington[3] or Caligraph[4] typewriter, but gives poor results—or rather unsatisfactory—when used in connection with the Hammond.[5]

I think, however, that an ink similar to the Cyclostyle ink,[6] or that used with the Electric Pen,[7] would do better work, and I would deem it a great favor if you would ask Mr. Edison to send me the necessary directions for making this ink— I would like to come out and explain the matter personally, as I am certain Mr. Edison could help us out, but I dislike the idea of taking up his time. Yours very truly

Malcolm McDowell[8]

<John[9] We have some common printers ink down stairs make several mixtures of about 3 oz each using Castor oil—olive oil & thin it down in various proportions & grind through the ink Mill[10] in Joes Room[11] put in bottles and mark No 1 No 2 etc E[dison]>

ALS, NjWOE, DF (*TAED* D8803AAD). [a]Followed by dividing mark.

1. McDowell wrote on behalf of the A. B. Dick Co.'s New York agency at 19 Dey St. The Dick company of Chicago (formerly a lumber wholesaler) was devoted to the development and marketing of the Edison Mimeograph, using Edison's patents and in conjunction with him. Doc. 3034 n. 4.

2. Albert Blake Dick developed the mimeograph process of copying documents by means of perforated stencils, using some of the same principles that Edison had patented for his electric pen. Having acquired rights to those patents, the A. B. Dick Co. marketed the device as the Edison Mimeograph. Although the mimeograph was originally designed to copy handwritten documents, the firm had also devised a process for making typed stencils. See Doc. 3034 esp. nn. 4 and 7.

3. The Remington Standard Typewriter Co. manufactured in Ilion, N.Y., under the control of Wyckoff, Seamans & Benedict, a partnership which in 1886 had acquired the right to make and sell the machines formerly produced by E. Remington & Sons. The Remington line (which included the popular Remington Standard) introduced the shift key to allow printing of both upper- and lower-case letters. They were the first typewriters to reach commercial success on a large scale; by 1888, the firm was turning out about 1,500 machines per month, a milestone in American precision manufacturing. See Doc. 3034 esp. nn. 10 and 11; *AACR* (1891), s.v. "Type-writers"; Utterback 1994, 9–10; Hoke 1990, 141–50.

4. The Caligraph typewriter, the chief competitor to the Remington, was developed by G. W. N. Yost and Franz X. Wagner and manufactured by the American Writing Machine Co. of New York. Instead of employing a shift key to move between upper- and lower-case letters, the Caligraph provided a separate key for each character, which necessitated a larger keyboard. Yost's 1880 patent application for the Caligraph was granted in 1884. Oden 1917, 29–30; Current 1954, 98–103; U.S. Pat. 295,469.

5. Named for its inventor, James B. Hammond, this typewriter had

spring-actuated hammers that produced a uniform impression. It also used a removable type-wheel rather than the type-bar of the Remington and the Caligraph. The type-wheel or shuttle could be taken out and interchanged without affecting any other part of the mechanism. This was an attractive feature for offices doing business in different languages, and the machine was popular in foreign countries. The Hammond machine was also made in New York and came on the market in the mid-1880s. Oden 1917, 31–32; Current 1954, 106–8.

6. The Cyclostyle, a version of which was also marketed under the name Neostyle, was a duplicating machine that used a pen to perforate special paper in order to make a stencil through which ink was forced by a roller. The technology was similar to Edison's electric pen or autographic writing system, and in 1889, Edison, Robert Gilliland, and the A. B. Dick Co. sued the Cyclostyle Co. for infringing Edison's 1876 electric pen patent. The judge dismissed the case, ruling that because stencil technology had been used for many years prior, Edison's patent protected only the pen itself with its reciprocating needle and did not pertain to the Cyclostyle's rotary point. Edison appealed to the U.S. Supreme Court, which dismissed the case with costs in October 1892. "Methods of Manifolding by Copying Machines," *School World* 2 (June 1900): 218; "Edison *et al.* v. Klaber," *Federal Reporter* 38 (May–July 1889): 744–46; U.S. Pat. 180,857; Albert Dick to TAE, 5 Apr. 1889; A. B. Dick Co. circular, 10 Apr. 1889; both DF (*TAED* D8903AAF, D8903AAI); Williams 1894, 37:958.

7. The electric pen was a document duplicating system developed by Edison in 1875 that enjoyed some commercial success. The operator used a rapidly reciprocating needle projecting from the pen to prick small holes in paper. The resulting stencil could ink hundreds of copies. See Doc. 721 (and headnote).

8. Malcolm McDowell (1860–1943) was at this time a partner with Henry Livor in the New York agency for the Edison Mimeograph. He was the nephew of Irvin McDowell, commander of Union forces at the First Battle of Bull Run. His father, Maj. Malcolm McDowell, a staff officer during the war, later became a major figure in the steel industry in Chicago. Malcolm, Jr., was born in Providence, R.I., where his father had been associated with the Providence Tool Co. Following what seems to have been a brief career in New York as an agent for the mimeograph, he became a reporter for the *Chicago Daily News,* a position he held until 1901. He then became assistant secretary of the Central Trust Co. of Illinois and was conspicuous for his philanthropy among the city's poor, as was his sister Mary, who was associated with Jane Addams at Hull House and later founded the University of Chicago Settlement House. U.S. Dept. of State, n.d., roll 505, McDowell passport issued 18 Apr. 1898; "Malcolm McDowell Dies at Age of 82; Rites in Chicago," *Washington Post,* 11 Feb. 1943, B5; McDowell to TAE, 28 Feb. 1888, DF (*TAED* D8803AAE); "Malcolm McDowell," *Iron Age* 73 (7 Jan. 1904): 104–5; "When Blizzards Blow Remember Malcolm McDowell's Hot Stuff Charity for Down and Outs," *Chicago Commerce,* 6 Sept. 1912, 21–24; "Gives A Building for the Unemployed," *Chicago Daily Tribune,* 7 Jan. 1908, 2; *ANB,* s.v. "McDowell, Mary Eliza."

9. That is, John Ott.

10. Ink mills (or grinding machines) commonly used several steel

rollers for crushing pigments and dispersing them through liquid ink. Wilson and Grey 1888, 395; cf. *KNMD,* s.v. "Ink Grinding Machine."

11. Edison probably meant John Joseph Force (b. 1860?), the younger brother of Martin, who was often referred to as Joe. Force was a glass blower who had worked for Edison since 1880, and in his planning for the laboratory in July 1887, Edison noted that he would be a good candidate for the "fancy" glassblower capable of decorative work. Force's workroom was likely on the second floor of the main building. He died sometime before 1913, when his wife Hannah was listed as a widow in the Plainfield, N.J., directory. Docs. 2980 n. 2 and 3077; Millard, Hay, and Grassick 1995, 1:74; Richmond 1913, 123.

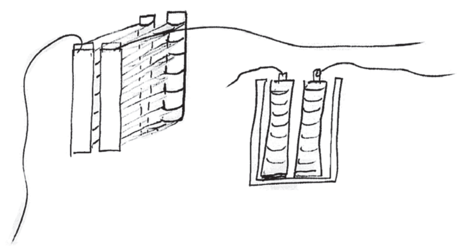
–3151–

Memorandum to Arthur Kennelly: Storage Battery

Orange, N.J., Feby 17 *1888*[a]

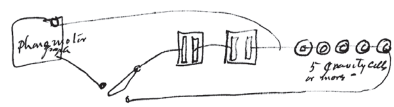
Kennelly—

Have made 2 cells like the Lelande with Lead grids use glass cells[1]



put thick paste of red Lead mixed with the Regular Solution that goes in the cell proper— Then form them in regular way— when good—

put them thus[2]



I hope by this means to use 2 cells of storage battery for the phonog motor & throwing them on the constant battery when not in use—

E[dison]

ADS, NjWOE, Unbound Notes and Drawings (*TAED* NS88ABD). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" and "*188*" preprinted.

1. Edison evidently sought to copy one of the several ways a Lalande cell could be constructed. The Lalande's caustic electrolyte did not give off unpleasant gases, unlike acid batteries, and its durability and steadiness further suited it to domestic use. Its electrodes were typically made of copper oxide and zinc, though the original Lalande and Chaperon

patent included the possibility of using lead. See Doc. 3129 n. 78; Nursey 1888, 203.

Edison's instructions came the same day that Kennelly compiled results of a week of testing on various Lalande cells with different concentrations of potash electrolyte, in which he recorded the current, internal resistance, voltage, and voltage drop through a resistance. He eventually presented his results through the end of the month in table form (N-88-01-19:18–24, 44; Lab. [*TAED* NB019018, NB019024A, NB019044). When Kennelly wrote a short "List of Requirements for experiments to be made for Mr Edison" on 25 February, he included "4 Leaden grids instead of iron to make a secondary Lalande cell. Two grids to fit in one glass cell" (Unbound Notes and Drawings [1888], Lab. [*TAED* NS88ABF]). He continued similar tests with several batches of numbered Lalande cells—some three dozen in all—through late March (the last entry in the series is N-88-1-19:83, Lab. [*TAED* NB019083]).

2. Figure labels are "phonograph motor" and "5 gravity cells or more—." Edison initially wrote "phono motor"; the syllable "graph" was interlined below, possibly by Edison to make the distinction from the phonoplex telegraph. See Doc. 1314 and cf. Doc. 3129 n. 33.

–3152–

Draft Patent Application: Phonograph

[Orange,] Feby 17 1888

Improvements in processes for Duplicating phonograph Cylinders called phonograms—[1]

The improvement consists in reproducing The indentations from a cylinder on which the indentations are raised and pressing The same against a smooth cylinder thus reproducing the face of records as on the original in the manner known as Knearling[2]

After the phonogram is prepared ie[a] talked on it ~~a pla~~ coated with plumbago placed in a bath & coated with Zinc or it may be placed in a vacuum which is the preferable process & a thin film of Zinc deposited on the face in[b] the manner already described in a previous application[3] If done by Electrolysis the Coating is made very heavy but if done by Vacuous deposit it[b] is afterwards put in a bath & Electrolytically deposited on to make it sufficiently thick— Then the wax is disolved out, and the internal part is deposited by Electrolysis or Vacuum method with silver then with a heavy backing of Copper or other hard metal. All but the face is waxed over & the Zinc is Eaten away by[b] weak sulphuric[c] acid which disolves[b] all the Zinc & stops at the silver—on which the records is raised.[4]

The Cylinder is then mounted on a shaft & placed in bearings paralell is a wax or other cylinder of exactly the same circumference which is to receive the records. The [–––][d] Record[e] cylinder is pressed with sufficient power against the receiving cylinder to cause the round parts to be pressed into it— The Record cylinder is revolved but once and to an exact point shown by an index. it may slightly overlap to prevent the Knock which would occur is the grooves did not run into each other The Record cylinder is rotated by a worm & worm[b] wheel & very slowly The temperature of the room should be ~~slightly~~ above or below[f] normal according to[b] the nature of the substance used. Silver or nickel is preferable for the face of the Knearl as they do not tarnish and are cheaper than platinum or gold

Claim the Solar System.

TAE

ADfS, NjWOE, PS (*TAED* PT032AAW1). [a]Circled. [b]Obscured overwritten text. [c]"weak sulphuric" interlined above. [d]Canceled. [e]Interlined above. [f]"or below" interlined above.

1. Perhaps in response to his patent attorney's objection (see note 4), Edison significantly revised the application as Doc. 3157 before signing it on 3 March.

2. Edison meant knurling, a process for making small projections or ridges on a hard surface. *OED*, s.v. "knurl."

3. Edison referred to his Case 751, filed in January as a result of the division of an earlier application (Case 743, based on Doc. 3119) in which he anticipated making the present application. Edison's efforts to protect a vacuum deposition process for duplicating recordings took especially tortuous paths at the Patent Office, where he had at least two other related applications pending at this time. See Doc. 3119 nn. 3 and 6.

4. Richard Dyer noted at the top of Edison's draft that he thought "the silver will be like the wax and that the record will <u>not</u> be raised."

–3153–

Alfred Tate to Samuel Insull

[Orange,] Feb. 18, 88.

(Personal)

My Dear Insull:—

I have just had a conversation with Mr. Edison in regard to finances. I think that you are aware that he has been waiting to effect an arrangement with Mr. Villard before doing anything in regard to the Phonograph, which is the resource that we are looking to now to provide ourselves with funds. Mr. Villard was to have come out here this week, but he found that his engagements would not permit his coming, and has now made an appointment for one day next week. Mr. Edison tells me that the result of this visit will be a supply of money; but I doubt very much if it will be forthcoming before at least a fortnight.[1]

We are, as you can imagine, very hard up, and there is about thirty thousand dollars outstanding, the greater portion of which is overdue. All of this is not pressing, but some of our creditors are running us very hard, and with the very slim resources which are at the moment available, it places us temporarily in somewhat of a hole. There are some parties whose bills are overdue who have advised us that they have deposited drafts. One of these, Lehn & Fink (Chemicals),[2] was drawn for last week. The amount was about a thousand dollars, and as Mr. Edison was in Chicago[3] I had a very good excuse for returning the draft. They have, however, drawn again, and it will do our general credit no good if I am again obliged to return their draft. If we could get about three thousand dollars it would help us out very materially. I have two of the notes which you sent us—those drawn at six months and which, of course, are not available now. Besides this, I am hanging on to them in the interest of our pay roll, unless affairs ease up before the time comes when we can realize on these notes, which I sincerely trust will be the case. Can you help us out with all or any portion of three thousand dollars? Every thing has been so dull in New York that it has been impossible to dispose of anything, except at ruinous prices. I am going in on Monday to see what can be done. Yours truly,

A. O. T[ate].

TLS (carbon copy), NjWOE, DF (*TAED* D8818AEJ).

1. See Doc. 3144 n. 3.

2. Lehn and Fink was a prominent pharmaceutical wholesaler in New York from which Edison frequently bought chemicals and other laboratory materials (worth well over $1,000 in recent months). The firm was created in 1874 by Louis Lehn (who left the business in 1886) and William Frederick Fink, and it remained a major producer of pharmaceutical and household products for national markets well into the twentieth century. Vouchers—Lab. 1887–88; *NCAB* 27:455–56; "New York City Wholesale House Incorporates," *Pharmaceutical Era* 43 (Feb. 1910): 164; Marchand 1985, 309, 346.

3. Edison left on 6 or 7 February for a semiannual meeting of the Association of Edison Illuminating Companies in Chicago. He planned to return on 10 February. John Vail to Tate, 2 Feb. 1888; Sigmund Bergmann to TAE, 6 Feb. 1888; Tate to George Barker, 7 Feb. 1888; Tate to Villard, 7 Feb. 1888; TAE to Villard, 13 Feb. 1888; all DF (*TAED* D8831AAL, D8802AAD, D8818ADA, D8818ADG, D8818ADW).

–3154–

To Witherbees, Sherman & Co.[1]

[Orange,] Feb 20/[188]8

Dear Sirs:

We have at last succeeded in getting a separation of .05[2] and are designing a forty ton machine which consists of separating machine, Conveyors and Sifters—[3] Everything will be complete and we want to know if the lay of the lands at your mines is such that it can be put on the side of a hill. If not we shall have to build a long[a] cart way as the ore has to be brought up to the crusher eighteen 18[b] feet above the level of the grounds.

Perhaps you had better send one of your representatives over here to give us some explanations as to where the apparatus must be erected Yours truly

Thos. A. Edison T[ate]

L (letterpress copy), NjWOE, WOL, Laboratory Letterbook LM-102:10 (*TAED* LM102010). Written by Alfred Tate. [a]Repeated at bottom of one page and top of the next. [b]Circled.

1. Witherbees, Sherman & Co. (variously Witherbee, Sherman & Co.) was an iron-mining firm in the Adirondack region. It was formed in 1862 by S. H. and J. G. Witherbee with George Sherman and George R. Sherman to acquire mining properties in the vicinity of Port Henry, N.Y., and its principals at this time still included members of the Whitherbee and Sherman families. By the turn of the twentieth century, the firm was a major supplier of iron ore and a pioneering large-scale user of magnetic processes for concentrating and refining raw ores. Its New York offices were at 40 Wall St. in the Merchants' and Manhattan Building, where Edison rented personal office space that Alfred Tate still used. Letterhead, Witherbees, Sherman & Co. to TAE, 12 Apr. 1888, DF (*TAED* D8845AAS); "The Mineville Magnetite Mines," *Iron Age* 72 (17 Dec. 1903): 10, 15–19; Docs. 2945 n. 14, 3087 n. 3, and 3096.

2. Evidently at the suggestion of Alfred Tate, that firm sent Edison a sample of ore for testing in October 1887. The native ore had a high percentage of phosphoric acid or apatite that unsuited it for the Bessemer steel process; if that could be reduced to no more than 0.05 per cent, the firm anticipated the possibility of selling 100,000 tons annually (Witherbees, Sherman & Co. to TAE, 4 and 7 Oct. 1887; both DF [*TAED* D8747AAK, D8747AAM]). William K. L. Dickson made small-scale experiments on samples from the company during the winter, particularly trying various crushing and tumbling techniques to aid the removal of "clinging particles of phosphorous" (Notebook E-2610:45, Lab. [*TAED* NM031045, NM031045A]; see also Docs. 3159 n. 5 and 3163 n. 2). On 13 February, Tate solicited another sample with the suggestion that "Mr. Edison has the designs for the large [separator] machine almost ready" and hoped to be ready to test it by the time the new ore reached him (Tate to Witherbees, Sherman & Co., 13 Feb. 1888, DF [*TAED* D8818ADS]).

Edison's broad goal was to create concentrating technology that could be adjusted to concentrate an assortment of lean ores until the iron content was rich enough (at least 65 percent iron with a low phosphorous content) to be used in the Bessemer process, still the principal means of producing steel in the United States (Misa 1995, xviii, 5, 31; cf. Doc. 3389). Such lean ores still abounded in Eastern states, but after decades of operation, mines in New York, New Jersey, and Pennsylvania were becoming depleted of the richer ores and faced increased competition from richer deposits in the West and abroad (Birkinbine 1889, esp. 722). The concept of Edison's ore separator was simple. Finely crushed ore was released in a stream from a hopper suspended about fifty feet in the air to fall into two bins at the bottom. Midway in its descent, the stream passed near a powerful electromagnet; as the finely ground ore fell, the magnet deflected the iron particles toward it to fall into one bin. The nonmagnetic materials, by contrast, fell straight into the other bin. For further refinement, this process could be repeated (Birkinbine and Edison 1889a).

3. Edison received a number of inquires around this time about his iron and gold separating processes, some of them prompted by an announcement circulated by Preston Hix that Edison wished to buy gold-bearing ores from the Appalachian region to process at his laboratory ("Edison's Invention. The Magician of Menlo Park Helping the Georgians," *Atlanta Constitution,* 18 Mar. 1888, 14). His comments and responses to these inquiries provide a rough timeline for the development of demonstration machinery, though nothing of its details. On 17 March, for example, he drafted a reply indicating that an "experimental plant" would be working at Orange in "3 or 4 weeks" but had to acknowledge in the second week of April that it was not yet ready. The next week, he said it would have been ready except for delays by the railroad but that he expected it running within a few days. He finally notified Witherbees, Sherman & Co. on 14 May that the experimental plant was ready for their inspection. He answered another correspondent about that time that he expected to have a full plant built and running at a Witherbees, Sherman & Co. mine. The commercial equipment would be built at the Edison Machine Works but "we cannot set a price until our 1st plant is in successful operation which we hope will be about July 1" (TAE marginalia on each of the following letters: Brewer & Co. to TAE, 17 Mar. and 9 Apr.1888; A. G. Bradstreet to TAE, 17 Apr. 1888; Witherbees, Sherman to TAE, 14 May 1888; Fraser & Chalmers to TAE, 10 May 1888; all DF [TAED D8845AAI, D8845AAR, D8845AAT, D8845ABA, D8845AAZ]). Consulting engineer John Birkinbine planned to come watch the demonstration on 25 May (Witherbees, Sherman & Co. to TAE, 24 May 1888, DF [TAED D8845ABG]).

–3155–

From Edward Johnson

New York, Feb. 21st. 1888.[a]

Dear Sir:—

Referring again to your favor of the 7th inst.[1] already acknowledged by Mr. Hastings,[2] I have to report that the question of this Company assuming a portion of your laboratory expenses has been discussed by our Executive

Committee and on my recommendation a resolution was adopted declaring the sense of the Committee to be in favor of making you a reasonable allowance on account of these expenses, but before acting finally on the matter the Committee desired some definite information regarding the proposed plan and the proportion to be born by the other interests concerned.

Before authorizing any expenditure of this nature the first and most important question that they will want determined is, as to the nature and extent of the advantages to be derived by this Company? and to whom will the resultant benefits accrue? That is to say, if they are called upon to authorize an expenditure for certain experiments which may develop adjuncts to our system more or less valuable, they will desire some reasonable assurance that we shall acquire the right to use these inventions or improvements so far as they may pertain to our system, without payment of royalty or consideration other than such proportion of your[b] expenses as we may agree to assume.

They would also like to know the proportion and amount of expenses assumed by each of the shops, and whether they will bind themselves, in good faith, to pay the same. They also suggest that if the matter is agreed to, all around, some arrangement be made by which the money should be paid periodically, by each of the parties interested, to one common recipient, who shall be responsible to each party in interest, and who shall turn the funds over to you.

As soon as I can hear from you on these several points, I shall be glad to bring the matter before our committee for final action. Yours very truly,

Edwd. H. Johnson

<Upon mature consideration I have concluded after reading over your letter of the 21 that I shall not ask the ~~l~~Light Co to contribute towards the expenses of the Laboratory.[c]

The Mandatory paragraph which requires assurance from me that all inventions due to the money advanced by the light Co shall be given without royalty or other[d] "consideration" than payment of Expenses has tended to form my decision—[3] my intention was to do so but to make it mandatory when puts[e] it in a business light & it would be manifestly unfair that I should give my time & experience to devising apparatus without consideration other than being a 1/16th owner of the Co= The 15/16 of my partners would benefit— E[dison]>

<Tate write a nice letter & let me see it>[4]

TLS, NjWOE, DF (*TAED* D8830AAH). Letterhead of Edison Electric Light Co. [a]"*New York,*" preprinted. [b]"they will desire…proportion of your" circled by Edison and connected by a line to the second paragraph of marginalia to designate the "Mandatory paragraph." [c]Paragraph bracketed at left and written to the right of text that follows; its intended position is indicated by a line drawn from end of sentence to the top of the page. [d]Interlined above. [e]Obscured overwritten text.

1. See Doc. 3145 n. 2.

2. Frank Seymour Hastings (1853–1924) was the secretary and treasurer of the Edison Electric Light Co. and the Edison Electric Illuminating Co. of New York. When the Edison General Electric Co. was formed in 1889, he became assistant secretary and, the next year, its treasurer (Doc. 2420 n. 24; "Hastings, Frank Seymour," Pioneers Bio.). In acknowledging Edison's letter, Hastings stated that the request had been referred to the Electric Light Co.'s executive committee but would not be acted upon until Johnson returned from a meeting of the Association of Edison Illuminating Companies in Chicago (Hastings to TAE, 8 Feb. 1888; TAE to Johnson, 21 Jan. 1888; both DF [*TAED* D8830AAG, D8831AAH]).

3. Under his 1878 agreement with the Light Co. (Doc. 1576, still in force), Edison had received $25,000 in cash for experimental expenses (plus a large portion of stock), and the company obtained exclusive North and South American rights to any inventions he might patent in electric light, heat, or power for seventeen years. For the first five years, the company was entitled to these rights without paying further "consideration" but subsequently could secure them only by additional compensation negotiated with Edison or through arbitration; it had continued to cover Edison's laboratory bills beyond its initial $25,000 payment (to the amount of $80,000 through 1880). Under a supplemental contract in 1881, the company agreed to credit Edison with an additional $50,400 toward experimental expenses over five years from that date. See Docs. 2356 n. 7 and 2482; TAE agreement with Edison Electric Light Co., 12 Jan. 1881, Miller (*TAED* HM810140).

4. A brief typed response went out in Edison's name, telling Johnson: "you place the matter in such a light that I feel constrained to withdraw the proposition. Perhaps at a later date we can arrive at an understanding." TAE to Johnson, 29 Feb. 1888, DF (*TAED* D8818AFM).

–3156–

To George Gouraud

[Orange,] Feb. 22, 88.

Col. George E. Gouraud,[1]

In reference to your memorandum of the 28th ult., I fully agree with you in believing that the multiplication of Phonograms will result in the development of a large and lucrative business. You can rest assured that I will take care of this duplicating process.[2]

In regard to German patent, which you state was not filed for three weeks after the time it reached England, I consider this an unreasonable delay. We have accomplished the same thing here in a week, and it seems to me that you might with advantage change your solicitor. You cannot always count on getting three weeks to prepare these cases. I do the very best I can for you in this respect and when you receive a patent you should have a couple of men work on it night and day and put it through in American style.[3]

ROLLING SHEET PHONOGRAMS. In regard to these, the old tin foil was of the character which you refer to. I have tried wax cloth and paper, but there are many mechanical difficulties which have got to be overcome, and I hardly think that the patent which you suggest would hold. If organ music had to be registered as closely as the registration on the Phonograms, I am quite satisfied that there would never be any organ music by that method.[4] Yours truly,

T.A.E. T[ate].

TL (carbon copy), NjWOE, DF (*TAED* D8818AEU). Initialed for Edison by Alfred Tate.

1. George Edward Gouraud (1842–1912), a native of New York and a former Union army officer, was a longtime business agent in London. He had dealt with Edison since 1873 and played significant roles in efforts to commercialize the phonograph, telephone, and electric light in Great Britain and its colonies. Gouraud became the agent for the new phonograph outside the U.S. (apparently excepting only Canada, Japan, and China) in December 1887 and accordingly took responsibility for filing foreign patents on Edison's behalf. Docs. 159 n. 7, 2913 n. 7, and 3092 nn. 1–2.

2. Gouraud had suggested that a cheap and accurate process for duplicating original recordings could lead to "a new business" that might have "more money in it than in Phonographs themselves." He also urged the formation of a publishing company (suggesting the name "Edison's Phonogram Publishing Co.") because "the copyrights in such connection would be of immense value." Gouraud had raised the question of duplicating phonograms in November, when he hoped especially for some means of making numerous copies of a long-awaited (and not forthcoming) recording of Edison's voice for use by sales agents. He called attention at that time to the work of Emile Berliner, whose success in making and copying recordings etched into a thin coating was in the news about that time. Gouraud to TAE, 28 Jan. 1888 and 30 Nov. 1887, both DF (*TAED* D8850AAK, D8751AAL); "Berliner's Gramophone," *Electrical World* 10 (12 Nov. 1887): 255–57, Clippings (*TAED* SC87004A).

3. This paragraph was based closely on Edison's extensive marginalia on Gouraud's 28 January letter (see note 2), in which he instructed his secretary to "Just say in respect to this that 3 weeks is a ridiculous time." His letter was part of an ongoing exchange with Edison (and Alfred Tate and Richard Dyer) about securing foreign patents, and he had pointed to this German specification as an example of the difficulties. He argued that Edison's expectation of having it filed within three days of receiving the American draft version in London was unreasonable, in part because of having to translate into the language of each country something so long and novel, including new words for which there was no direct correspondence. Then there was transit time in the mail (notably to Australia), for which undersea telegraphy was not an economical alternative ($12,000 for a 6,000-word specification). Given these delays, he cautioned against allowing publication of any information about improvements to the phonograph until foreign patents were filed. Specifically, he warned that an article in the 31 December issue of *Scientific American* was "dangerously premature" and could have reached foreign shores ahead of the patent specifications (TAE to Gouraud, 30 Dec. 1887, DF [*TAED* D8717ACP]). In any case, Gouraud filed specifications in England, France, Germany, Belgium, and Austria by mid-January (Gouaud to TAE, 14 Jan. 1888, DF [*TAED* D8849AAA]).

The preparation and filing of Edison's foreign specifications, both in and outside of Great Britain, had been an intermittent source of serious trouble for years. Since about 1882, his American patent attorneys, Dyer & Seely, had drafted specifications for Britain and sent them to Thomas Handford, a London agent, to review and file. They had similar arrangements with at least two agencies on the Continent: Charles Dreydel in Stockholm, and with Brandon and Sons (Brandon et Fils) in Paris (see, e.g., Docs. 2203 [headnote], 2626 esp. n. 3, and 2738 n.1; also cf. TAE to Edward Johnson, 23 May 1883, Lbk. 16:437 [*TAED* LB016437]; Henry Seely to Alfred Tate, 5 Nov. 1888, DF [*TAED* D8846ACF]). To prepare what would become Edison's British patent 17,175 (1887) in December 1887, Gouraud retained John Fletcher Moulton, Q.C., a renowned barrister in patent and industrial matters and, on Moulton's recommendation, also engaged patent agent G. G. M. Hardingham. At their suggestion, Gouraud promptly cabled for permission to delay filing the corresponding German patent so it could be revised to conform to the English one, and second, to file the English in provisional form only so as to gain nine months of secrecy before its publication. Richard Dyer conditionally approved the first request and Edison granted the second, "provided cases on Continent are filed immediately, so I can make public here." Edison's new foreign applications for the phonograph would be complicated by his early telephone patents, which had included the phonograph and remained in force in several countries, including Belgium, France, Germany, Italy, Russia, and Norway (Gouraud to TAE, 25 Nov. and 10 Dec. 1887; TAE to Gouraud, 16 Dec. 1887; Richard Dyer to TAE, 31 Oct. 1887; all DF [*TAED* D8751AAF, D8751AAN, D8717AAY, D8749AAO]; "Obituary. John Fletcher Moulton," *Journal of the Institution of Electrical Engineers,* 59 [1921]: 781–82).

4. This paragraph is based closely on comments that Edison wrote on Gouraud's 28 January letter (see note 2). Gouraud projected that the "the Phonograph is so almost inconceivably broad & the future of the Phonogram & the quantity of Phonograms that will be consumed so utterly incalculable that nothing short of a flat, thin pliable material to be carried upon a pencil-like drum will ever meet the necessities" of storing and perhaps also mailing a large number of cylinders. Recordings could be played back using a mechanism like a combination of the moveable typewriter carriage and the self-playing organ, a common-enough instrument that produced music according to notes encoded on perforated paper strips. (Edison's remark about close registration presumably referred to the minute vibratory patterns recorded on the phonograph cylinder's densely-spaced grooves compared with the grossly larger holes for an organ.) Edison rejected the idea out of hand, alluding to the compactness of cylinder recordings relative only to written communication: "I cant see my way clear for a flat phonogram— Have you considered the fact that if you write a 1000 words on Legal Cap & roll it up it takes more space than the phonogram with a 1000 words." Gouraud to TAE (with TAE marginalia), 20 Jan. 1888; TAE to Gouraud, 2 Feb. 1888; both DF (*TAED* D8850AAI, D8818ACK).

–3157–

Memorandum to Richard Dyer: Phonograph

[Orange,] Feby 22 '88

Dyer

Change the Knearling application thus[1]

after phonogram is ready deposit with Silver in Vacuum or graphite Electrolytic process then plate with lead or tin, about $\frac{1}{16}$ inch thick.[2] disolve out wax Saw the cylinder through once so it can be bent flat. It is then bent around a cylinder and secured to the same by cement, forming an Knearl, or it can be laid flat and the cylinder to be reproduced passed over it like a lithograph press & stone.= The latter preferable method=

Edison—

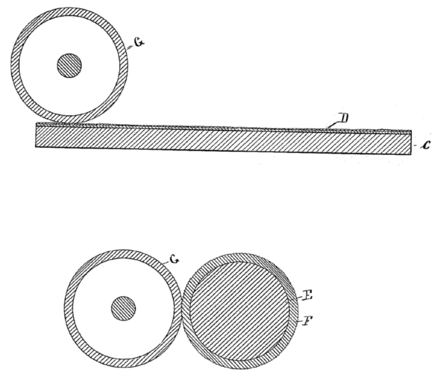
Claim. Alpha Centauri Orion & the pole star—[3]

ADS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAF).

1. Edison referred to Doc. 3152 (see esp. n. 4). Perhaps as the result of patent attorney Richard Dyer's objection, Edison revised the application to cover an entirely different process. As he described it in the issued specification,

> I deposit metals over the record of the recording-surface of a cylindrical wax phonogram, and after melting out the original wax I divide the remaining cylinder by splitting it longitudinally with a thin saw on one side. I then open the cylinder out flat or further bend it into the form of a cylinder, with the record upon its exterior. To give the necessary strength I provide a suitable backing. The

result is a flat or cylindrical knurling-surface having the record in relief, so that by rolling a wax phonogram-blank upon it the original record will be reproduced. [U.S. Pat. 382,419]



Edison's revised duplicating methods in his U.S. Patent 382,419. Either by cutting open and flattening metallic impression ***D*** *of the original cylinder or by cutting it open and wrapping it inside out (****F****) around a form* ***E****, the knurled surface could be impressed on blank cylinder* ***G****.*

2. Edison referred to electroplating thin metallic films in a vacuum, a process he began to investigate in 1884 and tried to patent in 1887 as a means of duplicating recordings (see Docs. 2587, 3101, and 3119). The process was sufficiently fine-grained to offer the possibility of creating a mirror or negative image of the delicate indentations of a cylinder's recorded surface. In late March, Franze Schulze-Berge began trying to apply a delicate film of silver over a wax cylinder. His end goal, however, was to create a useable copy of the recording, not a pressing master as Edison suggests below. According to the recollections of Jonas Aylsworth, who provided recordings to Schulze-Berge and saw him work (as well as testimony by Adelbert Wangemann and Edison), a more substantial body of metal was conventionally electroplated to the silver film, creating a mold, while the original recording was melted away. A duplicate was then created by dipping, pouring, or pressing wax into the mold. Schulze-Berge seems to have worked hard to master the trick of taking the new recording out of the mold, typically by one of two ways: sawing the mold into halves, either before or after the impression was made, or by chilling the wax to contract it. Schulze-Berge devoted nearly the whole of his working time to this endeavor from late March 1888 to early February 1889 (Schulze-Berge time sheets, WOL; Schulze-Berge notebooks N-88-04-11, N-88-09-27, both Lab., NjWOE; Aylsworth's testimony, pp. 113–14, 119–25, 128–31; Wangemann's testimony, pp. 60–79; Edison's testimony, pp. 138–43,155–58; all *National Phonograph Co. v. American Graphophone Co.*; Lit. [*TAED* QP006111, QP006059, QP006137]; see also Doc. 3201 n. 27).

3. Edison signed the completed application on 3 March. Filed five days later as Edison's Case 765, it sailed through the Patent Office in two months and issued (with two claims and four drawings) as U.S. Patent 382,419.

–3158–

From Francis Upton

Harrison, N.J., Feby 23, *1888*[a]

Dear Sir:—

We are desirous of making a small lamp for medical purposes which shall be the best made in the world.[1]

For this type of lamp we need a very fine fibre. We wish you would send us some fibre that you think is right. We now use a 6 × 6 bamboo,[2] but feel that if we can get a round fibre smaller than this, we can bring up the resistance of the lamp, and make the clamping still easier than now. Yours truly

THE EDISON LAMP CO. By Francis R. Upton Treas.

<Write him that I can give him what is required[3b]

Tell John Ott that I want to make saphire dies to draw down to 005—& to see me about it Show me this letter every day>

TLS, NjWOE, DF (*TAED* D8833AAP1). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.,*" and "*188*" preprinted. [b]Followed by dividing mark.

1. The Edison Lamp Co. had been producing miniature lamps on at least a custom, if not routine, basis for several years, and its catalogue now included two forms of small battery-powered lamps intended for dentistry (Doc. 2794 nn. 1, 3; Edison Lamp Co. catalogue [pp. 22–23], n.d. [1887], PPC [*TAED* CA041J]). Both medical and dental practitioners had been keen to use portable incandescent electrical lights to safely illuminate body cavities or examine eyes, and for various diagnostic and surgical procedures. Such devices often used Edison (or Swan) miniature lamps, but the editors have found nothing to suggest what, if anything, Edison knew of this pioneering work or the rapid changes underway in endoscopy, laryngoscopy, and similar fields. Carl Seiler, a medical doctor from Philadelphia, credited Edison with the idea behind an electric laryngoscope made by the S. S. White Dental Manufacturing Co. of that city (which also made an electric otoscope with 5 candlepower Edison lamps). Seiler's work on his own electric laryngoscope had included tests in 1883 with "a very small incandescent lamp made in the laboratory of Mr. Edison, which was mounted on a long stem, and was intended to be pushed into the cavities of the body to illuminate them." By 1888, the medical literature contains mentions of many such instruments, for which the Edison mignon lamps (as the miniature bulbs were known) were among the most commonly used (Lautenbach 1885, 324–27; Meyer 1888, 53; Fenwick 1888, 333–34; Fenwick 1904, 22–27; Bartholow 1887, 291; Seiler 1884, 350; Seiler 1889, 30–31; George Barker to TAE, 14 Feb. 1880, DF [*TAED* D8004ZAR]).

2. Upton likely referred to a 6⁄1000- inch filament.

3. Alfred Tate prepared a reply in Edison's name a few days later that promised: "I can give you what you want. I will start work on this immediately." TAE to Edison Lamp Co., 28 Feb. 1888, DF (*TAED* D8818AFG).

–3159– [Orange,] Feby 27/88

Draft Patent Application: Iron Ore Separation

The object of this invention is to improve the methods of seperating magnetic from non magnetic particles

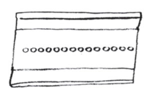
The invention consists of a peculiar delivery hopper which permits the powder to fall straight and not be spread out into a wide stream

Heretofore in magnetic or other[a] seperators V shaped hoppers have been used with a narrow slit at the bottom. The particles [---][b] are thus given an angular motion the result being a stream of particles which widens greatly as it falls Thus

~~my imp~~ This makes it very difficult to seperate the magnetic from the non magnetic by alterations of the Trajectory especially when the material is very fine as in Auriferous pyrites

I have found that the stream can be almost prevented from spreading by the following device

End view[1]

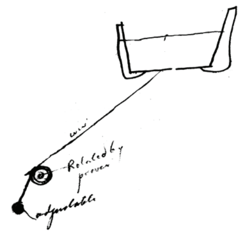


bottom view

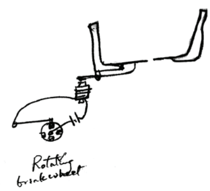
If the hopper be kept filled the particles leaving the thin sheet brass by the holes fall perfectly straight and continue so for a foot or more but gradually spread out by action of the air— The space between the holes causes the whole stream on its first start to appear as a number of streams but at some distance from the hopper these coelesce & form one sheet. Thus the particles are all <u>widely seperated</u> from each other which is very esential for perfect seperation when the largest portion of the material is magnetic.

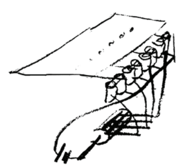
when the ore or material is very fine & a very fine sheet of falling particles is essential the holes must be very small say for 100 mesh[2] material the holes should be 3⁄64 of an inch and 1⁄32 apart, when this small the powder will not pass through. To obviate this The brass plate is made to receive vibrations like The vibrations of a phonograph diaphragm ~~of~~ or a plate bowed by a violin bow. This sets the particles in vibration & the pass freely through the holes. This vibration can be produced by a series of levers connected to magnets or by wires connected to diferent parts of the hopper plate. These wires receiving longitudinal vibrations by passing over a revolving wheel covered with leather & surfaced with Rosin— See Cuts.

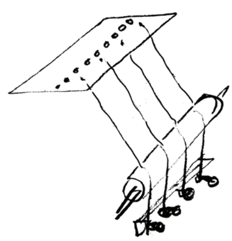
[A][3]



[B][4]







Dick— This is a big advance Cover it up as much as possible

Edison

P.S. A straight slit 3⁄64 wide can be used just as well as the holes, but the stream is thicker edgewise and does not give so perfect a seperation as particles are closer together & some of the magnetic particls lock the nons together when in close proximity to each other— still the slit is good so dont confine it to holes—[5]

ADfS, NjWOE, Lab., Cat. 1153 (*TAED* NM022AAG). [a]"or other" interlined above. [b]Canceled.

1. Edison appears to have erased a portion of this drawing showing a stream of material flowing from the hopper past an electromagnet. He also drew and erased a side view of the hopper with discrete streams flowing from the bottom.

2. Sieves and screens are gauged by the number of meshes or wires per inch. A 100-mesh screen has that many wires per linear inch, or 10,000 holes per square inch. See, e.g., Great Exhibition 1851, 2:632 (Section III, Class 22, no. 332 for Nicklin & Sneath).

3. Figure labels are "wires," "Rotated by power," and "adjustable."

4. Figure label is "Rotating break wheel."

5. Edison's draft was received by his patent attorneys the next day and was the basis for a patent application that he signed on 19 March. The application was filed ten days later and issued in January 1889 as Edison's U.S. Patent 396,356 with seven combination claims and six drawings, only three of which were directly derived from Edison's sketches (the fourth, seventh, and eighth above). The application was the culmination of several weeks of experiments by William K. L. Dickson, who had struggled to "get a perfect non scattering stream" of ore flowing past the magnet (or magnets). Dickson concluded on 11 February that the "only trouble" remaining was "in the outlet of hopper—to be able to get a straight stream without scattering," but he was unable to devise a suitable form. Then on 19 February, according to records that Dickson copied or adapted from his experimental notes, "Mr Edison solved the mystery of a straight thin stream by perforating a sheet of writing paper with a pencil point and allowing some ore to fall through.…The stream proved perfectly straight within 3 feet fall, spreading from ⅛" outlet to a little under ½" this would continue of coarse to any height of fall almost to at least 7 seven feet." He seems to have quickly changed his mind in favor of a slit after finding the differences between streams produced that way or by holes to be "almost imperceptible." Yet the model separator that Dickson constructed by 22 February (which he promptly began using for gold-separating experiments as well) apparently had a hopper with holes. Finding them clogged with powdered ore, he "devised a very rapid vibrator, giving an almost imperceptible stroke on the hopper—and so shaking the dust thro the holes." Notebook E-2610:51, 59–61, 64, Lab. (*TAED* NM031051A, NM031059, NM031064).

[Orange,] Feby 27/88

Draft Patent Application: Direct Conversion

The object of this invention is to produce electricity direct from Carbon[1]

The invention consists is forming cells containing two electrodes one of platinum or platinized material, & the other of Coke, or ignited Coal[a] —and the use of a sulphate preferably sulphates of Potash or Soda combined with Boracic or phosphoric oxide to render the sulphate more liquid & conducting—

The invention further consists in heating such cells to[a] a red heat or higher to render the Electrolyte Liquid & to reach the oxidation point of the Carbon. A number of these cells may be placed in a heated chamber & kept at a full red heat, and if the chamber is properly constructed very little heat will be lost by radiation

~~The~~ [-][b] The decomposition of the Sulphate gives off Oxygen, which Combines with[c] the[a] the Carbon at this[a] high temperature. The platina is not attacked in the least; sulphuric acid is also given off which may be condensed in another chamber connected to the heating chamber ~~& recombined with the resultant~~ & used over again—[d] The Electromotive force of such an Element at a full red heat is One[a] & six tenths volts and the internal resistance about 20 ohms per square inch of Electrodic surface.[2]

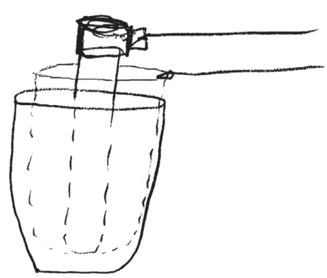
Claim— The use of a sulphate of a metal, as set forth

2nd Sulphate of a metal in Combination with Boric or phosphoric acid

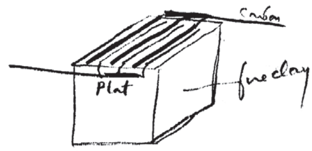
4th The use of a Sulphate of ~~Potash or an alk~~ Potash or Soda and Boric or phosphoric acid when used as an Electrolite in a fused state

The use of Carbon as the combustable Electrode in combination with metals of the[e] platinaum group in fused Electrolites ~~of~~ Containing sulphates and Boric or phosphoric acid—

Etc Etc



Dick— I dont know if a drawing is necessary in practice I shall make cells thus[3]



ADf, NjWOE, PS (*TAED* PT032AAV). [a]Obscured overwritten text. [b]Canceled. [c]"which Combines with" interlined above. [d]"~~& recombined~~ . . . over again—" interlined above. [e]"of the" interlined below.

1. Edison been working intermittently on methods to convert coal directly into electricity since 1882. His first efforts encompassed early fuel cell technology; more recently, he had been experimenting with what he called pyromagnetic generators and motors that used alternate heating and cooling to vary a magnetic field around a conductor. This document marks a revival of Edison's interest in fuel cells. Unlike his pyromagnetic devices, these cells had no moving parts and, unlike conventional batteries, they consumed a replaceable fuel (carbon) rather than their own electrodes. See Docs. 2520 (headnote), 3029 (headnote), and 3129 n. 4.

In this patent draft Edison returned to a design he experimented with briefly in July 1884 (see Doc. 2701). His new experiments began on 2 February, and twelve days later Arthur Kennelly summarized the "results obtained during the last few days with a pyrocell using different metals and fusible salts." On 17 February and again on 21 March Edison wrote out instructions for James Gladstone, who seems to have been responsible for preparing the cells. Kennelly was responsible for testing them, which may be why his work was assigned experimental number 60 ("Pyro Carbon Cell") while Gladstone's was assigned 100 ("Thermo Battery") even though the experimental record shows both men working on similar devices. (See Docs. 3129 and 3133 for the kinds of devices Edison usually designated as thermo batteries.) Experiments with different combinations of electrodes and solutions continued into the beginning of March. N-88-02-02; N-88-01-19:23; TAE to John Ott, 17 Feb. 1888 and TAE to Gladstone, 21 Mar. 1888, both N-88-02-17; Kennelly's experimental notes are in N-88-01-19:23–76 (passim), and Gladstone's (with some calculations by Kennelly) are in N-02-17; all Lab. (*TAED* NA022AAA [images 13–15, 19]; NB019023A; NB025AAK; NB025AAO; NB019 [images 25–76]; NB025 [images 43–73]); N-87-11-24, WOL (*TAED* NL002AAA [images 4 and 6]); Time Sheets, WOL.

2. Edison amended this description in a separate undated note to Richard Dyer, likely in response to an inquiry that has not been found: "I find that the closed chamber wont do it requires a very high heat because you dont get the attraction of the Oxygen to help you decompose it— So just say roasted to that point where it is reduced from a Bisulphide to a protosulphide but not oxidized." Edison's note was preserved with his draft application. The application was received

by patent attorney Richard Dyer on 28 February, but the editors have found no evidence that a completed version was filed at the Patent Office.

3. Figure labels are "Plat," "carbon," and "fireclay."

–3161–

From George Gouraud

Little Menlo,[1] Mch. 3d, 1888.

Dictated.

Edison:

I confirm my telegram of yesterday, as follows: "Gilliland.— Please have Edison and his friends photographed in the act of talking the first phonogram for Europe. Send me duplicate negatives. Important for lecturers, agents and press. I will do likewise as regards those I have invited to receive and reply to the same."[2]

Such a thing will be copied in all the illustrated papers, and will give us many thousand dollars worth of free advertising. Don't let your natural modesty, or the slight personal inconvenience, prevent your complying with this request.

G. E. Gouraud. H.[3]

<Tate= I want you to write Gouraud a strong letter about these advertising schemes— I dont propose to be Barnumized[4] & I will furnish <u>no</u> data for his proposed book—[5] I[6] he does anything in that line other than a dignified biz way we shall at once get into a Row— I believe in his proposed Exhibition with[a] phonos from here & talk etc which will be quite sufficient I insist that he does not shove my name forward so prominently—but want him to talk phonogh & not Edison— E[dison]>

TL, NjWOE, DF (*TAED* D8850AAX1). [a]Obscured overwritten text.

1. Little Menlo was Gouraud's name for his house at 55 Beulah Hill, in Upper Norwood (a fashionable residential section near Crystal Palace Park, south of the City of London), where he planned to demonstrate the phonograph and display other inventions in an "Edison room." *London Ency.*, s.v. "Upper Norwood"; Gouraud to TAE, 18 Feb. 1888, DF (*TAED* D8850AAQ).

2. The editors have found neither Gouraud's telegram to Gilliland nor any such photo as he requested. Gouraud had been anticipating a recording of Edison for publicity purposes, recently writing: "When, oh when! great master shall I hear that <u>voice</u> that is to re-echo wherever in the world man is." He also asked for the megaphone that Edison had devised in 1878 and apparently promised to give him. Edison answered that the instrument was "all rusted to pieces" but vowed to make another; he seems to have thought better of the expense and instead offered large photographs of it. Gouraud to TAE, 30 Nov. 1887, 11 Feb.

and 18 Feb. (with TAE marginalia) 1888; all DF (*TAED* D8751AAJ, D8850AAO, D8850AAQ).

3. The editors have not identified this typist or scribe.

4. That is, to be promoted with flamboyant showmanship in the style of American circus proprietor P. T. Barnum (*OED,* s.vv. "Barnum," "Barnumize"). The letter that Alfred Tate prepared in Edison's name stated:

> I am well aware of the value of the assistance which the press is capable of giving us, but it appears to me wholly unnecessary to make a parade after the fashion of Barnum and his White Elephant.
>
> Your suggestion about sending phonograms from here to England and your proposed exhibition after their arrival are to my mind good judgment, but I think we should stop there. I have no objection whatever to your advertising the Phonograph to any extent you please, but personally I have no desire for notoriety and do not wish to be included in arrangements which are distasteful to me and which, at least in America, would be considered undignified. [TAE to Gouraud, 21 Mar. 1888, DF (*TAED* D8818AGP)]

Gouraud had recently proposed to Samuel Insull his vision of marketing all of Edison's manufactures through his own "almost world-wide system of agencies" (Gouraud to Insull, 14 Feb. 1888, DF [*TAED* D8850AAW]).

5. Gouraud wished to publish a lavishly illustrated book comprehensive of "Edison and His Works," which he described fully in a letter that would not yet have arrived. His collaborator on the scientific details was to be William Fletcher Barrett, an Edison acquaintance and professor of physics at the Royal College of Science in Dublin, whom Edison had recently referred to Gouraud to obtain a phonograph for a lecture. Gouraud to TAE, 29 Feb. 1888; TAE to Barrett, 3 Feb. 1888; TAE to Gouraud, 3 Feb. 1888; all DF (*TAED* D8807AAM, D8818ACS, D8818ACX1).

6. Edison presumably meant "If."

–3162–

Charles Batchelor Journal Entry

[Orange,] Mch. 6 1888

545.[1] Toy phonograph. <2.>[2a]

Made a small phonograph for dolls, etc. with an automatic return motion so that you simply turn always in one direction and it says the same thing over and over again—

AD, NjWOE, Batchelor, Cat. 1337:43 (*TAED* MBJ004043043A). [a]Marginalia written by Charles Batchelor.

1. Batchelor consecutively numbered each entry in this journal.

2. Edison had licensed the manufacturing and sales rights for phonograph toys to William Jacques and Lowell Briggs (and had since assigned his financial interest in that contract to the Edison Phonograph Co.). Jacques and Briggs incorporated the Edison Phonograph Toy Manufacturing Co. in late 1887, but responsibility for developing a

suitable mechanism remained with Edison and his laboratory (see Docs. 3076 and 3100; TAE agreement with Edison Phonograph Co. [art. 4], 28 Oct. 1887, Misc. Legal [*TAED* HX87013]; for overviews of the toy ventures, see Wile 1987 and Rondeau 2003). Charles Batchelor took up the problem in February. This journal entry on the subject was his second and part of a long sequence of separately numbered entries on the talking doll. On 23 February he described and illustrated the design of some "mica diaphragms with springs on so" that "gave loud talking without the objectionable extra metallic sounds." A measured drawing of the complete toy phonograph was made at the laboratory on 29 February (Cat. 1337:42 [item 542; 23 Feb. 1888], Batchelor [*TAED* MBJ004042B]; Unbound Notes and Drawings [1888], Lab. [*TAED* NS88ABG]). Batchelor picked up the project again at the end of the month, working through the night of 30–31 March to try seventeen variations, mostly on the "receiver" point and diaphragm. Among the conclusions he drew was the necessity of limiting the diaphragm to no more than 1.5 inches diameter and, for the best sound quality, using a "<u>very rigid lever</u> to hold your [reproducing] point," and a shallow groove in the recording surface (Cat. 1337:44–47 [item 547, sub-entries 3–19; 31 Mar. 1888], Batchelor [*TAED* MBJ004044]). Batchelor also recorded eighteen numbered experimental devices (related to those in his journal) in a small pocket notebook during the last week of March (PN-88-03-25, Lab. [*TAED* NP054B]).

In early April, after working through three nights in a week, Batchelor made another detailed record of his progress. He tried a diaphragm of shellacked bolting cloth with recording surfaces of metallic foil and then cylinders of an asphalt-carnauba wax mixture as well as of lead, tin, or solder (tin being preferable). These cylinders had but a single recording track across the circumference so "the words are all put on one turn of the cylinder." This arrangement severely limited the length or quality of recording: the toy worked best turning at 900 linear inches per minute (the standard phonograph turned at about 530) but a cylinder small enough to fit inside a doll could reproduce a recording of any useful length at only 250 inches per minute, a speed that resulted in "not such good talking." (Several pages of sketches and notes related to this work from 1 and 6 April, as well as a few earlier undated sketches, are in N-87-12-26, Lab. [*TAED* NB011AAA, NB011AAB, NB011AAC].) Batchelor overcame this constraint on 14 April by reverting to a spiral track, made four times around the cylinder, and devising a push-button mechanism to return the reproducing point and diaphragm to the start. With this, he felt he had a "Very good & practical" toy phonograph (Cat. 1337:47–49 [item 547, sub-entries 20–25; 6 and 14 Apr. 1888], Batchelor [*TAED* MBJ004047, MBJ004049]); on the design and construction of the phonograph doll generally, see Feaster 2015.

Notebook Entry: Iron Ore Separation

Some Roasting Exp. continued—[1a]

—Fig 1—

—Fig 2—

—Fig 3—

Such a roasting device Mr Edison advised my trying, that is to drop the ore thro' a heated tube—which proved after some experiments to be almost useless owing to the fact that when the tube became red hot there was a decided upward hot air current created, which drew up and away all the fine dust and only allowed the coarser to fall in a magnetic roast— Should therefore the gold be so fine as to pass off with the dust the result would be evident—

A number of Experiments on this proved again the absolute necessity of oxygen to arrive at the best magnetic results—

Fig 1 & 2 the tube is raised and allowed the ore to fall thro air and at the same time permitting a current to rush up the tube— Tho' in Fig 2 the tube end shd not be so near to the flame, better results were attained by using a somewhat longer central tube cooler at top & bottom—

In Fig 3—it will be seen that the tube is resting on the pan & so excluding all air from entering the tube—

The result of this Experiment proved a total failure as far as a magnetic roast was concerned but more fine dust was saved—

This decided the question that I should raise the pipe and allow the air to enter & so giving me a most magnetic roast—

This Exp. simply goes to prove an experiment tried on pg. 40 and that is the impossibility of getting Iron Pyrites to a magnetic state unless a large % of oxygen be used during roasting—[2]

X, NjWOE, Lab., Notebook E-2610 (*TAED* NM031067). Written by William K. L. Dickson. [a]Followed by dividing mark.

1. Edison had drafted a patent application in the summer of 1887 for heating ("roasting") ores in the course of separating gold, and William K. L. Dickson had returned to the subject on a few occasions since then (see Doc. 3074 esp. n. 4; Notebook E-2610:30, 32, 46; Lab. [*TAED* NM031030, NM031032, NM031046]; see also note 2). Having "perfected" a hopper and separator for concentrating iron (see Doc. 3159), Dickson tried running gold-bearing pyrites through them on 24 February. He noticed that a small percentage of the gold was unaccountably carried away with the dross. Examination under a microscope showed that during the roasting process, "particles of gold were fused to the pyrites and so carried over to the magnetic side" of the separator. Reducing the temperature solved that particular difficulty but did not address the related problem that roasting in a pan heated the material unevenly and necessitated additional crushing and heating. Dickson left off his notes at that point on 2 March (Notebook E-2610:64–66, Lab. [*TAED* NM031064, NM031066]).

Processes for roasting various ores were used commercially for a number of reasons, several having to do with oxidation. Some iron oxides are more strongly magnetic than related compounds, and the refinement of copper and zinc ores occasionally involved roasting to convert pyrites into oxides that could be culled by magnets. At least one iron mine in Germany at this time was similarly oxidizing its ore prior to concentrating it by electromagnets. For recovering gold from tailings (the object of Dickson's investigations), roasting had been tried experimentally in conjunction with magnetic separation as early as 1862. Spon 1881, s.v. "Iron"; Walker 1880, 313–16; Thorpe 1877, 2:344–45; "Notes on the Progress of the Home and Foreign Iron and Steel Industries," 252–53; Gordon 1885, 36–37.

2. Dickson referred to the crushing, roasting, and concentration of three ore samples from Witherbees, Sherman & Co. on 19 January. He submitted paramagnetic and diamagnetic (properties arising through roasting) versions of this stock to the company for analysis. One sample proved too fine to go into a furnace. More significantly, the others contained unacceptably high levels of phosphorous, evidently a result of the incomplete separation of magnetic iron. Notebook E-2610:40, 45; Lab. (*TAED* NM031040, NM031045).

Dickson had a finished model of the gold ore magnetic separator by 20 March, with which "all fine Experiments could be easily tried—[it] having every means of adjustment." After finding that a small percentage of gold was carried off as waste with pulverized quartz, he began working on an electrostatic process to capture it, for which he completed a patent application on 9 May. He also worked on mechanical methods of improving traditional techniques of amalgamating gold with mercury (Notebook E-2610:71–72, 75, 79; Lab. [*TAED* NM031071, NM031072, NM031075]; U.S. Pat. 476,991). Dickson continued making frequent notebook entries related to the separation of precious metals through mid-summer, after which his work trailed off through the fall.

–3164–

Notebook Entry: Aluminum Production

[Orange,] March 15 1888.

Notes on Experiments for production of Aluminum[1]

Try Bunsens Electrolytic process—Watts Dic Vol 1 page[a] 152[2]—also see full paper in Poggendorf Annalen xcii. 648[3] Use the Electric Light Current— If you succed in getting the results, then rig up & make a quantative Experiment to determine how much material & Current is used under the best Condition ~~per~~ [---][b] per gramme of aluminium— Try platinum as well as Carbon Electrodes instead of a porous partition use a non porous partition & leave an opening at the bottom for the Current to pass Thus[4]

You will have to fit it in the sides of the Crucible.[c]

Try also fused Carbonate Soda—Carbon Electrodes & then when Liquid add Chloride of Alumina Connect Current so Oxygen will be Eliminated on the Carbon pole—

Vary this Experiment by using ~~Iron wire & eliminating Oxygen on it & a Carbon pole~~

~~also Vary it by using~~ The following wires or electrodes[d]

Electrodes on which Oxygen is liberated	Electrodes on which the Base is liberated—
Iron	platinum
Nickel	Iron
Copper	Nickel
Zinc	Copper

Silver	Zinc
Cast Iron	Silver
Carbon	Cast iron
platinum	Carbon
Brass	platinum
Cadmium	Brass
	Cadmium

Change these about in various ways—

Use the following solutions— ~~Try~~[c]

Chloride of aluminium alone[c]
Double Chloride of aluminum & Sodium—[c]
Cryolite[5e]
Sulphate of aluminium alone[c]
Sulphate[a] of aluminum and Carbonate of Sodium in various proportions.[c]
Sulphide of Soda & Chloride of aluminum—Various proportions[c]
Sulphide of Soda & Sulphate of aluminium[c]
Sulphide of Soda—Acetate of alumina—[c]
Sulphide of ~~alumina~~Soda & Carbonate of Aluminum[e]
Chloride Sodium Carbonate ~~Al~~ Soda & Chloride of Aluminium—[c]
Caustic Soda & Chloride Aluminium—[c]
Borax and Cyanide of aluminium—[c]

Note— put pure Chloride aluminium anhydrous in side tube of Lamp 32 cp & get vac heat alumina chloride which when pure boils at 180° & Volatilizes at even[f] lower temperature then heat filiment— This[a] will probably not work— Then substitute an iron wire— The chlorine will Combine with this & if vacuum kept[a] high & action go on slowly aluminum metal should be deposited on the globe—[c]

Solutions[a] Continued

Carbonate Soda & the double chloride of Aluminium & Sodium[c]
Common Alum ie[g] potassium & Aluminum[c]
Chrome Alum[c]
Ammonia Alum—[c]
Chrome Alum & Carbonate soda—[c]
Ammonia Alum & Carbonate soda
potassium Alum & Carbonate soda—[c]

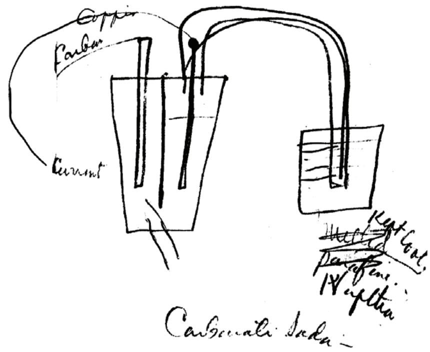
Note= See Joules method of Electrolytic preparation of

Aluminum—Chem Gaz 1850 339— perhaps found in Joules papers a book recently issued &[f] now in Library[6c]

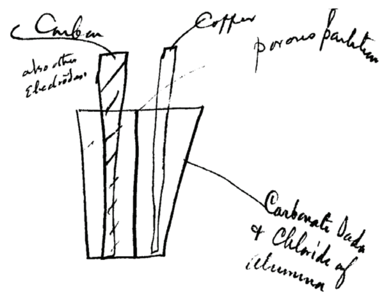
Acetate soda & & chloride alumina—[c]

Ordinary chloride aluminum 25 pct of its weight of Lamp-black & Carbonate Soda—

[A][7h]

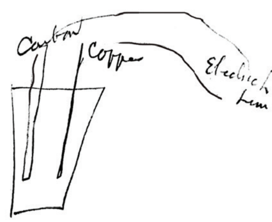


[B][8]



Carbonate Soda— perhaps this will work without the partition—[c]

In electric Lamp 32 cp—in side tube anhydrous Chloride alumina & asphalt pitch or napthalin. on heating Chloride alumina & napthaline Volatilized— heated filiment decomposes the Chl alumina & Chlorine Combines with [~~Car~~?][b] Hydrogen to form HCl—[9]



Use—anhydrous chloride alumina, 30 pct—70 pct

Carbonate soda— fuse to red heat the Soda & then add the chloride—[c]

also use Chloride alumina & Carbonate potash

also use Double chloride of alumina & Soda with & ~~without carb~~ potash—

also double chloride of Al & K with & without Carb Soda[a]

Look for deposit alumina on Copper or bottom Crucible— ~~to me in Case this~~ [-][b] use as low a heat as possible—[c]

TAE

X, NjWOE, Lab., N-88-03.15.2 (*TAED* NA023001). [a]Obscured overwritten text. [b]Canceled. [c]Followed by dividing mark. [d]Columns in following table separated by vertical line. [e]Obscured overwritten text and followed by dividing mark. [f]Interlined above. [g]Circled. [h]Unrelated drawing on facing page has not been reproduced.

1. Despite being one of the most abundant elements on Earth, usable aluminum was scarce and costly owing to the difficulty of smelting it (it volatilizes readily and has a strong affinity for oxygen, in particular). Its properties of light weight, tensile strength, resistance to corrosion, and beauty created demand for it in ornamentation and dental and surgical devices and suggested a wide range of other uses if the supply could be increased (Self 1887, 209–10). Edison had touched on the subject several times in the past (see Docs. 1902 esp. n. 5, 1944 esp. n. 3, and 2262 esp. n. 2). His renewed interest at this time coincided with an offer by a New York dealer on 13 March to sell him pure aluminum from "a new and large supply" at $8 per pound with the expectation of lower prices in the future. Edison declined (Richards 1896, 39; Packard 1890; Emerson Foote to TAE, 13 Mar. 1888; TAE to Foote, 19 Mar. 1888; both DF [*TAED* D8856ACL, D8818AGL]).

Other investigators had recently made discoveries of great practical significance, but Edison's citation in this document is to Robert Bunsen's groundbreaking earlier work (see note 2). About 1854, Bunsen devised means to electrolyze aluminum compounds—using a battery current not merely to heat but to dissociate them by electrolysis—but the technique was impractical at that time beyond the laboratory. Subsequently, Charles Hall of Oberlin, Ohio, found that he could dissolve alumina (a common oxide) in a bath of molten cryolite (a sodium-aluminum fluoride) and, by subjecting the whole to electrolysis with a strong dynamo current, drive oxygen and other elements from the aluminum. Hall filed a patent application for his process in 1886 but may have been anticipated in the development of a similar electric furnace by Eugene and Alfred Cowles, brothers connected with the Brush Electric Company in Cleveland who described their invention to the American Association for the Advancement of Science in 1885. Paul Louis Héroult independently devised a process much like Hall's, and other researchers (including Charles Bradley, a former Edison employee) had been working along much the same lines. At the same time, drastic improvements in methods of producing the sodium used for smelting aluminum by conventional methods had significantly reduced the cost of the finished metal. By the end of 1886, the Cowles had set up a plant near Niagara Falls using hydro-electric power to make large quantities of aluminum bronze, an industrial alloy that did not require pure aluminum but was something of a chemical intermediate step. But it was Hall's patent for his electrolytic process, licensed to the new Pittsburgh Reduction Co. (later renamed Alcoa) even before it issued in April 1889, that would soon revolutionize aluminum production in the United States (G. Smith 1988, 1–26 offers a helpful historical overview; more contemporaneous sources include Richards 1896, 8–31; Hopkins 1905, chap. 12; and Self 1887, 319–21; see also Cowles 1958, 7–63; Edwards, Frary, and Jeffries 1930, 11–30). Edison's response to an unknown offer at the end of 1888 suggests his awareness of the rapidly changing field. He instructed his secretary to say in reply "that cheap aluminum would be a great thing but there are more than 20 Cos at it already & patents are coming out here & in England & Continent at rate 20 a week" (TAE marginalia on Walter Mallory to Alfred Tate, 14 Dec. 1888, DF [*TAED* D8845AGR]).

2. Edison referred to a summary of work by distinguished chemist Robert Bunsen in the "new edition" of *A Dictionary of Chemistry and the Allied Branches of Other Sciences,* a multi-volume work by Henry Watts published in numerous different editions and supplements. Under the entry for aluminum, Watts stated that the reduction by electrolysis

> from fused chloride of aluminium and sodium was first effected… by Bunsen in 1854…. The salt is introduced in a fused state into a red-hot porcelain crucible, divided into two parts by a porous earthenware diaphragm, and the extremities of the carbon poles of a Bunsen's battery of ten elements are introduced into the two halves of the fused mass. The metal is then reduced at the negative pole. The heat must be raised considerably above the melting-point of the double chloride, otherwise the aluminium separates in the pulverulent [powdered] form.

The process yielded pure metal in "globules of considerable size" and was similar to that developed nearly simultaneously but independently by Henri St. Claire DeVille who, however, used platinum rather than carbon at the negative electrode. Watts 1872–75, s.v. "Aluminium"; Richards 1896, 8–13.

3. The Watts *Dictionary* entry (see note 2) gave the citation to Robert Bunsen's brief paper on the extraction of alkaline and alkaline earth metals in the *Annalen der Physik und Chemie* (Bunsen 1854). The name of this prestigious journal was often conflated with that of its longtime editor, Johann Christian Poggendorff.

4. Figure label is "partition."

5. This mineral (a double fluoride of aluminum and sodium), a key to Hall's successful electrolytic process (see notes 1–2), had been recognized as a useful flux in experimental efforts to purify aluminum by heat. Other compounds listed by Edison, notably the chlorides and sulfates, also appeared in the published literature in this context. Self 1887, esp. p. 320.

6. Edison referred to an abstract in the *Chemical Gazette* of James Prescott Joule's presentation to the British Association for the Advancement of Science on the amalgamation of a handful of

metals—not including aluminum—with mercury by means of an electrolytic process and great pressure (Joule 1850). The abstract was cited in a number of sources, including the Watts *Dictionary* (1872–75) under "Mercury, alloys or amalgams of," and it was republished in an 1884 volume of Joule's papers (Joule 1884, 331). Aluminum does not readily amalgamate, but another reference book stated that it could be done "as recommended by Joule, by electrolysing the solution of an aluminium salt with mercury for the negative pole." (R. Hunt 1878, s.v. "Aluminium"). This statement was made without attribution.

7. Figure labels are "Copper," "Carbon," "Current," "Kept Cool ~~Melted parafine~~ Naptha," and "Carbonate Soda."

8. Figure labels are "Carbon," "also other Electrodes," "Copper," "porous partition," and "Carbonate Soda & Chloride of alumina."

9. Figure labels are "Carbon," "Copper," and "Electric L Line."

–3165–

From Ezra Gilliland

NEW YORK. March 19th, 1888.[a]

My dear Edison:—

The commercial end of the Phonograph business needs my personal attention badly and I think from this time forward I shall give it all of my time. I will enumerate the important things that ought to be attended to at once and you will readily see that it will take up all of my time between now and the time when the factory will begin to turn out machines.

First; to determine accurately the cost of the apparatus, as this forms the basis of all of our agency contracts and it is absolutely necessary for us to know these facts before we can negotiate with any agency.

Second; To get out the cuts and prepare the matter for the descriptive pamphlets[1] and cuts and written matter for the book of instructions. As the matter now stands, we are within two weeks or less, of having machines ready for market and not one contract closed with any agent and no printing or advertising matter of any kind. Up to the present time this has been unavoidable, but it need not be postponed any longer, as it is definitely understood just what we are going to put out and I can have a machine within the next two or three days to put into the hands of the draughtsman and engravers and within the next few days if I give my time to it, we can determine all questions of costs of manufacture. The detail cuts of the recorder and the reproducer can be left until the last thing so as to include any changes that you are likely to make.

Keller[2] is clear up on his parts to the commutator and the brass part of the spectacle[3] and the feed lever. He ought to have these parts at once or he will be obliged to lay off some tool makers.

I sat down with Batchelor Saturday and gave him my ideas in regard to the unfinished parts. He can finish them up just as well as I can and has said that he would be very glad to do so.[4]

All of the money that we expect to make out of the Phonograph from this time forward depends upon this end of the business and I trust that you will agree with me that it needs my undivided time and very best efforts.[5] Yours truly,

E. T. Gilliland

TLS, NjWOE, DF (*TAED* D8848AAO). Letterhead of Edison Phonograph Co., E. T. Gilliland, general agent. [a]"New York." preprinted.

1. In December 1887, Gilliland had proposed making a "descriptive pamphlet" to illustrate and "give a short history of the Phonograph," and he planned to engage journalist and editor George Parsons Lathrop to make it a "first-class" publication. Edison endorsed the idea and recalled scrapbooks from his New York office to provide detailed information. Edison wanted to show "cuts of the Phonograph and cuts of every detail, with name and number, sewing machine style—the very best that can be made." Gilliland reported before the end of the year that he had arranged for illustrations with the artist who made cuts for a similar pamphlet about the Hammond typewriter, but the project seems to have languished. Gilliland suggested sending copies to George Gouraud for the British market but was not ready to publish until about 24 May, when Edison gave the project (and price quotations) his final approval. The editors have found neither references to the project in later correspondence nor evidence that the pamphlet was printed. Gilliland to TAE, 10 and 20 Dec. 1887, 31 Mar. 1888; TAE to Gilliland, 16 Dec. 1887; all DF (*TAED* D8750AAS, D8750AAV, D8848AAV, D8717ABC); see Doc. 3197.

2. Albert K. Keller (1852–1942), a native of Green Castle, Pa., was a machinist in the Mechanical Dept. of the Bell Telephone Co. in Boston in 1885, when Ezra Gilliland was the superintendent. Keller came with Gilliland to New York to work with Edison and helped set up the joint Edison-Gilliland residences in Fort Myers, Fla. He was then employed at the lamp factory but worked on the phonograph in 1887 at the laboratory and became superintendent of the phonograph factory in Bloomfield, N.J., later that year (Doc. 2991 n. 4; *Pennsylvania Death Certificates, 1906–1963,* online database accessed through Ancestry.com, 2 Mar. 2017). Keller received numerous patents for a variety of inventions during his career. In early 1891, he applied for three patents relating to coin-operated phonographs. These issued in 1894 and were assigned to the Automatic Phonograph Exhibition Co. of New York, which controlled the marketing and sales of the Edison coin-in-slot phonograph (U.S. Pats. 518,190; 518,191; 518,192). Keller's device used an Edison phonograph and was, according to historian Allen Koenigsberg, "one of the first attempts to standardize the industry." Keller said he first conceived of the idea in July 1887 and had

constructed a working model by November, a timeline corroborated by Ezra Gilliland. Keller noted that a number of these coin-operated phonographs were manufactured at the shop of the Gilliland Electric Co. in Adrian, Mich., in 1889, and that by 1890, one had been installed in Ezra Gilliland's New York City home (Koenigsberg 1990, xxxv; Welch and Burt 1994, 32). Keller left Edison's employment sometime during or after 1889 but applied again in 1896 to work as an experimenter, for which Edison offered him three dollars a day. Keller inquired about a machinist position with Edison in 1901 but was told the low-paying temporary job was not suitable for him (John Randolph to Keller, 18 Feb. 1896, Lbk. 62:250 [*TAED* LB062250]; Randolph to Keller, 7 Oct. 1901, Lbk. 67:785, NjWOE).

3. The "spectacle" was a frame, somewhat resembling a pair of eyeglasses, holding the recording and reproducing diaphragms at either end. It pivoted to allow the user to switch easily from recording to reproducing. Edison included the device in a patent application in November 1887 that would issue in July 1888 as U.S. Patent 386,974. The spectacle is visible in Doc. 3105. *ERS,* s.v. "Spectacle."

4. According to Alfred Tate, the phonograph model was finished and sent to the factory the next day, where men were soon "working night and day to turn out the commercial article." At the end of the month, Gilliland asked Edison to provide photographs of the machine for him to give to illustrators. Edison replied that he could not do so but had already instructed Frank Toppan to have photos made in New York City, perhaps at a studio recommended by the offices of *Scientific American*. Tate to William Dean, 23 Mar. 1888; Gilliland to TAE, 31 Mar. 1888; TAE to Gilliland, 2 Apr. 1888; all DF (*TAED* D8818AGV, D8848AAV, D8818AHU).

5. Gilliland also addressed two letters to Tate at Edison's laboratory the same day. One asked Tate to bring his letter to Edison's attention immediately and "get an expression of opinion or an answer and telephone it to me at once." The other explained that Gilliland likely would be writing frequently to Edison about the phonograph for several weeks because "for every step I take I want his approval." He asked Tate to give such letters to Edison "out of their turn and not let them go the way of the regular correspondence." Gilliland to Tate, both 19 Mar. 1888, DF (*TAED* D8848AAP, D8848AAQ).

–3166–

From Francis Upton

Harrison, N.J., March 19, *1888*[a]

Dear Sir:—

The following extracts from a letter rec'd from Mr. Jno. Lieb, Milan,[1] may interest you: "Mr. Dyer[2] left Milan a few days ago, and carried with him an order for a supply of lamps for 1888. We were glad to hear of the success you are meeting in the manufacture of the new lamp. I am glad to hear that you are 'there' and hope you will continue to stay there i.e. lead the World in making the best lamp in all respects. The comportment of the lamps we are using now is not all together satisfactory; the life is good, excellent in fact, but the blackening is giving us trouble. In order to keep up the C.P. of the 'old stagers'[3] we are required to maintain an E.M.F. of 107–108 volts while the normal should be 102 volts. One would suppose that the newly exchanged lamps would succumb under such treatment, but our mean life of lamps for the year is between 1,000–1,100 hours.

"This distribution of the E.M.F. is good but for the reasons given above we are obliged to keep it generally high.

"The lamps have an almost unlimited life when we use alternate currents. In Rome they have no difficulty in keeping the E.M.F. within a half a volt above and below the normal, and their lamp breakage is surprisingly low.[4]

"Mr. Deu,[5] of Messrs Ganz & Co.[6] was in Milan a few days ago and as usual he was loud in complaints of the treatment his firm was receiving from the Edison Company; he showed me several newspaper extracts in which quotations from some Edison Company reports are given, and which speak in disparaging terms of the converter system in general.[7] From the drift of his remarks I believe they intend to make these publications the basis of an action tending toward the annulment of their contract with the Edison Company.[8] Our Transformer plant in Milan gives perfect satisfaction. The steam engines made by Ganz and Company are not up to the American Standard of excellence, though.

"We use a Sieman's underground cable[9] about a mile long and I have made continual daily observations to see how the insullation holds up. The insullation has increased very slightly. Next month we will start up a 3000 light transformer plant at Leghorn.[10] We have already closed negociations for a 6000 light plant for Genoa, the source of power (water) being some ten miles distant.

"It may interest you to know <u>as a fact</u> that up to the present time it has not been possible to run successfully alternate current dynamos in Multiple arc. Ganz and Company have all their force at work on this problem.[11]

"We will put up an arc light station next spring, removing our Thomson-Houston[12] Dynamos from our present plant. Our Company will declare a dividend of 4,½–5% for 1887 over and above a heavy reserve for depreciation and sinking fund. The new lamp if it comes up to our expectation will make our station a first rate investment. The suit between the municipality and the gas Company has been decided in our favor,[13] and we have closed a contract with the municipality for five years. We will soon have 175 Thomson-Houston Arcs on Municipal circuits. The Municipality are removing all the gas lamp posts along the streets lighted electrically."

Trusting the above may be of some interest to you we remain. Very truly yours

THE EDISON LAMP COMPANY
By Francis R. Upton Treas. L.[14]

TL, NjWOE, DF (*TAED* D8839AAO). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.,*" and "*188*" preprinted.

1. John William Lieb (1860–1929), formerly the head electrician at the Pearl St. station in New York, had been chief engineer of the Italian Edison company, the Società Generale Italiana Elettricità, since 1882. The firm operated the power station in Milan, which had opened in 1883 as the first permanent Edison central station in Europe (Docs. 2481 nn. 1–2, 2642 n. 3). The station began using the Zipernowsky-Bláthy-Déri system of alternating current (AC) transformers on a trial basis in 1886. About the end of that year, its capacity was permanently increased by the addition of at least two 2,000-volt AC dynamos and their corresponding transformers ("Experiments with Alternating Current Transformers in Milan," *Teleg. J. and Elec. Rev.* 19 [30 July 1886]: 104–5; "The Edison Central Electric Light Station at Milan," *Industries: A Journal of Engineering, Electricity, & Chemistry* 1 [19 Nov. 1886]: 537; "Electrical Distribution by Transformers," *Electrical Engineer* 1 [6 Jan. 1888]: 6–7; "Electric-Lighting Stations in Europe, and Their Lessons," *Science* 13 [3 May 1889]: 337).

2. Philip Sidney Dyer (1857–1919) moved to Antwerp in 1886 as the European agent of Edison's American manufacturing enterprises, especially the lamp factory, for which he had been the bookkeeper since 1881. He was the brother of patent attorney Richard Dyer. Doc. 2435 n. 4; TAE to Miller Moore, 11 Feb. 1886, Lbk. 21:277 (*TAED* LB021277); Letterhead, Dyer to Samuel Insull, 11 Nov. 1887, DF (*TAED* D8736AEN).

3. Usually a person qualified by long experience in a profession or trade. *OED,* s.v. "stager" 13a.

4. Under construction since early 1887 and evidently not yet fully operational, the central station district in Rome reportedly was designed to encompass 18,000 lamps in an 1,800-volt alternating current transformer system. In January 1889, it was reported that the plant (operated by the Anglo-Roman Gas Co.) carried an average daily load of about 5,000 lamps. Doc. 3022 n. 5; Badt 1888, 307; "Central Stations Worked by Underground Mains," *Electrical Engineer* 3 (1 Feb. 1889): 98.

5. Not identified.

6. Ganz & Co., a major engineering and manufacturing firm in Budapest, made transformers and other equipment for the electric distribution system co-invented by Károly Zipernowsky, Otto Bláthy, and Max Déri, whose patented transformer made high-voltage alternating current feasible for interior lighting. Doc. 3013 n. 9.

7. The press accounts that Lieb saw have not been identified, but possibly they drew upon the most recent report of the Edison Electric

Light Co. to its stockholders, released in October 1887. It included paragraph-length descriptions of the "numerous ephemeral systems" against which the company competed, among them the alternating current transformer system, which it dismissed as being devoid of commercial value and "notoriously destructive of both life and property." Edison Electric Light Co. stockholder report, 25 Oct. 1887, pp. 11, 13, CR (*TAED* CA019C).

8. Ganz & Co. owned the key United States patent rights to the Zipernowsky alternating current distribution system, which it licensed to the Edison Electric Light Co. in November 1886. In May 1890, Ganz filed suit against the Edison Electric Light Co. in federal court in New York, alleging that the firm, far from working to promote the AC system in the United States, had entered into the contract intending "to prevent the introduction of the system here." Specifically citing the activities of Edison and Harold Brown around electrocution, it charged that "Endeavors have been made…to create the impression that the alternating current is deadly and unfit for commercial use, and to bring such currents and systems into disrepute." The suit sought the cancellation of the 1886 agreement and $500,000 in damages; the editors have not determined the outcome. Docs. 3013 n. 9 and 3022 n. 3; "An International Suit," *NYT,* 4 May 1890, 20; "Action for Damages against the Edison Electric Company," *Teleg. J. and Elec. Rev.* 26 (9 May 1890): 517.

9. Lieb meant Siemens & Halske, the longtime manufacturer of cables and other equipment for telegraph and electric lighting systems. The Milan plant reportedly used a Siemens concentric double conductor cable to carry alternating current to incandescent lamps a little over a mile from the station. "Underground Electric Light Wires," *Industries: A Journal of Engineering, Electricity, & Chemistry* 4 (30 Mar. 1888): 330.

10. The plant at Leghorn (Livorno), Italy, was a steam-powered 2,000-volt alternating current system built by Ganz & Co. J. Fleming 1890a, 379–80.

11. Running alternating current dynamos in parallel (multiple arc) on a circuit requires that the alternation pattern of each machine exactly match those of all the others. Once operating on the same circuit, multiple machines would tend to find a unison among themselves but their out-of-phase outputs in the meantime were recognized as a destructive force on incandescent lamps. Although the Ganz company's central station in Rome was probably using AC dynamos in parallel by this time (and certainly by early 1889), some engineers continued to regard parallel operation as a serious difficulty. Urquhart 1890, 52–56; Forbes 1889, 508; "Correspondence. The Ganz Alternating System," *Electrician* 23 (10 May 1889): 16–17; Silcock 1889, 52.

12. Named for scientist and inventor Elihu Thomson and his fellow educator and electrician Edwin Houston, the Thomson-Houston Electric Co. was by now a major electrical manufacturer and contractor based in Lynn, Mass. It was the dominant supplier of arc lighting in the United States, due in part to an 1887 patent-sharing arrangement with Westinghouse Electric. The firm had recently pushed to enter the market for alternating current (AC) incandescent lighting; it had installed nearly two dozen such systems by the end of 1887, abetted also by a patent agreement with Westinghouse. Doc. 2684 n. 2; Carlson

1991a, 249–65; Carlson 2013, 75; Passer 1972 [1953], 25–31, 52–55, 145–46.

According to a public statement by Lieb in January 1887, the Milan plant then operated sixty 2,000-candlepower Thomson-Houston arc lamps (in addition to Siemens arc lamps); two years later, the number had grown to 350 Thomson-Houston lamps. "Underground Wires in Milan, Italy," *Electrical World* 9 (12 Feb. 1887): 78; Forbes 1889, 681.

13. What one journal described as "The long pending lawsuit of the Milan Gas Company against the Municipality" alleged that the city had broken its contract with the gas supplier by allowing electric street lighting and should be liable for loss of income from lower prices and reduced consumption. The matter was decided in the city's favor in November 1886 and the verdict upheld on appeal in June 1887. That resolution enabled the Edison firm to enter into a contract to provide public lighting through the end of 1892. "Notes. Gas v. Electricity," *Industries: A Journal of Engineering, Electricity, & Chemistry* 1 (12 Nov. 1886): 523; Pavese 1986, 55–56.

14. The editors have not identified the typist or clerk.

–3167–

From Edward Johnson

NEW YORK, March 20/88[a]

My Dr Edison

I backed Gus Noll & his Bro[1] against Bergmann (his Bro in-law[2] and my affect. Partner[3]) for 4 years— You have yourself born powerful testimony to my determined pertinacity in backing a man as long as I believe in him= Lately I gave them up as ~~a~~ bad eggs & swallowed a dozen crows of most indigestible character in doing it. This should be enough to condemn them as[4]

<E.H.J. Why not write Beggs[5] fully, warn him, & then Let him take the responsibility— The running of the Illuminating Co[6] is his funeral— As for the Nolls ~~If~~ The Almighty has ~~not~~ written their character on their face[7] so plain & unmistakeable that I wondered you never stopped to read Yrs E>

<Edison[c] I have but Beggs tells[b] me My failure doesnt mean His—that He can & will keep them in harness We shall see EHJ>[d]

<OK>

AL (fragment), NjWOE, DF (*TAED* D8836AAH, D8836AAI). Letterhead of Edison United Manufacturing Co. [a]"NEW YORK," preprinted. [b]Obscured overwritten text. [c]Followed by dividing mark. [d]Marginalia written by Edward Johnson.

1. A native New Yorker, Augustus Noll (b. 1860) worked for the Edison Electric Light Co. and the Edison Machine Works before becoming an independent contractor around 1885. He co-founded Noll Bros. on 1 January 1887 with his brother Charles A. Noll (b. 1861?) and Edwin

Greenfield, former general manager of the wiring department at Bergmann & Co. Their firm did wiring work for Edison central stations, but one of their jobs was the wiring of the Edisons' home in Llewellyn Park, N.J., where their work generated as-yet unresolved dissatisfaction. Noll Bros. was merged in July 1887 into the new Edison Wiring Co. which was absorbed, in turn, by the Edison United Manufacturing Co. in March 1888. Soon after, a new partnership named Augustus Noll & Co. appeared as an Edison contractor. Both Augustus and Charles, as well as a third brother, Fred A. Noll, remained in the electrical industry. Doc. 3065 esp. nn. 2 and 5; U.S. Census Bureau 1970 (1880), roll M593_987, p. 80A, image 163 (New York Ward 11, N.Y); *TAEB* 8, chap. 7 introduction; "Fred A. Noll," *Electrical Engineer* 25 (16 June 1898): 695; Charles Batchelor to Johnson, 28 Dec. 1887; A. Noll to Batchelor, 10 and 16 Jan. 1888; A. Noll & Co. to TAE, 7 Apr. 1888; Philip Seubel to Alfred Tate, 14 Apr. 1888; all DF (*TAED* D8717ACJ, D8844AAA, D8837AAA, D8844AAF D8844AAC); Tate to Noll Bros., 16 Apr. 1888; Tate to Edison United Manufacturing Co., 16 April 1888; both Lbk. 26:222, 227 (*TAED* LB026222, LB026227).

2. Sigmund Bergmann married Louisa Noll in 1877. *Marriage Index, 1866–1937* (New York, N.Y.), online database accessed through Ancestry.com, 18 Mar. 2015.

3. Johnson, like Edison, was a partner in Bergmann & Co.

4. Johnson reached the end of the first page here, and the remainder of his letter has not been found. Edison marked "over" atop the page and wrote his draft reply on the reverse.

5. A founder of the Harrisburg Electric Co., which he ran quite profitably, John Irvin Beggs (1847–1925) was vice president of the Edison Electric Illuminating Co. of New York in 1887 and, since January, a director as well; he would succeed Charles Chinnock as general manager before the end of the current year. Beggs was also president of the Association of Edison Illuminating Companies (from 1886 to 1892). Edison sought to confer with him in January about plans for converting the original Pearl St. district to the three-wire system of distribution, a project that would occur under Beggs's direction in 1890. As a member of the Illuminating Co.'s construction committee, Beggs also oversaw the building of its new power stations in Manhattan. Doc. 3016 n. 5; "Home News," *New York Tribune,* 18 Jan. 1888, 10; TAE to Beggs, 11 Jan. 1888, DF (*TAED* D8818AAT; "Obituary" [Chinnock] *Electrical World* 65 (19 June 1915): 1654; P. Jones 1940, 218, 228–29.

6. The Edison Electric Illuminating Co. of New York was incorporated in December 1880 to provide electric light and power service in Manhattan. Its first central station (downtown, at Pearl Street) opened in 1882 and remained its sole operating plant at this time, but the company had been laying underground conductors and wiring buildings to extend service from Seventeenth to Fifty-ninth Sts. A station on Thirty-ninth St. opened on 26 December 1888 and another on Twenty-sixth St. entered service on 4 January 1889. The company's directors in 1888 included Edison, Henry Villard, Spencer Trask, James Hood Wright, Charles Coster, John Beggs, and Edward Johnson. See Docs. 2037 and 2243 (headnote); "The Edison Up-Town Stations.—New York," *Electrical Engineer* 8 (Feb. 1889): 73; Martin 1922, 172; cf. P. Jones 1940 (pp. 222, 228–32, 339–41), which places the

service area's southern boundary at Eighth St.

7. Edison had a long-standing interest in phrenology and sometimes evaluated prospective employees on that basis. In 1885 he also made a chart of physiognomic traits that he observed in friends and acquaintances. Docs. 2827 n. 2 and 2852 (headnote).

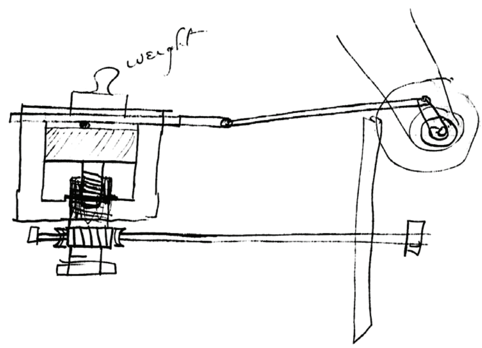
–3168–

Memorandum to John Ott: Incandescent Lamp

[Orange,] March ~~19~~20 1888

John

Design a machine for rolling out filiments 008 of plastic material like Lampblack & tar. Dont say what it is for—[1] Kinney[2] will work it—[3]



AD, NjWOE, Lab., Unbound Notes and Drawings (*TAED* NS88ABJ).

1. Edison had long ago settled on Japanese bamboo as the best available fibers for carbonizing into lamp filaments, but he had never given up searching for a better alternative and at this time was sponsoring a worldwide search for a superior natural fiber (see Docs. 1950 [headnote] and 3230). He also experimented periodically on homogeneous substances from which he could stamp or cut filaments that would be more durable and standardized, as well as easier and cheaper to manufacture, than those made from any plant (see Doc. 2927 n. 1; for other instances, see also Docs. 2085, 2892, 2921, and 2995). In addition to those advantages, the homogeneity of materials like lampblack or tar may have offered the hope of increased electrical resistance, another long-term goal of Edison's lamp research. Other manufacturers were searching as well for alternatives to natural fibers. Edward Weston cut filaments from cellulose films, and the U.S. Electric Lighting Co. had been selling lamps made this way for several years. In England, Joseph Swan, among others, achieved similar results by extruding liquid cellulose, a process that became standard in the industry (Docs. 2479 n. 2 and 2697 n. 2; Swinburne 1886–1887 [pt. 5], 256; "The Experimental and Research Laboratory of Edward Weston," *Manufacturer and Builder* 19 [Dec. 1887]: 272; Bright 1972 [1949], 118; Howell and Schroeder 1927, 81–82). Edison, too, had tried cellulose but never made it a major subject of research (see Docs. 2511, 2627, 2630–2632, 2634).

Edison learned from his attorneys in late February that the Patent Office was insisting on having (by early March) specimens of filaments stamped from sheets of rolled graphite or plumbago in connection with a patent application pending since 1881 (Case 290; see Doc. 2087 n. 2). He urged Dyer and Seely to work around the requirement because he could not "except at great expense prepare these [samples] as it requires highly polished flat steel plates & a powerful Hydraulic press neither of which I have at present." Though the application was floundering, he made clear his wish "to get broad claim on the Idea of forming thin carbon sheets & punching filiments out of such sheets—as I think the future will bring it into prominence." Dyer & Seely to TAE (with TAE marginalia) 24 Feb. 1888, DF (*TAED* D8846AAJ); TAE to Dyer & Seely, 25 Feb. 1888, Laboratory Letterbook LM-102:23, WOL (*TAED* LM102023).

2. Patrick Kenny (b. 1830?), likely a machinist by trade, had worked for Edison intermittently since 1878, mostly on telegraph instruments. Doc. 2784 n. 4.

3. Figure label is "weight."

–3169–

Telegrams: From/To William Pitt Edison

March 21, 1888[a]
Fort Gratio[t], Mich.,

T. A. Edison,—

Father[1] was taken with congestive chill yesterday, and on account of his age the case is a very critical one. Will advise you later.

(Signed) W. P. Edison.[2]

[Orange]

W P Edison—

Have best Doctors and do everything for him possible—[3]
Edison

TD (copy) and ALS (both telegrams), NjWOE, DF (*TAED* D8816AAE). [a]Date from document; form altered.

1. Samuel Ogden Edison (1804–1896). According to the federal 1880 census, Samuel and his second wife, Mary, lived with her parents, Joseph and Margaret Sharlow, in Fort Gratiot, Mich. *TAEB* 1, chap. 1 introduction, n. 2; Obituary, *NYT,* 27 Feb. 1896, 4; U.S. Census Bureau 1970 (1880), roll T9_604, p. 199C, image 0398 (Fort Gratiot, St. Clair, Mich.).

2. Edison's brother, William Pitt Edison (1831–1891), often referred to by his middle name.

3. Edison's brother wrote again two days later stating that their father "knows no one and is getting weaker every day.... I will do all that is possible to make him comfortable." Press accounts of the illness circulated; the elder Edison had "very little hopes of recovery," according to the *New York Times.* In early May, however, Samuel's physician informed Edison that the patient had "fully recovered." William Pitt Edison to TAE, 23 Mar. 1888; Sylvester Merritt to TAE, 5 May

1888; both DF (*TAED* D8816AAG, D8816AAI); Mary Valinda Miller to Mina Edison, 4 Apr. 1888, FR (*TAED* FI001ACI); "T. A. Edison's Father Very Ill," *NYT,* 26 Mar. 1888, 5.

–3170–

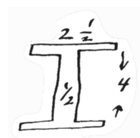
Memorandum to Arthur Kennelly: Dynamos

[Orange, March 27, 1888?][1]

Kennelly—

We use a great deal too much Copper on the field magnets of our Dynamos because we must keep down the heat We do not add the Copper for economy of Current but solely to prevent over heating—

Now I want a few experiments tried on winding Several spools all exactly the same—say ~~2 diam on~~ thus[2]



Use the same size wire—say No 19 or 20 B.W.G.[3] Cotton[a] Covered—

~~No. 1~~ On No 1 use Simple Cotton
No 2 " drawn through hot Carnauba wax—[4]
No 3. Drawn through hot shellac
No ~~4—~~ Hot ~~As~~molten Asphalt ~~wax~~
No 5 " " mixed with 10 pct of Linseed oil—
No 6. Drawn through Molten gum Dammar with 5 percent of Linseed oil—

After all dry give each the same Energy per unit of radiating surface and make a Curve of rise of temperatures from cold to 3 hours or to where they are constant.[5]

arrange the amperes so that the Simple Cotton one will give 200 degrees in 3 hours but not higher—put them under[a] protected shades so all will have same conditions.[b]

We used brass wire for a binding wire around our armatures, it expands rather too much when armature gets hot & worse than this the foucault Currents[6] in it is very great heating it up twice as high as the armature proper— I want to test the availability of phosphor Bronze[7]—aluminum bronze & Nickel & Cobalt wire They should have a strength Equal to brass & have higher resistance—piano steel will not answer as it rusts, possibly it could be plated with Ni or Co but it could be unsafe

E[dison]

I want to see if the lines of force in our big dynamo or one of the small ones when loaded up say with 200 or 300 lights oscillate very much, enough to throw Focault Currents in the iron piece of the field magnet. You can probably ascertain this with a fixed wire over opening in field[a] & using an Electrodynamometer—

ADS, NjWOE, Lab. (*TAED* NSUN11B). [a]Obscured overwritten text. [b]Followed by dividing mark.

1. Kennelly began to carry out the requested experiments on this date; see note 5.

2. Dimensional labels are "2½" (top), "½" (center), and "4" (side).

3. That is, British wire gauge.

4. Edison's entry for "No 2" continued to a new line, at the end of which he placed ditto marks, probably intending them for "No 3" below.

5. Kennelly recorded the start of "experiment no. 52 for examining the radiation of heat from coils of wire" (with a diagram similar to Edison's) on 27 March. He made numerous trials between then and the third week of April, most of them with eight wires (seven coated and one plain) carrying different levels of current. He plotted data onto curves that consistently associated the highest temperatures with the plain (uninsulated) wires. N-88-01-19:81–91, NB-88-04-18:5–12; both Lab. (*TAED* NB019081–NB019089G, NB035005–NB035010).

6. Sometimes called "local" or "eddy" currents, Foucault currents were induced in the iron structure of the armature rotating in a magnetic field; unable to be drawn off for useful work, they were dissipated as heat. A common problem, Edison (and other dynamo designers) put considerable effort into preventing them. See Doc. 1694.

7. A copper-tin-phosphorous alloy formulated in the early 1870s, phosphor bronze was highly regarded for making exceptionally clean castings and was often used in precision applications such as bearings, cogs, guns, and locks. Doc. 2892 n. 14; *KAMD,* s.v. "Phosphor Bronze."

–3171–

Memorandum to James Gladstone: Phonograph

[Orange, c. March 29, 1888][1]

Gladstone=[2]

Please drop your present experiments for a while and go on the following—[3] I want to get a better phonograph cylinder, one that will be hard like Carnauba Wax but not ~~b~~so brittle, one that the tool in the phonograph will turn off polished & take a continuous chip[a] or partially so & [~~the~~?][b] ~~leave~~ [---][c] the transmitter or rather recording Knife will cut a clean shining groove— I will give you a piece as a sample— I find that while Mr Payne[4] has obtained a cylinder which is perfect it is formed of materials which cause it to act as an [electroporous?].[5d] The turning off tool electrifies the cylinder & chip & they are electrically attracted to & stick to the cylinder & when blown off are attracted & stick to everything—

The first base I want you to go on is white glue This can be melted with water by suspending a dish in hot water. As softeners of glue use the following various proportions Glucose— Molasses— Caramel, Grape sugar Glycerine, possible some of the thick fluid extracts from Herbs—we have them all—[e]

If you find even the smallest proportion of these soften it too much add the following hardeners & then add or not as may be necessary some of the softeners. The object of the softeners is to cause the glue to be continuously soft after the same has been cooled from the hot pour The object of the hardeners is to diminish the tenacity of the glue so the Cutting tool will take a chip easily & not tear You will notice that the softeners are bodies that never get hard and are uncrystaline bodies & all soluable in water—

The hardeners may be any brittle[f] gum or resin soluable in water among which may be mentioned Ordinary Gum Dextrin, Gum arabic Logwood extract, Albumen—Picric acid—Jalap Resin aniline Violet & other an~~a~~iline Colors and a host of uncrystalizable substances soluable in water which give brittle mass on evaporation of water—Annato, Ammonio-citrate Iron Boiled starch—

2nd Base

Use: Gum Arabic as a base and following as softeners: Caramel, Albumen—glucose, glycerine, Chloride Zinc, phosphoric acid—Glue or gelatin, Boric acid—Irish Moss[6]— Aniline colors [~~O— acid~~?][c] Lactic acid Cyanide Potassium

Repeat with Gum Dextrin as a base

AD, NjWOE, Lab., N-88-10-01 (*TAED* NA028AAE1). [a]Obscured overwritten text. [b]Canceled and interlined above. [c]Canceled. [d]Illegible. [e]Followed by dividing mark. [f]Interlined above.

1. The conjecture of this date is based on Arthur Payne's experiments of 28 March (see note 5) and the beginning of Gladstone's research on 30 March (see note 3).

2. James William Gladstone (1859?–1925), a native of Middlesex, England, gave up his commercial job in London to emigrate to New York in 1887. Soon after his arrival, he wrote to Edison seeking work in electricity, something for which he had no formal training but professed an aptitude and deep interest, and he was working at the laboratory by January 1888. Time sheets and Gladstone's notebook records show him quickly taking on experimental duties. *Census of England and Wales,* 1911 (London, Lewisham, Sydenham, p. 136), accessed through Ancestry.com, 20 May 2016; *England & Wales, National Probate Calendar (Index*

of Wills and Administrations), 1858–1966, online database accessed through Ancestry.com, 20 May 2016; Gladstone to TAE, with enclosed references, 6 Oct. 1887, DF (*TAED* D8713AAM); N-88-03-30, Lab. (*TAED* NB033); Time Sheets, WOL.

3. James Gladstone had been working on battery materials along lines directed by Edison. On 30 March, he began using a new notebook to record experiments directly related to those outlined in this document. Gladstone apparently completed his experiments on cylinders by 10 April, when he recorded "Cleaning & putting away apparatus used for cylinder work." N-88-02-17; N-88-03-30; both Lab. (*TAED* NB025AAO, NB033AAA, NB033AAI); see also note 5.

4. Arthur Coyle Payne (1864–1952), an engineering graduate of Rutgers College, had entered Edison's employ as an experimental assistant by about May 1887. Doc. 3039 n. 7.

5. Edison likely meant electrophorus, a device for generating static electricity. On 28 March, Arthur Payne had tested wax compounds of Syrian asphalt, carnauba wax, and crude Japan wax, two of which he described as good but "sticky" due to their "Electrical properties." *OED,* s.v. "electrophorus"; N-88-03-06, Lab. (*TAED* NB026AAF1).

6. A mucilaginous algae native to the Atlantic coasts of Ireland and New England, sometimes used in medicinal preparations. Biddle 1874, 383–84.

–3172–

From Delancey Louderback

CHICAGO, March 30th 1888[a]

Dear Sir

We have found two or three very bad burn outs, where the lines are connected together, and our Supt desired me to write you, asking if Acid used in soldering the connections could make this trouble, and if we could use anything else.

All three of the places seemed to be burned across the end of the Tube, where soldered, caused by Electrolysis, and he lays it to the acid Yours truly

D. H. Louderback.[1] Genl. Manager.

<~~Refd to Saml Insull et Mons Kruzi~~[2] ~~to answer to the best of their ability~~ E[dison][3b]

Louderback= This has caused crosses & we have tried hard to get a substitute—

The proper thing to do is to Connect all your network together put on ~~a~~ two[c] 200 amper machine safety Catches[4] & Let them boil This will bring out defects, then go for them= This is the way I used to do= No [---][d] system will ever be laid in the present age of intelligence that wont develope bugs[5] for the 1st 6 months—its inevitable & must be considered as inevitable with a good bug man one summer ought to get 85 percent of the bugs out of a 20 000 lt system & without stopping 1 percent of Customers>

ALS, NjWOE, DF (*TAED* D8831AAT). Letterhead of Chicago Edison Co., D. H. Louderback, general manager. [a]"CHICAGO," and "188" preprinted. [b]"E" written very large over marginalia and followed by "over" to indicate page turn; remainder of marginalia written on reverse. [c]Interlined above. [d]Canceled.

1. Delancey Horton Louderback (1849–1914), a former telegraph operator and manager, had been involved in promoting Edison's electric pen for the Western Electric Mfg. Co. in the late 1870s. When the Western Edison Light Co. was organized in Chicago in 1882, he became its general manager. Louderback subsequently amassed a fortune developing electric traction in Chicago with Charles Yerkes. Docs. 1221 n. 2 and 2299 n. 1; *NCAB* 16: 233–34; "D. H. Louderback Dies; Physician Asks for Inquest," *Chicago Daily Tribune,* 10 Apr. 1914, 1.

2. A highly skilled machinist who worked with Edison for many years, John Kruesi (1843–1899) was assistant general manager and de facto supervisor of the Edison Machine Works. His previous responsibilities included managing the Electric Tube Co., which manufactured underground conductors until it was absorbed by the Machine Works, and overseeing installation of the conductors for the Edison Construction Dept. Doc. 2784 n. 7; Letterhead, Kruesi to Insull, 19 Feb. 1886, DF (*TAED* D8627F).

3. Alfred Tate sent Louderback's letter to Samuel Insull, giving him the option of answering directly or having Tate draft a letter according to Edison's notes. Insull instead returned the letter to Chicago because "Mr. Edison's pencil memorandum will be sufficient answer to Mr. Louderback…as it shows him clearly what Mr. Edison's opinion personally is." Louderback subsequently requested to have the reply made as an official letter from Edison but the editors have not found it. Tate to Insull, 3 Apr. 1888; Insull to Tate, 4 and 14 Apr. 1888; all DF (*TAED* D8831AAS, D8835ACB, D8835ACH).

4. That is, a fuse made of a short piece of lead wire that would melt when the current became too strong. In the Edison lighting system, safety catches were used in distribution networks and for individual buildings. Doc. 2111 n. 12.

5. While working on multiple telegraph systems in the 1870s, Edison applied the term "bug" to unexpected technical problems. He used the word freely, and it took hold among the electrical community in the following decade (with credit given to him), making its way into an dictionary of electrical terms in 1892. Magoun and Israel 2013; Sloane 1892, s.v. "Bug."

–2– April–June 1888

Of necessity, spring became the season of the phonograph for Edison. Having decided over the winter to create a stream of income by making and selling phonographs, Edison still had neither the final design of marketable machines nor the ability to make them on a commercial scale. So he worked at the laboratory on wax cylinders, the machine itself, and arrangements for its manufacture and distribution. By the end of June he would be well on the way to having both a practical machine and sufficient manufacturing capacity, though both projects required large sums of money. It is as difficult as ever in this period to assess the state of Edison's finances, but the needs of his new laboratory must have made money a top concern. Its equipment and staff offered extraordinary capabilities for inventive research but also demanded commensurate financial resources far beyond its ability, so far, to generate them. The other immediate necessity for acting on the phonograph was the appearance in March of a new organization to bring the graphophone, a rival sound recording and playback device, into the business dictation market, potentially taking away a lucrative field from Edison. His responses to these exigencies would have far-reaching consequences for him personally and for the commercial development of recorded sound, yet they left curiously light footprints in his trail of surviving documents. Because Edison no longer kept meticulously dated notebook records of research and experiments, the editors have had to make some surmises about his work at this time.

The graphophone's backers agreed in March with Pittsburgh industrialist Jesse Lippincott on a contract for the distribution and sale of up to 5,000 machines each year.[1] Soon after, Edison began taking steps to create a new business entity that would build a factory to manufacture his own instruments for the Edison Phonograph Company. He tried to interest George Gouraud, his British agent, in the new venture but Gouraud, who had been waiting months for a marketable phonograph, took a wait-and-see approach to the enterprise. Robert Cutting, Jr., a financier already involved with other Edison projects, proved a willing investor, and he became a trustee of the new Edison Phonograph Works when it was incorporated on 3 May. Even so, the company remained a closely-held concern in which Edison, having supplied most of the funds, owned the majority of stock and Cutting about one-fifth.[2] Edison commissioned architect Joseph Taft, who had designed the laboratory, to plan the factory. A construction contract was let for about $33,000, and ground was broken in late May in the shadow of the laboratory at Orange.[3] Edison estimated about $100,000 more for equipment and initial expenses, an allowance that proved wildly optimistic.[4]

All the while he was making these plans, Edison still had no phonograph suitable for the market. Then, in mid-May, after a development process that is nearly invisible in the documentary record, he unveiled a new model at his laboratory and at an Electric Club soiree in New York City. Despite extravagant claims on its behalf by Ezra Gilliland and the cultivation of an enthusiastic welcome in the press, this machine, like its experimental predecessor from late 1887, proved unfit. Weeks of intensive work followed, during which George Gouraud sailed to New York to see what was going on. By mid-June, Edison and his men had substituted a quieter motor and drive train into the chassis of the May model, resulting in what was described as the "perfected" phonograph.[5] One of the first was sent to Gouraud for promotion in Great Britain. For both experimental and public relations purposes, Edison and Gouraud began conducting part of their prolific transatlantic correspondence by recorded cylinders.[6] By that time, Alfred Tate had been dictating letters to the phonograph in Edison's office for five or six weeks, at one point claiming to have dispatched thirty letters in three quarters of an hour. Copies of some of Edison's outgoing typed correspondence were soon stamped "PHONOGRAPH DICTATION."[7]

Sometime between mid-April and the rollout of the "perfected" machine in June, negotiations were quietly opened between Ezra Gilliland and John Tomlinson (Edison's personal attorney) on one hand and, on the other, Jesse Lippincott, who was interested in adding the phonograph to his sales portfolio. The course of the negotiations is murky, as is the extent of Edison's knowledge of them, which became a source of bitter dispute some months later. At the time, however, Edison was willing to entertain Lippincott's offer of a half million dollars (paid in cash installments) for the U.S. and Canadian sales and distribution rights, with Edison retaining the manufacturing rights.[8] Whatever reservations he felt about the arrangement (and he would later profess to have had grave ones), the clear division between manufacturing and sales seemed to steer him clear of the sorts of conflicts he had been having with his electric lighting manufacturing partners. Regarding one such longtime associate, he impetuously swore at the end of May that "hereafter I shall act the big hog myself and eat all of my own swill."[9] The proposed terms for the phonograph appeared to safeguard Edison's inventive "swill," and he signed a sales agreement at the end of June. The arrangement placed the phonograph's commercial future in North America in the hands of Lippincott, an industrialist and financier with no apparent experience with such business nor, as it turned out, the financial means to meet all the obligations he had assumed. Amid these intense efforts to redesign and market the instrument, the widely read *North American Review* published an article titled "The Perfected Phonograph" under Edison's byline in its June issue. This piece echoed one in the same journal ten years earlier, but the editors have found no information about how it came to be written or placed there.[10]

The phonograph held the center of Edison's attention, but it was only one of many projects being worked on or discussed at the laboratory. Some of the others were ancillary to it, such as the toy (talking doll) phonograph and the prospects for a new "Amusement Company" based on a coin-operated playback machine. Edison was also exploring techniques for overcoming the difficulty of recording musical instruments that use strings and sounding boards (like the piano and violin), and he seems to have thought briefly about an electrically assisted piano.[11] But a good deal of other work was entirely unconnected to recorded sound, and the time sheets of laboratory employees give a kaleidoscopic view of activities there. Of course there were projects related to electric lighting (lamps, filaments, dynamos,[12] transformers, insulation), some of them directed to meeting the competitive challenge from alternating current (AC) distribution systems. With the Edison lighting interests having reached some degree of maturity in a rapidly evolving field, Edison had to help manage the pace of innovation. Premature release of improvements could make an older catalog of equipment unsaleable, while indecision or delay might cause a loss of competitive advantage.[13] Laboratory assistants also worked on ore milling, a rock drill, typewriters, tobacco coloring, and a proposed flying machine. The latter, according to newspaper descriptions, was similar to the heavier-than-air "electric balloon" that he had briefly worked on in 1880.[14] The ore-milling work was advanced enough that, in early June, Edison proposed sending one or more magnetic separating plants to a prominent iron mine operator in New York State for an on-site test.[15]

The laboratory, with its shops, library, and office, was more than a place for Edison to invent, study, and conduct business. It was also becoming an attraction to the world outside its gates and a place where Edison sometimes welcomed neighbors or the merely curious. In mid-April, he hosted pupils of the Dearborn Morgan School, which his two sons recently (and likely still) attended in Orange.[16] Around the same time, there was a reception for the Contemporary Club featuring a talk on electricity by in-house expert Arthur Kennelly.[17] He received members of the local New England Society on 7 June and their female family members a few days later.[18] Kennelly guided a group of local teachers through the complex on a Saturday in June. The phonograph and talking doll were among the highlights of that tour, but he reportedly also showed them a calculating machine in his office that he claimed routinely saved "hundreds of hours" of arithmetical labor.[19] Other visitors at Edison's specific invitation included photographic pioneer Eadweard Muybridge, musicians Edgar Stillman Kelley and William Sherwood, and author Samuel Clemens, as well as the press delegation that came out to see the "improved" phonograph on 11 May.[20]

Edison had long called the phonograph his "baby," but a real baby girl born to Mina Edison on 31 May drew other visitors to their home. The birth was Mina's first, and it came about a year after the unsuccessful outcome of an earlier pregnancy. According to a news account, the parents had selected "two or three" possible names for the infant but were not ready to make a decision. Some family members referred to her as "Grace," in honor of Mina's youngest sister, until she was christened "Madeleine" in November.[21] Edison's first child, Marion, was studying at the Bradford Academy in Massachusetts when her sibling arrived, but his third one, nine-year-old William, told a reporter, "Papa has been experimenting with my new sister. He is all the time experimenting." Edison averred that he planned to record the baby's cries at three-month intervals.[22]

1. See Doc. 3200 (headnote) n. 2.

2. See Doc. 3182; Cutting, Jr., to TAE, 23 Apr. 1888; TAE to Gouraud, 24 Apr. 1888; TAE to Cutting, Jr., 9 May 1888; all DF (*TAED* D8848ABB, D8818AJH, D8818AKF); Edison Phonograph Works list of stockholders, 14 Jan. 1890, Lbk. 36:47 (*TAED* LB036047).

3. The property was leveled on 22 May. N-88-04-18:61, Lab. (*TAED* NB035061); TAE agreement with Frank Moore, 14 May 1888, Misc. Legal (*TAED* HX88022); Moore to Tate, 26 Nov. 1888, DF (*TAED* D8848AEX).

4. TAE to George Gouraud, 26 Apr. 1888, Lbk. 26:248 (*TAED* LB026248); see Doc. 3200 (headnote) n. 5.

5. See Doc. 3209 (headnote).

6. See Docs. 3210 and 3218.

7. Tate to William Dean, 9 May 1888; TAE to William Marks, 12 May 1888; both DF (*TAED* D8818AKH, D8818AKL).

8. See Doc. 3200 (and headnote).

9. Doc. 3198.

10. Edison 1888 and Edison 1878.

11. TAE marginalia on J. S. Wilson to TAE, 5 May 1888, DF (*TAED* D8822AAS); regarding the coin-operated phonograph, see Docs. 3191, 3199, and 3217; on stringed instruments, see Doc. 3188.

12. On the development of a multipolar dynamo in particular, see Doc. 3194.

13. See Docs. 3189 and 3194; Francis Upton to TAE, 28 May 1888, DF (*TAED* D8830AAS).

14. According to (perhaps fanciful) news accounts, the flying device had been commissioned by the government of Spain as a reconnaissance vessel. Docs. 1952 esp. n. 4, 2520 (headnote) n. 10, and 3057; "Edison Working on an Air Ship," *New York Tribune,* 7 June 1888, 10; "Will Tackle A Flying Machine," *Dallas Morning News,* 29 June 1888, 4.

15. See Doc. 3207.

16. Tate to Dearborn Morgan School, 6 Apr. 1888, DF (*TAED* D8818AID); Mary Valinda Miller to Mina Edison, 16 May 1888, MFP (*TAED* X018D1AF); Jeffrey 2008, 165.

17. Among a number of Contemporary Club organizations scattered throughout the country, this one likely was the local iteration, formed in Orange at the end of 1887. "Miscellaneous Notes," *Electrical World* 11 (21 Apr. 1888): 209; "News From The Suburbs. New-Jersey," *New York Tribune,* 12 Dec. 1887, 8.

18. See Doc. 3203.

19. "Edison's Laboratory," *Omaha Herald,* 25 June 1888, 2.

20. See Docs. 3188, 3192, and 3195.

21. "Edison's Latest," *New York Herald,* 2 June 1888, 9; Marion Edison to Mina Edison, n.d. [June 1888], FR (*TAED* FB002AAD); Mary Valinda Miller to Grace Miller, 24 July 1888; Mary Valinda Miller

to Mina Edison, 16 Sept. and 2 Oct. 1888; Mary Miller to Mina Edison, 26 Aug. 1888; all MFP (X018D1AF1, X018D1AK, X018D1AL, X018C9AI); Samuel Insull to Alfred Tate, 28 Nov. 1888, DF (*TAED* D8805AJM).

22. "Edison's Latest," *New York Herald,* 2 June 1888, 9; "Miss Edison's Lung Power," *New York Tribune,* 4 June 1888, 10.

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To Francis Upton

[Orange,] April 2, 88.

Dear Sir,—

In reference to your letter of the 28th ult. in regard to Newburg Station,[1] I would say that I am opposed to the Lamp Co. going into any outside schemes. Perhaps among us all we might be able to make a deal whereby we could get control of the Newburg Station;[2] or, on the other hand, we could wait for Villard's new Company,[3] which I think will go through. I saw in the papers a few days ago that the Newburg Arc Co. had collapsed.[4] Yours truly,

THOMAS A. EDISON. M[aguire].[5]

TL (carbon copy), NjWOE, DF (*TAED* D8818AHV).

1. This typed reply from Edison was based closely on the draft response he wrote on Upton's letter. According to Upton, an inspection of the Edison central station in Newburgh, N.Y., (operating since March 1884) showed it to be barely profitable and "in a very bad way from lack of proper management." Upton suggested having the Edison Lamp Co. buy a controlling interest in the operating company's stock at a discounted price, then reorganize the plant and sell the shares for a profit. He believed the Newburgh station, because of its prominence, was the only one worth controlling in this way; it had "been for years doing the Edison [Electric Light] Company a very great injury from its lack of energy. The Westinghouse Company use this station as a reference showing the lack of earning capacity in the Edison apparatus." Upton apparently had already approached freelance electrical engineer Wilson Howell (a former Edison employee) about cleaning up the station's operation. Upton to TAE, 28 Mar. 1888, DF (*TAED* D8833AAZ); Howell to Upton, 24 Mar. and 19 Apr. 1888, EP&RI (*TAED* X001M3150, X001M3180).

2. The editors have not determined if anything came of Edison's suggestion. Wilson Howell spent an unspecified period in Newburgh; he identified technical problems and corrected some of them before issuing a final report in September 1888. The plant was somewhat expanded by the end of the year. In 1890, Edison encouraged further

expansion in part because "We have stock in the Newburgh Company." The plural pronoun is ambiguous, but he probably meant the Edison General Electric Light Co., successor to the Edison Electric Light Co., which took shares in a number of local illuminating companies as part of patent licensing agreements. Howell to Edison Electric Illuminating Co. of Newburgh, 22 Sept. 1888, EP&RI (*TAED* X001M2AM); TAE to Jacob Herrick, 10 Oct. 1890, Lbk. 44:372 (*TAED* LB044372); "The Electric Light," *Electrical World* 12 (3 Nov. 1888): 247.

3. Edison referred to as-yet indefinite plans to reorganize the Edison lighting interests into what would become, in 1889, the Edison General Electric Co.

4. The Newburgh Electric Lighting Co., founded in 1885, was an arc lighting competitor of the local Edison Electric Illuminating Co. At the start of 1888, the company was expanding its service area and planning to introduce alternating current (AC). By April, however, it was in receivership, reportedly due to the treasurer's malfeasance. Jenkins 1984, 10; "Electrical," *Light, Heat and Power* 4 (2 Jan. 1888): 31; "The Newburgh Electric Light Co.," *Electrical World* 11 (21 Apr. 1888): 204.

5. Thomas McGuire (d. 1894) was a stenographer and secretary at the Orange laboratory. At the time of his death, he held similar positions at the North American Phonograph Co. James Kearny to TAE, 1 Oct. 1895, DF (*TAED* D9505AAD); North American Phonograph Co. to TAE, 20 Aug. 1894, Vouchers—Lab. 1894 (*TAED* VC94061D).

–3174–

From Josiah Reiff

New York, Apl 3rd *188*8[a]

My dear Edison

The unfortunate Phonograph matter is up again—

It is considered advisable to have a meeting of the Stockholders of the old Co, to confirm Johnson's account as Treasurer,[1] as I understand Cheever[2] is inclined to be ugly in [some?][b] way. The only other question is that of winding up the affairs of the old Co. All the stock should be there. If you will send me your proxy it shall be voted only to confirm Johnsons accts and on question of liquidating the Co. & not involve you at this time in any other question.[3] Yours truly

J C Reiff[4]

<Say to JCR That I dont want to mix in it—that I have had enough of U H Painter & his methods—[5] E[dison]>

ALS, NjWOE, DF (*TAED* D8848AAW). Letterhead of Woerishoffer & Co. [a]"*New York,*" and "*188*" preprinted. [b]Illegible.

1. Edward Johnson was both treasurer and secretary of the Edison Speaking Phonograph Co.

2. Charles A. Cheever (1852–1900), a self-described "promoter of enterprises," was among the organizers of the Edison Speaking Phonograph Co. in 1878 and the company's president. Cheever also had a long connection with the Bell Telephone interests. In 1890, he helped organize the Automatic Phonograph Exhibition Co. for the manufacture and distribution of coin-operated phonographs. Doc. 2784 n. 13; "Death of Charles A. Cheever," *Western Electrician* 26 (12 May 1900): 298; Edison Speaking Phonograph Co. annual statement, 14 Feb. 1888, Misc. Legal (*TAED* HX88018); "The 'Nickel in the Slot' Phonograph," *Electrical Review* 16 (9 Aug. 1890): 1; Welch and Burt 1994, 34.

3. The governance structure of the moribund Edison Speaking Phonograph Co. was splintered, apparently as a result of Edison's offer in late 1887 to buy out its stockholders. Cheever, who had been willing to consider a deal with Edison, led one faction; Painter, determined to hold onto the company, headed another. Cheever remained interested through the winter in selling out his holdings (in late March he met for undisclosed reasons with James Clephane, a backer of the American Graphophone Co.). The rift led to a demand by Cheever for the company's books and records, which Johnson controlled, and to a disputed election of its directors in January. To fend off a possible lawsuit, Painter was seeking to have the company's books reviewed and ratified by its stockholders. To that end, he enlisted Reiff's help in obtaining Edison's proxy for a vote on such a procedure. Doc. 3102 n. 6; Andrew Devine to Painter, 22 Feb. 1888; Johnson to Painter, 24 Feb. 1888; Painter to Gardiner Hubbard, 27 Mar. and 5 Apr. 1888; Painter to Johnson, 30 Mar. and 3 Apr. 1888; all UHP (*TAED* X154A7AY, X154A7BA, X154A7BI, X154A7BW, X154A7BL, X154A7BQ).

4. Railroad financier and telegraph entrepreneur Josiah Custer Reiff (1838–1911) was a longtime business associate of Edison and one of his early financial supporters. Reiff had been a stockholder and director of the Edison Speaking Phonograph Co. since November 1878, and he would become vice president in July 1888. He was also an investor in the Edison Phonograph Co. (which Painter disparaged as Edison's "bastard Comp'y"). At this time, Reiff was a silent partner in the Wall St. banking firm of Woerishoffer & Co. See Docs. 1574, 1583, 3120 n. 6; Edison Speaking Phonograph Co. minutes, 25 July 1888, UHP (*TAED* X154A7DK); "Col. Josiah C. Reiff Dead," *NYT,* 2 Mar. 1911, 9.

5. Alfred Tate did not send a reply until 5 April, after Reiff had importuned Edison again (at the behest of Painter and Johnson) with a blank proxy form. Writing in the margin of Reiff's second letter, Edison reiterated to his secretary that he "didnt want anythg to do with it." Reiff to TAE, with TAE marginalia, 4 Apr. 1888; TAE to Reiff, 5 Apr. 1888; both DF (*TAED* D8848AAX, D8818AHZ); Painter to Reiff, both 4 Apr. 1888; Reiff to Painter 4 Apr. 1888; all UHP (*TAED* X154A7BT, X154A7BU, X154A7BV).

–3175–

Alfred Tate to Robert Putnam[1]

[Orange,] April 5, 88.

Dear Sir:—

Mr. Edison asks me to say in reply to your letter of the 31st ult.[2] that there is no vacancy in connection with his business at present. Mr. Edison says further that he would advise your son to study chemistry, with the view of becoming an Industrial Chemist.[3] There are very few men of this kind, and they command high salaries, while the purely electrical field is being rapidly filled up and will soon be overcrowded. Yours truly,

A. O. T[ate]. Private Secretary.

TLS (carbon copy), NjWOE, DF (*TAED* D8815AAY).

1. The Rev. Robert Wiley Putnam (1837?–1901) was superintendent of public schools in Ypsilanti, Mich. He became head of the normal department at Kalamazoo College in 1891. U.S. Census Bureau 1970 (1880), roll T9_609, p. 416A, image 0313 (Ypsilanti, Washtenaw, Mich.); ibid. 1982? (1900), roll T623_1807, p. 4A (Wauwatosa, Milwaukee, Wisc.); Find A Grave memorial no. 79257677, online database accessed through www.findagrave.com, 24 Feb. 2015; "Kalamazoo College," *Michigan Moderator* 12 (3 Sept. 1891): 24.

2. Putnam wrote on behalf of his son, who was completing high school and had a strong interest in science, particularly chemistry, and aspired to a career in electricity. He asked if Edison could employ the youth and, more generally, if he would "advise a young man who wishes to make the most of himself to devote himself to work with the Edison plan of electrical work." Edison jotted a reply on the letter which Alfred Tate followed closely in preparing the typed response. Putnam to TAE (with TAE marginalia), 31 Mar. 1888, DF (*TAED* D8805ABV).

3. Edison occasionally advised seekers of education or practical experience in electricity (cf. Docs. 2427 n. 3 and 2643 esp. n. 2), but his meaning of the phrase "Industrial Chemist" is not clear. At this time, "industrial chemistry" was an elastic term related to the manufacture (and to some degree, the development) of practical substances based on chemical knowledge, such as soaps, explosives, fertilizers, and steel, or of chemicals themselves on a commercial scale. In practice, it often consisted of making analyses by established methods (see, e.g., Brock 1992, 640–41; Thackray et al. 1985, 10–12; Thorp 1898, 1–2; Remsen 1880, 224; Reynolds 1986, 699–701). As an academic discipline that was taught widely, industrial chemistry typically was allied with other branches of chemistry or different sciences (see, e.g., Mass. Inst. Tech. *President's Report* 1884, 13–14; ibid. 1885, 21; Mass. Inst. Tech. 1888, 5). But Edison perhaps had in mind something more like chemical engineering, which was just beginning to emerge in the U.S. and Britain as a discipline devoted to chemical processes on an industrial scale. MIT put in place the first four-year course of chemical engineering (designated "Course X") in the United States in 1888 (Mass. Inst. Tech. *President's Report* 1888; Cohen 1996, 175–82; cf. Servos 1985; Reynolds 1986, 695–704). The MIT program included "an extended study of Industrial Chemistry" and was designed to produce a chemical

engineer who is "not primarily a chemist, but a mechanical engineer. He is, however, a mechanical engineer who has given special attention to the problems of the chemical manufacture[r]" (Mass. Inst. Tech. *President's Report* 1888, 42).

–3176–

From Francis Upton

Harrison, N.J., April 6, *1888*[a]

Dear Sir:—

Regarding the 200 lamps which you ordered from us.

The order came by telephone to us for 200 lamps with sockets, and was so entered by us. The order was questioned by the young man who received it and he asked particularly regarding it, whether it was to be WITH or WITHOUT sockets, and the reply was "WITH" sockets.[1]

Our Mr. Latus[2] upon receiving the order said: "That the order could not mean anything, as it was simply specified regular lamps," and he had the Laboratory called up again, and inquired if the message was right, stating—that the order simply called for regular lamps, and he could not understand why it should be specified "with sockets," and[b] especially asked[b] if the order did not mean, "without" sockets. The order was handed to Mr. Holzer,[3] and he made the same remark, that he did not understand why "with sockets" should be specified. He was informed that it was the order explicitly given.

The lamps were sent by messenger to your Laboratory, as requested, and we do not see what other course we had to take but to send exactly in accordance with explicit directions given.

It is our intention, regarding your orders to fill them as promptly as possible, and your orders are always given precedence. You know that orders may come upon us for regular and new lamps in a certain stage, and we may not be running on the lamps ordered at the time, and have none ready for you. This, of course would cause delay.

We suggest that in cases where you are in a great hurry for anything from us that you send a written order to us by a messenger, and request him to bring it back with him, if possible. Our experience with the telephone is, that it is very unsatisfactory to receive orders by telephone, and we have made it a rule with our regular trade never to receive orders in this manner, except we are fully acquainted with the circumstances. We also, insist that in case orders are modified, or changed in any way by telephone, that full written confirmation be sent to us of such changes.

We would thank you for calling our attention to any delay in fulfilment of your orders, or lack of intelligence, or accuracy on our part in carrying in ~~carrying~~ out instructions given to us in writing. Very truly yours

THE EDISON LAMP COMPANY
By Francis R. Upton Treas.

TLS, NjWOE, DF (*TAED* D8833ABB). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.*," and "*188*" preprinted. [b]Interlined above by hand.

1. The lamp socket was the ordinary screw-in base. It is not clear why Edison requested lamps from stock, although ongoing lamp experiments appear in an 1888 list of projects to be assigned to laboratory assistants. At some point during 1888, the factory adopted a longer brass screw base for some lamps. This change was made to accommodate variations in the bulb necks, to which the screw base was attached with plaster of paris, a consequence of the bulbs still being free-blown by hand. Some manufacturers had adopted the technique of having the bulbs hand-blown into molds, increasing their uniformity. Still others (such as the Hammond Electric Co. of London) had automated the glass-blowing process as early as 1883, using a machine devised by the London electrical engineers Frank Wright and W. W. Mackie. N-87-11-24, Lab. (*TAED* NL002AAA); Howell and Schroeder 1927, 163, 185–88; Swinburne 1886–1887 [pt. 14], 539–40; "A Glass Blowing Machine," *Sci. Am.* 48 (20 Jan. 1883): 39; "Manufacturing of Electric Lamps," *Sci. Am.* 48 (30 June 1883): 399.

2. William J. Latus (b. 1863?), a native of Frankfort, N.Y., was a bookkeeper at the Edison Lamp Co. He seems to have been employed at the lamp factory as early as 1883, when he witnessed a patent application by William Holzer. His younger brother John also worked at the lamp factory. New York State Census 1865, accessed through Ancestry.com; U.S. Pat. 295,398; Willam Latus to TAE, 23 Feb. 1888, DF (*TAED* D8833AAP).

3. William Holzer (1844–1910), Edison's brother-in-law, was the manufacturing superintendent of the Lamp Co. Doc. 2518 n. 2.

–3177–

Technical Note: Phonograph

[Orange,] April 14 1888

Points for phonogh Caveat[1]

split cylinders held together by rubber bands etc[2]
Wax varnish in Volitile Solvent.
False cylinders with straight instead[3]
taper surface to coat wax on—
Wax paper butt.
Revolving Rec & Receiver[4]
Ex dup Trans[5]

gramme Motor[6]
arrange Electric Light ckt.[7]
Hand turning machine
Clock work & intervening eveness[8]
Turning cylinder off by hand with single Knife like hat Knife used in mfg mac[hine][9]
Seperate turning off knife not lifted by arm so it can be in advance of the Recorder
Limiting stud to hit wax so not dig [Trench?][a] in wax
Double cylinder mac[10]
Flat plate mac[11]
Solid tin for clox & toys[12]
new Receiver with Silk shellacked[b]
See chronogh & telescope clock work[13]
also wheatstone[14] for phono—

TAE

X, NjWOE, Lab., N-88-01-03.2 (*TAED* NA021AAG). [a]Obscured overwritten text. [b]Followed by dividing mark.

1. The editors have not found a corresponding caveat or draft from this time, although Edison included some of the features mentioned here in an October 1888 caveat (Doc. 3272; also cf. Doc. 3251). The *Encyclopedia of Recorded Sound* provides useful overviews of the state of the art of the principal media, materials, and mechanisms for recording and playing back sound. *ERS,* s.vv. "Cylinder" and "Disc."

2. Cf. Docs. 3253 n. 3 and 3272 fig. 22. Edison had also filed a patent application for a duplicating process that involved sawing a cylinder in half longitudinally and flatting it out. U.S. Pat. 382,419.

3. In October 1888, Edison filed patent applications for a "false shell," essentially an adapter for the phonograph machine's cylinder to fit a phonogram with a different taper (or none at all). One special case of this device was to accommodate a phonogram made of a flexible sheet of recording material. U.S. Pats. 397,706 and 406,568; see Doc. 3253 esp. n. 3.

4. The "Revolving Rec[order] & Receiver" was commonly called the spectacle, a term Edison employed in his first patent on the device (U.S. Pat. 386,974). He at some point adopted a telephone analogy for the phonograph, using "receiver" for the instrument that received signals from the outside (the phonogram) and converted them into sound. Correspondingly, he sometimes designated the recorder as the "transmitter," the part that, like its telephone counterpart, translated sound waves into non-auditory signals.

5. Edison possibly meant some sort of duplicating "transmitter" or recording device for creating a copy of a recording.

6. Although the Gramme ring armature was lightweight, it required a larger diameter for the same induction area as the more common drum type. Edison likely expected that the mass of wire on its periphery

would cause the armature to act as a flywheel and tend to smooth out irregularities of motion; cf. Doc. 3209 (headnote).

7. That is, enable the motor to run on current from an electric lighting circuit.

8. Providing uniform rotation to the phonogram, whether a disc or a cylinder, was a critical problem for obtaining any semblance of fidelity to the original pitch. From the first, Edison had imagined using clockwork mechanisms to regulate the speed closely, but he had limited success (see, e.g., *TAEB* 4:4, 11, and Docs. 1174, 1200, 1203, 1204, 1310, and 1398). Charles Tainter had recently sought patent protection for a governor mechanism with a clutch designed to keep the phonogram turning smoothly no matter the source or variability of power (U.S. Pat. 416,969).

9. Edison probably was thinking of a hat trimming machine, in which a rounding-jack, or curved knife attached to a gauge, followed a pattern around a hat to cut the brim to a uniform width. *KAMD,* s.v. "Hat-brim Trimmer."

10. In July, Edison would file for patent protection on a phonograph adapted to record simultaneously on two half-length cylinders placed side by side on the machine's mandrel. One recording could be sent in the mail and the other retained as a record of the correspondence (U.S. Pat. 437,423). The idea of making simultaneous duplicate recordings was one that George Gouraud had urged on him in November 1887 as having "incalculable" value for business dictation. Not two weeks before Gouraud's suggestion, Charles Tainter had received a patent (based on an application filed in November 1887) for a machine with double cylinders and "duplicate recording instruments, the latter being connected together by tubes leading to a common mouth-piece." Tainter had shown the new machine in August 1887 (news of it reached Uriah Painter soon after) and, according to his published rebuttal of priority claims made on Edison's behalf by Ezra Gilliland, the design was being manufactured by July 1888 (U.S. Pat. 380,535; Gouraud to TAE, 19 Nov. 1887; James Ash to Painter, 15 Aug. 1887; both DF [*TAED* D8751AAE, D8750AAC]; Tainter 1888, 16, 18).

11. So-called "plate" machines adapted to flat (disc) phonograms were among Edison's earliest experimental phonographs. He claimed to be ready to start manufacturing them in February 1878 but seems to have made little headway with that general design and focused instead on the cylinder form (see, e.g., Docs. 1161, 1174, 1196, and 1203). In the intervening years, the Volta Laboratory group had pursued the disc idea with some success and obtained several patents; at this time, Charles Tainter had two applications pending (one of them filed on 3 April) related to such machines or the discs themselves (U.S. Pats. 341,212; 341,214; 385,886; 385,887). The name most associated with this form was that of Emile Berliner, who by 1887 was promoting what he called the gramophone. Unlike either Edison or Tainter, Berliner etched sound waves laterally onto a metallic disc rather than impressing or cutting them into a yielding medium ("Berliner's Gramophone," *Electrical World,* 10 [12 Nov. 1887]: 255–57; "The Improved Gramophone," ibid. 12 [18 Aug. 18 1888]: 80; Gelatt 1977, 58–64).

12. The idea of using metal records in the doll seems to have emerged just at this time. Charles Batchelor was still experimenting

with wax compounds as recently as the previous week but, on this date, he "Made small cylinders of Lead, pure tin, & Solder (half lead & half tin). All worked but tin is the best giving very little scratch" (Cat. 1337:48–49 [item 547, sub-items 21 and 23, 6 and 14 Apr. 1888]; Batchelor [*TAED* MBJ004047, MBJ004049]; cf. Doc. 3179). Edison had considered using cylinders of soft copper or similar materials in his first iterations of phonographic clocks and alarms in 1878. Such a pre-programmed recording medium would be loosely analogous to the cylinder in a music box, except that the latter had small pins (rather than indentations) striking against tuned teeth. Music boxes were constructed in a range of styles and sizes, from fine cabinet pieces to pocket watches. Manufacture of boxes with pinned discs instead of cylinders began in the United States about this time (see, e.g., Docs. 1186–1187; *GMO,* s.v. "Musical box"; Q. Bowers 1972, 15–99; Ord-Hume 1980, chaps. 2, 4).

13. Edison referred to a chronograph, a instrument to record intervals of time with great exactitude, often in astronomy. The form of clockwork he had in mind was likely a conical pendulum mechanism often used in telescope drives, which Charles Batchelor had incorporated into a phonograph design in 1878. See Doc. 1310 esp. n. 5.

14. It is not clear what Edison had in mind. Sir Charles Wheatstone (1802–1875), the British physicist, instrument-maker, and electrical pioneer, designed several types of experimental electric motors. He also employed delicate clockwork mechanisms in alarms and other innovative telegraphic instruments, and he applied electromagnetic start and stop devices to clockwork chronographs. *Oxford DNB,* s.v. "Wheatstone, Sir Charles"; Prescott 1884, 697; B. Bowers 2001, 94–97; *Globe Ency.,* s.v. "telegraph."

–3178–

Memorandum to John Ott: Phonograph and Telephone

[Orange,] Apl 16 88

John—

I want a hard Rubber shell made that is an exact copy of the wax Cylinder ready to go on phono. have it fit taper well & have a true outer surface I want to coat the surface with waxes also have a <u>metal</u> one made say of Brass as hard rubber may give me trouble by Expansion[a]

Have The Japaneese[1] furnished with some disks of thick & thin tin foil so as to weight the sheets in the hat microphone.[2]

TAE

ADS, NjWOE, Unbound Notes and Drawings (*TAED* NS88ABL). [a]Followed by dividing mark.

1. Edison referred to Kiyoshi Sawai (d. 1894), who visited the laboratory on the strength of a letter of introduction from Ichisuke Fujioka, chief engineer of the Tokyo Electric Light Co., with whom Edison was acquainted (Fujioka to TAE, 1 Feb. 1888, DF [*TAED* D8805AAL]; see Doc. 2821). A physics graduate of the Imperial University in Tokyo, Sawai had been sponsored by unidentified Japanese capitalists to

study practical electricity abroad. He was amid an extended tour of the United States, where he had recently been working (alongside a fellow countryman) on telephones at the Western Electric Co. shops in Chicago ("Correspondence. Chicago," *Electrical Engineer* 7 [Jan. 1888]: 27; "Personal Paragraphs," *Western Electrician* 1 [12 Nov. 1887]: 238; "Obituary," *Electrical Engineer* 19 [16 Jan. 1895]: 58). The editors have not found evidence of Sawai's presence at the laboratory before this date; he remained until early August. After leaving Edison, Sawai remained in the U.S. to study telephone exchanges until he departed for Europe sometime after early October. He reportedly helped William Hammer with Edison's exhibit at the 1889 Paris Universal Exposition (Sawai to TAE, 9 Aug. 1888; DF [*TAED* D8805AFO]; Sawai to Charles Batcehlor, 8 Oct. 1888, Batchelor [*TAED* MB244]; Hammer recollection, n.d., Ser. 2, Box 27, WJH [*TAED* X098HC11, image 12]). Before his premature death, Sawai was an engineer with the Imperial Government Telephone Exchange ("Report of the Committee on the Practical Units of Electrical Quantities and Light, Appointed by the Imperial Government," *Tōkyō Sūgaku Butsuri Gakkai* 7 [n.d.]: 38).

2. The same day, Sawai made four pages of notes on experiments with what he termed a "hat" telephone transmitter, but he did not provide any clear explanation of its construction or operation. On 19 April, Edison wrote and illustrated instructions for John Ott to make a platinum point transmitter with mechanical linkages for Sawai's experiments; the purpose of that instrument, too, is unclear. Sawai memorandum, 16 Apr. 1888; TAE memorandum, 19 Apr. 1888; both Unbound Notes and Drawings, Lab. [*TAED* NS88ABM, NS88ABN]).

–3179–

Charles Batchelor Journal Entry

[Orange,] April 16th 1888

550[1] Toy phonograph.[2] <#26.>[3a]

Have decided to make a phonograph like the regular phono. but provided with a cylender to take a number of tin rings on— Thus[b] we can talk at least 15 times & take them off & mount them on the toys—or we can have the words put on a cylinder a large number of times & then cut the cylinder up into small pieces & mount each piece in a toy

AD, NjWOE, Batchelor, Cat. 1337:51 (*TAED* MBJ004051A). [a]Marginalia written by Charles Batchelor. [b]Obscured overwritten text.

1. Batchelor consecutively numbered each entry in this journal.

2. Batchelor wrote this entry following the experimental work discussed in Doc. 3162 n. 3, and it was his last journal entry devoted to the talking doll until 7 September. In May, meanwhile, Edison acknowledged "unavoidable delays in perfecting the toy phonograph" and consequently agreed to waive the initial $4,000 royalty payment due him in July under the 1887 contracts with William Jacques and Lowell Briggs and to delay the official start of those contracts. Briggs to TAE,

17 May 1888, DF (*TAED* D8848ABK); TAE to Briggs and Jacques, n.d. [c. 17 May 1888], Miller (*TAED* HM89AAU); see Doc. 3076 n. 7 and Wile 1987, 9–10.

3. At some later time, Batchelor numbered the journal entries about the toy phonograph independently of the main sequence of entries.

–3180–

From Francis Upton

Harrison, N.J., April 18, *188*8[a]

Dear Sir:—

We herewith enclose you letter from Mr. Deshler[1] regarding his salary. He is at present getting $15 per week, and desires us to increase it to $20. We would like to have your opinion in the matter. Kindly return letter. Very truly yours

THE EDISON LAMP COMPANY
By F. R. Upton Treas.

<The position Labor etc of Mr. Deshler is not worth any more than he is getting. He can readily see himself that The position will not warrant a greater salary—[b]

Had he any ambition he would assist in experimenting & initiate things himself and not always be told to do this & that— If he would make himself more useful which he can Easily do I would be agreeable but not now You can show him this[2] Edison>

TLS, NjWOE, DF (*TAED* D8833ABE). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.,*" and "*188*" preprinted. [b]Marginalia to this point written at top of page and connected by a line to the remainder, written below Upton's signature.

1. Charles D. Deshler (1864?–1943) joined Edison's laboratory at the lamp factory in 1887, two years after graduating with a scientific degree from Rutgers College. His wages rose to $20 per week before the end of the year. He went on to a distinguished career at Edison's laboratories and retired in 1930. Doc. 3041 n. 9; Time Sheets, WOL.

2. Alfred Tate used Edison's comments as the basis for his own typed reply to Upton a few days later. Tate to Upton, 20 Apr. 1888, DF (*TAED* D8815ABC).

–3181–

To Richard Dyer

[Orange,] April ~~19~~20 1888

Dyer—

This works beautifully and if I do say it myself I think it is an[a] extremely beautiful idea & very Valuable & deserving of broad & generic claims[1] ~~See~~

The three great & <u>only</u>[b] processes of ~~milling Gold in~~ of extracting a particle of gold in mining is

1st grabbing it[a] with mercury
2nd Eating it up with chlorine gas
3rd melting the whole ore
& Last but I hope not least is yanking it into <u>a box by a magnet</u>.

Yours

Edison

ENCLOSURE[c]

Orange April 20 1888.

Patent—

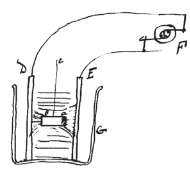
The object of this invention is to seperate gold from its ores—

The invention consists in depositing a magnetic metal like Iron electrolytically on the gold, Then Seperating The particles of gold by a Magnetic Seperator, of any desirable form such as shewn in my patents[2d]

The ore containing gold in a free state is pulverized to such a fineness as to free the gold. It is then put in vats with electrodes of iron so arranged that between each ~~po~~ positive & negative electrode there is a space of ⅛ of an inch filled with powdered ore over the whole of which is poured the electrolytic solution which is a salt of iron[e] preferably Sulphate of Iron

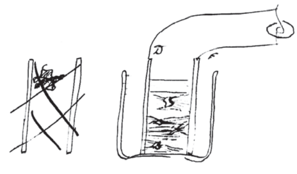
The action is as follows as shewn in fig 1

Fig 1[3]



G is the bath. D & E Iron Electrodes F the Dynamo. The solution sulphate of Iron a b a piece of gold wire hung on a fibre If now the Current passes Iron will be taken off of E & deposited on .D. but I have discovered that[f] any metallic Conductor no matter how small if suspended out of contact with Either electrode will in an electrodepositing solution have a metal <u>deposited on one side & not on the other</u>[g] That in this case Iron will be deposited at a & not at b. There will be a convergence of the Conducting lines from the poorly conducting liquid to the highly conducting metal[h] and there will be a sharp[a] diference of potential between the fluid & the metal at the point where the Current enters & leaves & this[i] necessarily requires a deposit of iron one one side & ~~not~~ where the Current enters & not where it leaves—& as the deposit is accumulative[i] it requires but a short time to deposit sufficient metallic Iron on the gold to cause it to become strongly attracted by the magnet.

fig 2



The fact that the particles of gold are mixed with Sand etc increases rather than diminishes this action. fig 2 shews particles of gold & the divergence of lines of force. The shaded sides the deposit of iron—

fig 3

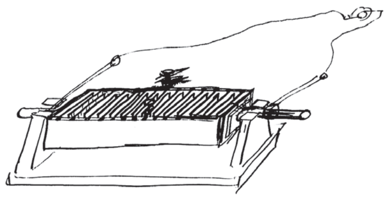


fig 3 is a large Vatt of iron split in two parts but secured together by planking & moveable[i] on trunions. A great number of thin iron plates are in the trough each about ⅛ of inch apart. Every alternate plate is Positive the other .n. several tons of powdered[i] ore is placed in the Vat in a wet pulpy state & submitted several hours to the action of the Current The ~~ore~~ pulp is then dumped [--][j] onto a Centrifugal drier. The Solution use over again The pulp is then dried, sifted & passed Through the magnetic seperator, which entirely seperate the gold from the gangue

ALS, NjWOE, PS (*TAED* PT032AAX). [a]Interlined above. [b]"& only" interlined above. [c]Enclosure is an ADf with drawings on a separate sheet. [d]Followed by dividing mark. [e]"a salt of iron" interlined above. [f]"I have discovered that" interlined above. [g]Multiply underlined. [h]"from the…conducting metal" interlined above. [i]Obscured overwritten text. [j]Canceled.

1. Edison signed the completed application prepared from this draft on 14 May and it was filed a week later as his Case 773. It included six claims and four drawings, the first and third of which correspond to the first and third figures in his draft. It referred specifically to the flat-bottomed magnetic separator described in Doc. 3159 as his preferred machine for extracting the coated gold particles. Patent Office officials asked to borrow Edison's apparatus in order to verify the practicality of the process, but when told that it weighed about a ton they decided

to make their own tests. Eventually satisfied that the process did work, the examiner nevertheless rejected the application in April 1889 on the basis of an 1886 British patent. Edison amended the claims to try to get around the prior specification, but the application was rejected a second time in April 1891 and was never issued. Patent Office to TAE, 15 Sept. 1888, 8 Mar. and 5 Apr. 1889, 4 Apr. 1891; TAE to Patent Office, 7 Jan. 1889 and 13 Mar. 1891; all Case 733, PS (*TAED* PT032AAX).

2. Edison's idea for this patent was apparently a speculative one; the editors have found no records of actual experiments until William K. L. Dickson took up the subject a week later. When he did so, Dickson called the idea "unique & stupendous." According to his precis, Edison

> thought that if a single particle of gold or cu. could be plated when placed between the anode & Cathode of iron (or nickel for Exp) in a solution of iron Sulph. that whole mines perhaps could be treated in the same manner, that is by using enormous tanks with sheets of iron at each end and a weak solution of its sulphide all the gold could be plated on one side and when put thro' the ordinary magnetic separator…all the gold would be drawn or attracted over. [Notebook E-2610:79, Lab. (*TAED* NM031079)]

Dickson's initial tests, made on a very small scale, gave "fair but not altogether satisfactory" results. He continued minutely detailed experiments throughout the spring and also started at least two longer and larger trials, one using canvas bags with definite amounts of copper or silver dust amid a great bulk of sand, all immersed in an electrolytic solution. Dickson sampled their contents at regular intervals but found by the end of June that less than two percent of the dust particles had been plated enough to be attracted by a powerful magnet. He seems to have dropped the subject then. Notebook E-2610:79, 84, 86 (*TAED* NM031079A, NM031084, NM031086).

3. Figure labels are "F" (top right), "D," "c," "E" (across the middle), and "b," "a," and "G" across the bottom.

–3182–

Draft to George Gouraud

[Orange, April 23, 1888][1]

<Gouraud>[a]

~~Better read my telegram~~

Telegram means just what it says—[2] Its a mfg Co that gets twenty per cent profit for manufacturing every instrument & nothing else[b] (no stock sold less than par) I get 40 per cent of stock for my right to manufacture. Capital gets sixty ~~stock to me only~~ for every ~~hundred shares sold~~ sixty shares sold from[c] treasury forty is issued to me as fast as sold[d] I maintain control by having issued to me some deferred shares which do not participate in dividends until they are over twenty five per cent on entire capital, no bonus or commissions given to anybody. Company only organized Wednesday last[3] 250 shares sold at par. ~~all~~ [—][e] Every dollar to go into machinery

& buildings[4f] Can reserve such an amount as you desire if notified in reasonable time.[5]

Edison

ADfS, NjWOE, DF (*TAED* D8850ABG1). Illegible initials written across bottom of document, possibly by the sender of this message. [a]Marginalia written in unidentified hand. [b]"& nothing else" interlined above. [c]"sixty shares...from" interlined above. [d]"as fast as sold" interlined below. [e]Canceled. [f]"~~all~~...buildings" interlined above.

1. This date appears both on a letterpress copy of the cable prepared from Edison's draft and in a typed transcription of cables exchanged with Gouraud. TAE to Gouraud, 23 Apr. 1888, Lbk. 26:246 (*TAED* LB026246); TAE to Gouraud, 24 Apr. 1888, DF (*TAED* D8818AJH).

2. Edison referred to a message he had sent on 21 April amid a back-and-forth exchange with Gouraud about investing in the prospective Edison Phonograph Works. According to a typed transcription, Edison had initially wired on 20 April: "Have formed Company for manufacturing phonograph; money gets sixty per cent of profits. Have to-day placed two hundred and fifty shares at par. Do you wish any?" Gouraud answered affirmatively and requested more details about the company, of which he hoped to become a director. The heart of Edison's lengthy 21 April response read:

> Company formed relates to manufacturing only; has contract with parent [Edison Phonograph] Company allowing twenty per cent full profit on output of factory; is capitalized two hundred and fifty thousand; all money paid in to be used solely for manufacturing purposes. I retain voting control, but receive forty per cent only from this Company for my contract right to manufacture. Require immediate cash for new factory which propose erecting at Bloomfield. Directors R. L. Cutting and my own men. This Company has nothing to do with royalties, but is sole manufacturer for the whole world. Thought you might desire small interest is reason I telegraphed.

That prompted yet another message from Gouraud on 22 April with five more queries, and it was that cable to which Edison drafted his reply on 23 April. TAE to Gouraud, 24 Apr. 1888, DF (TAED D8818AJH).

3. A certificate of organization for the Edison Phonograph Works was filed on 1 May in New Jersey, where the firm was incorporated two days later. Edison was president of this new independent entity, and Charles Batchelor, Robert L. Cutting, John Tomlinson, and Alfred Tate were directors. Edison soon afterward licensed his manufacturing rights to the new company, taking care to stipulate that its factory should supply the U.S. and Canada as well as Gouraud's demands for foreign markets. In exchange for the license, Edison received fifty-two percent of its $300,000 of capital stock. Shortly after its organization, the company moved to carry out the plans Edison had already made for building a factory adjacent to his laboratory at Orange, which included a $12,500 contract on four acres of land and a $10,000 mortgage from Henry Auchincloss, his Llewellyn Park neighbor. It also agreed to purchase Edison's small phonograph factory at Bloomfield, N.J., for

$24,124 in cash. Edison Phonograph Works certificate of organization, 30 Apr. 1888, and certificate of incorporation, 3 May 1888; both *New York Phonograph Co. v. National Phonograph Co.,* pp. 785, 788; Lit. (*TAED* QP0100785); Edison Phonograph Works minutes, 3–19 May 1888, including TAE agreement with Edison Phonograph Works, 12 May 1888 (p. 22); CR (*TAED* CK101, images 22–39).

4. Edison anticipated needing $135,000 to build, equip, and start the factory. It is not clear how much of that sum he had in hand when he hired architect Joseph Taft (to whom he still owed a modest balance for the new laboratory) and then entered into a construction contract on 14 May, two days after formally licensing his manufacturing rights. Trying to interest Gouraud in the stock, he claimed that 30,000 shares had been sold by 26 April; he also solicited Eugene Crowell and others of his acquaintance, with no evident success. TAE to Gouraud, 26 Apr. 1888; TAE to Crowell, 27 Apr. 1888; Lbk. 26:248, 250 (*TAED* LB026248, LB026250); Taft to TAE, 16 Apr. 1888; TAE to Taft, 3 May 1888; both DF (*TAED* D8855AAQ, D8818AJV); TAE agreement with Frank Moore, 14 May 1888, Legal (*TAED* HX88022).

5. Gouraud cabled on 27 April that he would "probably accept" the offer but wished first to review documents that Edison agreed to send him. Though cautioned by Edison that "Very little stock will be left for you by time you receive them," he did not commit. After about two weeks, having received neither the documents nor word of the long-promised departure of an expert carrying the latest phonograph, Gouraud began considering a "run over to see you and settle as to the Manufacturing Co." He made definite plans by 17 May and sailed for New York on the 21st. By that time he had also read an equivocal press report about the phonograph—and its noisy motor—exhibited in New York. Gouraud to TAE, 27 and 28 Apr. and 11 May 1888; TAE to Gouraud, 27 Apr. and 16 May 1888; Tate to Insull, 17 May 1888; Juliet Snow to TAE, 24 May 1888; all DF (*TAED* D8805ACO1, D8850ABI, D8850ABL, D8850ABH, D8818AKM, D8820AAD, D8850ABP).

–3183–

To Samuel Insull

[Orange,] May 2/[188]8

Dear Sir:

In reference to your telegram re compound to which I have replied stating that we are preparing it,[1] our water tests in connection with same show high insulation, and it gives no flame.[2] I have two men who are thoroughly instructed in the preparation of this material. It will be necessary for you to make it in Schenectady— The process is dangerous, liable to fire, and you therefore will require a separate building about 25' × 50'. If there is no spot on your own property ~~s~~which you consider sufficiently i[sol]ated[a] you can locate it some[wher]e[a] else in the town.

In about ten days I will send you all data in regard to this business and give you a sketch of the arrangement, and correct dimensions of the building. I will let you know when the compound goes forward.[3] Yours truly

Thos A Edison T[ate]

L (letterpress copy), NjWOE, Lbk. 26:254 (*TAED* LB026254). Written by Alfred Tate. [a]Paper damaged.

1. This letter was written at the end of a day in which Edison and Insull exchanged several telegrams about insulation. In the morning, Insull inquired: "Where is that Compound you were going to send for covering wire. Did you see test on wire which Kelly took to Laboratory and what do you think of it." Edison personally drafted a message saying that "Your wire tests much better but flames somewhat. Batchelor reports our new wire perfectly free from flame, insulation tests high like Gutta Percha are testing yours for insulation." Then in the early afternoon, he telegraphed: "Water test show your wire does not insulate at all." At the same time, Insull prompted again: "You promised send me several pounds your new insulation It has never come to hand." Responding in Edison's name, Alfred Tate wired: "We are having it prepared Writing you fully tonight" (all DF [*TAED* D8835ACO, D8835ACP, D8835ACS, D8835ACQ, D8835ACR]). The samples from the Edison Machine Works were brought to the laboratory by James F. Kelly and Joseph Hutchinson at the end of April. Arthur Kennelly made brief notes on "Tests of a certain specimen of insulated wire from Schenectady in water" on 2 and 3 May (Charles Batchelor to Insull, 30 Apr. 1888, DF [*TAED* D8818AJP]; N-88-04-18:32, Lab. [*TAED* NB035032]).

2. Finding a suitable nonflammable and electrically resistive insulating material was an ongoing challenge throughout the electric light industry. An 1888 naval report, referring to wiring on land, qualified the extent of the problem: "almost every kind of worthless insulation is found, and worse wire than that known as 'underwriters,' but appropriately nicknamed 'undertakers,' is used. This wire derives its name from the insurance underwriters insisting on a *fire-proof,* instead of an electrical, insulation." Though not necessarily waterproof, underwriters' insulation was used widely, indoors and out, in the United States. U.S. Navy 1888, 205; Addenbrooke 1889, 649–50.

Work on insulation began in January and continued to be a major activity at the laboratory. By the end of April, the amount charged to the Machine Works for these experiments amounted to $1,925. Expenses in May totaled $1,750 and averaged nearly $1,400 per month through September; by year's end, they came to more than $19,600 (Ledger #5:120, 455, WOL-Accts. [*TAED* NL011A1 (images 85, 150)]). The insulation compound described by Edison is probably the same as the "Insulation for House wires," which Charles Batchelor recorded in his journal on 10 May as having "Insulation very high & absolutely inflammable." According to Batchelor, it was made with "boiled linseed oil chlorinized into a thick mass" and combined in a mixer with antimony pentachloride "until it becomes a thick mass like rubber." The material was then worked in a kneading machine to make it more pliable so it could be put on a wire by a pressure squirter (Cat. 1337:54 [item 554, 10 May 1888], Batchelor [*TAED* MBJ004054B]). This insulation may have emerged from a line of research Edison suggested in an undated pocket notebook entry that he likely made in March:

> The true method of obtaining a proper non-combustable insulation is the formation of such compounds as metagallic acid, chlorine passed through gelatin & disolving them in Ammonia or a cheap amine— Chlorine passed thro gelatin makes white elastic tough insol stuff— Sol in alkali probably ammonia or an amine will do it (PN-88-04-13, Lab. [*TAED* NP032A, image 3]).

Although this compound was promising, Batchelor reported in mid-July that the laboratory had "tried many mixtures but as yet have not arrived at what we want for hardners just after putting on a wire so that it can be put on & covered at the same operation (Cat. 1337:55 [item 555, 15 July 1889], Batchelor [TAED MBJ004055]).

3. Insull lobbied Edison to send samples of insulation to be applied to wires at the Edison Machine Works. Though the laboratory could test the finished item, it lacked the machinery to apply it to wires as would be done for commercial use. Wire coated with "a small amount of cotton" would appear nonflammable, he cautioned, but when covered "with the amount of cotton winding and braiding that you are compelled to put on the wire in order to make it look well and saleable, and the result is often very different." Confident in the efficacy of insulation developed at the Machine Works, Insull urged Edison to send samples of his own compound so that a choice between them could be made in time to manufacture for the spring and summertime market. The laboratory may have been working at cross purposes, however. Charles Batchelor reported that machines were being made there to apply insulation to wires for testing. He also suggested that the Machine Works send a man to Orange "to thoroughly understand the process and method of making the stuff" so that Edison's compound could eventually be manufactured in Schenectady. In any case, Insull had received no samples by mid-June, even after John Kruesi's visit to the laboratory. Insull to TAE, 2 and 4 May 1888; Insull to Tate, 12 June 1888; Batchelor to Insull, 19 May 1888; all DF (*TAED* D8835ACT, D8835ACU, D8835ADC, D8818AKQ).

–3184–

Alfred Tate to Henry Bergh, Jr.[1]

[Orange,] May 2, 88.

Dear Sir:—

In reply to your letter of April 25th[2] in regard to the substitution of some more humane method than the destruction by drowning of such unclaimed animals as it is necessary to deprive of life, Mr. Edison desires me to state that the ordinary Brush current on the street lighting circuits[3] could be used for this purpose, say in the day time. It is unlikely, however, that the Company would permit it as they are very sensitive about taking life. A small alternating current machine could be used at the pound, and the dogs could be made to kill themselves. One pole of the machine being connected to a pan containing meat and placed in a block of wood, the other pole connected to the earth, every dog which attempted to touch the meat would drop dead, and the attendants need not be within 100 feet. Any number of pans could be used. Yours truly,

A. O. T[ate]. Private Secretary.

TLS, NjWOE, DF (*TAED* D8818AJT).

1. Henry Bergh, Jr., (1849–1924) was the nephew and heir of Henry Bergh (1811?–1888), the founder of the American Society for the Prevention of Cruelty to Animals. He succeeded his uncle as president of the ASPCA in late March 1888. Henry Bergh passport application issued 14 Feb. 1894, *U.S. Passport Applications, 1795–1905,* online database accessed through Ancestry.com, 14 Apr. 2017; "Died," *NYT,* 26 May 1924, 17; "In Mr. Bergh's Place," *NYT,* 24 Mar. 1888, 8.

Reformers seeking more humane ways to execute humans had previously consulted Edison regarding electricity as a suitable means (see Doc. 3125). After receiving Bergh's letter, Edison directed experiments on the electrocution of dogs (see Doc. 3224 [headnote]). The results of those and other animal tests were later used for polemical purposes during the "War of the Currents" to contend that alternating current (AC, promoted by the rival Westinghouse Electric Co.) was inherently more dangerous than the direct current (DC) used in Edison central stations.

Perhaps the most famous animal electrocution associated with Edison's name and sometimes incorrectly linked to the Edison-Westinghouse rivalry is the death of Topsy, an elephant at Coney Island's Luna Park, in 1903. The event was filmed by the Edison Manufacturing Co., and the motion picture was released under the title "Electrocuting an Elephant—Thomas A. Edison." This film has led subsequent writers to assume—incorrectly—that Edison himself was responsible for the electrocution or had some part in it. But it was officials at Luna Park who determined that the elephant should be euthanized by hanging after it had killed three men during a three-month period. After the SPCA objected to this method as unnecessarily cruel, park officials (with the organization's approval) decided instead to use a combination of poisoning, strangulation, and electrocution. The Edison Electric Illuminating Co. of Brooklyn provided technical assistance and 6,600 volts of power under the supervision of electrician P. D. Sharkey. The Brooklyn firm, like local illuminating companies across the country working under license from the Edison Electric Light Co. of New York, used Edison's name, although he had no role in its direction or operation. Edison evidently played no part in Topsy's death: neither contemporary newspaper accounts nor correspondence about the event suggest that he had any connection with it ("Topsy, an Elephant, Executed at Coney Island," *New York Herald,* 5 Jan. 1903, 6; "Electricity Kills an Elephant," *New Bedford Mercury,* 6 Jan. 1903, 6; "Coney Elephant Killed," *NYT,* 5 Jan. 1903, 1; "Bad Elephant is Executed," *Pawtucket Times,* 5 Jan. 1903, 10; "The Development of Summer Lighting," *Elec-*

trical Age 32 [April 1904]: 262). It is also highly unlikely that Edison had any personal involvement with the film that bears his name. Although he was president of the Edison Manufacturing Co., its day-to-day operations fell to vice president and general manager William Gilmore (*TAEM-G 4,* 43). Furthermore, the film could have borne no relation to the "battle of the currents" between DC and AC distribution systems, which ended a decade earlier in a decisive victory for the Westinghouse AC interests.

2. Not found.

3. Municipal arc lighting systems typically operated at several thousand volts, a pressure consistent with contemporary claims for a dynamo of the Brush Electric Co. of Cleveland, a leading firm in arc lighting. "The Brush Multi-Circuit Arc Dynamo," *American Electrician* 11 (Sept. 1899): 436; Whipple 1888, 111; Doc. 2654 n. 2.

–3185–

From Albert Dick

CHICAGO. May 5 1888.[a]

Dear Sir:—

I am in search of a very thin, transparent, elastic Varnish or substance for coating our Type-writer stencil paper which will make it impervious to ink, ~~and~~ to be spread over the stencil sheet after we have paraffined the fiberous paper with a very thin coating. I have tried Collodion but with poor success as it does not adhere to the wax sufficiently well to make satisfactory work.

You spoke to me, when last in your Laboratory, of a thin coating which could be used for this purpose or rather which could be used without the paraffine, and I thought perhaps it would be just what we are looking for to use in connection with the paraffine to make the sheets absolutely impervious to ink.[1]

If you can help us on this it will be appreciated. Yours very truly,

A. B. Dick[2] ~~Compy~~

<Dick[3] Boil Linseed oil down to consistency of molasses[b] takes a day— Coat wax & then expose to fumes or flow over it, Chloride of Sulphur— Experiment on glass plate till you get film of proper thinness [-][c] eveness & flexibility— The action of the Sulphur on the oil is almost instantaneous when thin— E[dison]>

TLS, NjWOE, DF (*TAED* D8803AAK). Letterhead of A. B. Dick Co.'s Edison mimeograph. [a]"CHICAGO." preprinted. [b]Obscured overwritten text. [c]Canceled.

1. Albert Dick's inquiry was part of an ongoing collaborative effort with Edison to devise a means of reproducing typed documents with the Edison Mimeograph marketed by the A. B. Dick Co. (see Doc. 3150). The firm had inquired in early April about the results of Edison's experiments on "a new process of 'coating' thin fiberous paper and displacing such 'coating' in the form of Type-written stencils." It suggested that a substance "impervious to ink, which could be thinly and uniformly spread over the thin fiberous Japanese paper" might be suitable; in making stencils, such a material could be "displaced by the aid of an acid ink to conform to the shape of Type-writer characters." The company later sent, at Alfred Tate's request, samples of the Japanese paper for experiment (A. B. Dick Co. to TAE, 6 and 12 Apr. 1888; Tate to A. B. Dick Co., 10 Apr. 1888; all DF [*TAED* D8803AAG, D8803AAH, D8818AIF]). According to itemized bills for the first three months of the year, Edison appears to have concentrated his efforts on inks and coatings. He charged the A. B. Dick Co. on its typewriter account (mostly for labor) to the extent of $69.03 in February, $65.77 in March, $173.79 in April, $65.70 in May, and lesser amounts on a separate account for mimeograph ink. The typewriter account regularly accrued labor charges throughout 1888 and 1889 (Ledger #5:462, 473, 511; WOL [*TAED* NL011A1; images 154, 159, 178]; TAE bills to A. B. Dick Co., 1 and 23 May, 1888, both DF [*TAED* D8855AAQ2, D8855AAQ3]).

Dick (or Edison) apparently settled in 1888 on a somewhat different approach to making typed stencils. A committee of the Franklin Institute reporting on the mimeograph in December described the process this way:

> The edges of a sheet of paraffine paper are folded over a piece of coarse silk cloth, back of which is laid a stiffening sheet. They are then passed through a typewriter in the ordinary way, except that no ribbon is used. The type strikes the paraffine paper, driving it against the silk cloth, which is termed "perforating silk." Wherever the type strikes, the paraffine is taken up by the cloth on the other side, and owing to is coarse texture, small holes are pierced through the paper in the lines of each letter.... The type is not at all injured, as in some processes, merely needing occasional cleaning. [Franklin Institute 1889, 382]

2. Albert Blake Dick (1856–1934) was a lumber wholesaler in Chicago when he devised a way of making a perforated stencil on wax-coated paper from which he could reproduce copies. Dick entered into a business alliance with Edison in 1887 and by the end of that year had reorganized his business, the A. B. Dick Co., entirely around production and marketing of what he called the Edison mimeograph. Doc. 3034 n. 4.

3. Alfred Tate's reply on Edison's behalf quoted Edison's marginalia in full. Tate to Dick, 8 May 1888, DF (*TAED* D8818AKC).

[Orange,] May 10 88

Draft Patent Application: Phonograph

The object of this invention is to obtain a perfect diaphragm for phonographs—[1]

The invention consists in the use of thin diaphragms of ~~microscope~~ glass called in the trade microscope glass— These diaphragms which are cut out by a diamond point ~~in~~ with[a] proper diameter are clamped between metallic rings with some yielding material such as paper around the edge on both sides—

The Recording[a] point & lever is secured to the glass by a cement such as shellac—

The advantage of glass or porcelain[b] diaphragm[a] in a phonograph above all other materials experimented with is that it is effected by temperature less than any other practicable material, that it is free from buckling. That it is not effected by moisture, and is the stiffest & most elastic material of equal thickness that can be used

Mention it can be used for a receiver as well[2]

Claim in a phonograph the use of a glass diaphragm

2= Use of microscope glass

3 securing the phonograph [~~recording or repro~~?][c] lever to the glass by cement—

4= clamping between metallic rings with soft rings on either side of the glass—

T.A.E.

ADfS, NjWOE, PS (*TAED* PT032AAY1). [a]Obscured overwritten text. [b]"or porcelain" interlined above. [c]Canceled.

1. In general, the diaphragm was a thin flexible plate designed to vibrate in response to sound waves in the air and transmit that motion to a mechanical component such as a recording point. Its action was also reversible, so that mechanical action applied to it, as by a reproducing point, would cause it to vibrate and create sound waves. Diaphragms were necessarily thin—often sheets of metal or mica—but could be made and mounted in countless ways. The wide range of sounds in speech and music placed heavy constraints on the design, however, and Edison had experimented over the years with many different materials and types of construction for telephones, phonographs, and other acoustic devices.

2. Edison executed an application based on this draft on 22 May and filed it on 7 June. It went through the Patent Office with its text essentially unchanged (and one new drawing) and issued in April 1889 as U.S. Patent 400,646. He explained in the specification that "The glass film or membrane diaphragm is not materially affected by ordinary variations of heat and moisture, it has great elasticity, and is highly responsive to sound-vibrations, and is capable, by reason of its extreme thinness, of sufficient amplitude of vibration to make or reproduce a deep record."

He also executed and filed at the same time a separate application for a reproducing (or receiving) diaphragm made of “thin fabric such as silk preferably of bolting cloth…stretched in a frame,” then shellacked and dried. Such a material would be “exceedingly thin and flexible” and make for a “more durable” reproducer that “will better maintain its adjustment under varying conditions of heat and moisture and will more effectively reproduce the sound vibrations.” That application underwent a revision of its second claim and did not issue until December 1892 as U.S. Patent 488,190. Pat. Apps. 400,646; 488,190.

–3187–

From George Bliss

Chicago, Ill., May 12th, *188*8.[a]

Dear Sir:

The discussion which has raged in the Chicago Electrical Club[1] on the Constant Current Vs the Alternating Current in electrical lighting has resolved itself into an assault upon the Edison system.[2]

Owing to the fact that I have defended the constant current system on several occasions the managers of the club insist that I shall read a paper on the subject.

I have not the time to go in to this subject as carefully as would be desirable and having been out of Electric lighting so long if you can send me some of the strong points of the constant current system and the weak ones of the alternating system I shall be glad to use them.

If you can tell me where to get at information the quickest which will cover the ground I shall be glad to get that.

There has been no special object to me in taking up this subject as I am not interested but there seems to be a combine against the Edison interest for advertising purposes and upon grounds which will not stand investigating and which experience will not sustain.

I am willing to stir up the enemy to the best of my ability if you are willing to help me to get at the strong points in the Edison side of the situation.

My paper will run largely upon the commercial results achieved by the constant current system which is the real test of the value of any system.[3] Sincerely Yours[b]

Geo. H. Bliss[4]

<Friend Bliss— I saw accts of your defending in papers I think Leonard[5] could give you the best points—

The principlel[c] Reason why there is so many advocates of alternating <u>may perhaps</u> be found in the fact that we have the principal & <u>broad patents on Direct</u> If our patents were public property you wouldnt find an alternating man in the US[6d] Edison>

TLS, NjWOE, DF (*TAED* D8805ACU). Letterhead of George Bliss. [a]"*Chicago, Ill.,*" and "*188*" preprinted. [b]"Sincerely Yours" handwritten. [c]Obscured overwritten text. [d]Followed by dividing mark.

1. The Chicago Electric Club was organized in May 1887 as a social and professional group. "Chicago Electric Club," *Western Electrician* 1 (2 July 1887): 7.

2. The Electric Club announced in early March a forthcoming series of papers and discussions on "The Continuous Current *vs.* Alternating Current." Among the planned participants were representatives of the Edison system, the U.S. Electric Lighting Co., and the Western Electric Co. The meetings reportedly generated high attendance and lively discussions ("Chicago," *Electrical Engineer* 7 [Apr. 1888]: 186). Harry Ward Leonard went first, on 5 March, advocating for the Edison direct (continuous) current system. Making an analysis of first costs and operating expenses, he argued that the reputed economic efficiencies of alternating current had been greatly overstated for areas within a radius of five miles. Part of Leonard's argument, however, was predicated on future improvements to lamps ("near at hand") allowing them to operate at twice the present voltage and resulting in much lower costs for copper conductors (Leonard 1888, quoted p. 167). After the fifth such paper, the *Electrical Engineer* commented that Leonard's own presentation had largely set the terms of debate for all those that followed ("Chicago," *Electrical Engineer* 7 [June 1888]: 267).

3. George Bliss delivered the seventh paper in the series at an Electrical Club meeting in early June. According to one published account, he

> viewed the subject almost exclusively from a commercial point of view. His point in brief was this: The continuous current, by its success, had demonstrated its usefulness and its safety. It had brought in dividends to stockholders, and its history was such that it had created a presumption in its favor. On the advocates of the alternating system rested the burden of proof.… This proof Mr. Bliss held had not yet been forthcoming; and it is safe to assert from the general tenor of his paper that he does not expect to find evidence which will be conclusive to him. ["Chicago," *Electrical Engineer* 7 (July 1888): 320]

4. A longtime Edison associate in Chicago, George Harrison Bliss (1840–1900) had established an office of the Edison Co. for Isolated Lighting in that city and was superintendent of the Western Edison Light Co. until the first half of 1886. Bliss's letterhead identified him presently as an "ELECTRICAL EXPERT, DEALER IN ELECTRICAL SECURITIES, [AND] EXPLOITER OF ELECTRICAL INVENTIONS." His offices were in Temple Court, a large new building in the Loop occupied by "coal dealers, capitalists, brokers, attorneys, scientific experts, manufacturers' agents, and professional men." Doc. 2426 n. 1; George Phelps to Samuel Insull, 8 and 12 May 1886, both DF (*TAED* D8603ZBD, D8603ZBF);

"The Real-Estate Field," *Chicago Daily Tribune,* 25 Dec. 1887, 2; Rand McNally & Co. 1893, 22.

5. Harry Ward Leonard (1861–1915), a graduate of the Massachusetts Institute of Technology, worked briefly at the Edison Machine Works in 1883 before being posted to a succession of Edison central stations as an expert on meters. Leonard had been superintendent of the Western Edison Light Co. in Chicago for the last year or so, but by now he was a principal in Leonard & Izard, an electrical contracting partnership, one of whose first jobs was to wire the new Rookery high-rise building. He was elected a vice president of the Chicago Electric Club in the summer of 1888. Leonard became general manager of the United Edison Manufacturing Co. in 1889, about the same time his Chicago partnership was subsumed by the new Edison General Electric Co. Doc. 2542 n. 1; "H. Ward Leonard Dies," *NYT,* 19 Feb. 1915, 9; "Chicago's Great Office Building," *Chicago Daily Tribune,* 17 June 1888, 3; "Chicago," *Electrical Engineer* 7 (Apr. 1888): 186; "Chicago," ibid. (Aug. 1888), 355; "H. Ward Leonard's Appointment," *Western Electrician* 5 (6 July, 1889): 2.

6. For an overview of Edison's recent approach to the competitive threat of alternating current distribution systems, see Doc. 3002 (headnote).

–3188–

From Eadweard Muybridge

New York 12 May 88

My dear Sir.

I have this day mailed to your address, a catalogue of the plates of Animal Locomotion.[1]

If agreeable to you, I should prefer for you to make a personal selection of the plates for your copy, if however you cannot spare the time to do so, I will gladly relieve you of the trouble if you will kindly return the enclosed blank,[2] marked with the quantities of each respective class of subjects you require; and I think my judgment in the matter will meet your approval. Since you favored me with a demonstration of the capabilities of your marvellous phonograph[3] I have thought much and earnestly of its destined place in our every day life. Some ideas with regard to conveying the sounds from a piano or other musical instrument have suggested themselves, which however I have no doubt you have long since tried and rejected as impracticable; but I will venture to remark that if you devote a little of your genius to the <u>construction</u> or <u>adaptation</u> of a piano, you will soon succeed in inventing one which will serve your purposes more effectively than one in which the necessity exists for conveying the sound by means of a wire connected with the frame work.[4] I trust to your good nature not to consider me impertinent, and am Yours Faithfully

Eadweard Muybridge[5]

<Tell him to make the Selection for me E[dison]>[6]

ALS, NjWOE, DF (*TAED* D8805ACT). University of Pennsylvania letterhead of Eadweard Muybridge.

1. Muybridge was circulating a *Prospectus and Catalogue of Plates* (1887) to solicit interest in the first edition of his *Animal Locomotion: An Electro-photographic Investigation of Consecutive Phases of Animal Movements.* The *Prospectus* contained descriptive data on 781 plates from his work with human and animal subjects. According to a separate advertising pamphlet, each plate contained an average of twenty-six images; subscribers could purchase the entirety for $600 or 100 plates of their choosing for $100. Advertisement [1888] enclosed with Muybridge to TAE, 28 Nov. 1888, DF (*TAED* D8805AJH).

2. The *Prospectus and Catalogue* ordinarily was accompanied by a printed form for ordering plates. Muybridge also enclosed to Edison a card for admission to William Bradford's studio at 42 East Fourteenth St. in New York, where prospective subscribers could examine his photographic plates. "New Publications. Wonders of the Camera," *NYT,* 5 Mar. 1888, 3; Announcement and Subscription Order Form, [June 1887], EMC, accessed online through Primary Sources Online, archives.upenn.edu, 2 Nov. 2016.

3. Muybridge would later give 27 February 1888 as the date when he visited the Orange laboratory and talked with Edison about combining the phonograph with projected motion pictures. He had lectured in Orange on 25 February under the auspices of the local New England Society and returned to give another presentation for the Free Library on 4 May. A June newspaper article offers no corroboration of a specific date when the two might have met but, citing Edison, reported that Muybridge "had visited him lately and proposed to him a scheme" and that "Edison intended to perfect it as his leisure" (Muybridge 1899, 4–5; Spehr 2008, 75–77; "Edison's Talking Baby," *New York World,* 3 June 1888, 16, Clippings [*TAED* SC88038a]). Art and film historian Gordon Hendricks, speculating that Edison attended a Muybridge lecture at his wife's prodding, suggested that their meeting was coincidental. Others in Edison's world, however, may have exerted some influence. Everett Frazar (Edison's agent in Asia), for example, had longstanding involvements with both the Music Hall and the New England Society in Orange. And at the invitation of Wendell Phillips Garrison, a Llewellyn Park resident and literary editor for *The Nation,* Edison joined the New England Society in January (see also Doc. 3203). Coincidentally or not, *The Nation* published in its 19 January issue both a review of *Animal Locomotion* and an unsigned editorial suggestion that the zoetrope, stereopticon, and phonograph might somehow be combined to create lasting visual and audible records of the speech of eminent persons, a dream as old as the phonograph itself (Hendricks 1961, 4, 11; Garrison, McDaniels, Bancroft 1908 7, 51; "Notes," *The Nation* 46 [19 Jan. 1888]: 53–54; "Animal Locomotion," ibid. 46 [19 Jan. 1888]: 55; for an early suggestion of combining moving images with phonographic sound,

see "Talking Photographs," *Nature* 17 [24 Jan. 1878]: 242). Like many contemporaries, Edison was familiar with stereopticon slides and the magic lantern for projecting them (see, e.g., Docs. 560 n. 2 and 1670 n. 3).

4. Muybridge seems to be referring to experimental ways of recording a piano. Instruments from which tones emanate from sounding boards, particularly the piano and the violin, were generally much more difficult to record than those which, like winds or brass, project directional sounds from a rather small opening. When composer Edgar Kelley referred a few weeks later to unspecified laboratory work on a fortepiano, Edison promised to "let him know when it is ready." Edison reportedly worked in June on some arrangement for recording a piano, but the editors have not learned details of that effort. Kelley to TAE (with TAE marginalia), 1 June 1888, DF (*TAED* D8805ADG); "Will Tackle A Flying Machine," *Dallas Morning News,* 29 June 1888, 4.

5. British-born photographer Eadweard Muybridge (1830–1904) was renowned for an innovative system of electro-photography that could capture time-sequenced motion with clarity and illustrate, for instance, how a horse would have all four feet in the air during rapid stride. His methods and apparatus influenced the thinking of chronophotographic pioneer Étienne-Jules Marey as well as Edison. Muybridge did his foundational work from 1872 to 1879 under the patronage of California oligarch Leland Stanford, who facilitated access to technical collaborators from the Central Pacific Railroad, including John Isaacs, who pointed Muybridge toward the use of electricity, and inventor and electrical machinist Paul Seiler, who helped fabricate electro-shutters. Muybridge took out two fundamental patents in 1879 on "Methods and Apparatus for Photographing Objects in Motion," including the mechanical and electrical triggers of multiple camera shutters. He also patented (in 1881) a "Picture Feeding Device for Magic Lanterns" that apparently was a component in his zoöpraxiscope, an image projection machine that created the illusion of moving pictures for audiences; the zoöpraxiscope itself—essentially a modified magic lantern—was not patented (U.S. Pats. 212,864; 212,865; 251,127). From 1880 to 1884, Muybridge was largely engaged with promoting his work through books and lectures. He resumed scientific and artistic work in 1884 at the University of Pennsylvania. There he undertook an intensive period of studies that resulted in a massive assemblage of human and animal locomotion photographs made with new dry plate technology and advances in his multiple camera system (*ANB,* s.v. "Muybridge, Eadweard"; *BDHT,* s.v. "Muybridge, Eadweard"; Haas 1972, 11, 18, 21–27, 34 nn. 16–17; Herbert 2004, 116; Braun 2012, chap. 7, pp. 182–87).

6. Edison's marginalia formed the basis of a typed reply on 22 May. In November, Muybridge sent a unique edition of his *Animal Locomotion* consisting of 100 plates personally selected for Edison. He also forwarded a printed subscriber list with Edison's name among the "Scientists." Edison acknowledged the book and paid Muybridge $100 soon afterward. The editors have not found his copy. TAE to Muybridge, 22 May 1888; Muybridge to TAE, 28 Nov. 1888 [with enclosed advertisement and subscriber list]; both DF (*TAED* D8818AKY, D8805AJH); TAE to Muybridge, 7 Dec. 1888, Lbk. 27:314 (*TAED* LB027314).

–3189–

From John Vail

New York, May 12. *188*8[a]

Dear Sir:—

Referring to the letter sent you some weeks ago regarding the use of motor dynamos for long distance lighting,[1] I would state, that we have asked the Machine Works for prices on these dynamos, and they replied stating that you have advised them not to make any prices, as you have a new device which is expected to be superior to motor dynamos.[2]

Anything of this nature will be very welcome[b] in our business at this time.

We are now putting up a station in Newport, R.I.[3] and have demand for a large number of lights in the numerous summer residences which are located from one to three miles from the station.[4] These residences are widely scattered.[5]

Will you kindly advise me how soon this new apparatus will be ready, whether you have at the laboratory a model which I can see in operation if I come over, also whether the apparatus can be worked in multiple arc on the three-wire system the same as the motor dynamos could be worked.?[c]

There are several other places besides Newport where this could be applied promptly if we can get it out this season. Yours truly.

J. H. Vail[6] Gen'l Supt.

<Will have it Soon E[dison]>[7]

TLS, NjWOE, DF (*TAED* D8830AAM). Letterhead of Edison Electric Light Co., J. H. Vail, general superintendent. [a]"*New York,*" and "*188*" preprinted. [b]Underlined by hand. [c]Question mark added by hand.

1. The editors have not found or otherwise identified the letter to which Vail was responding. Edison had devised several variations of "motor dynamos" (or motor-generators) for raising or lowering the voltage of a direct current. One set of armature windings acted as a motor to drive a second set of windings on the same shaft through a magnetic field to generate current at a different voltage. See Docs. 3002 (headnote), 3008–3011, 3014 n. 3.

2. Vail likely referred to the new "Continuous Current transformer" being developed since at least January (see Doc. 3142 esp. n. 17). Time sheets for the laboratory in May show a modest amount of work (centered around the middle of the month) by several draftsmen, machinists, and pattern makers on a "transformer," possibly this device (Time Sheets, WOL).

3. Once a leading commercial port of British colonial America, Newport was still one of the rotating capitals of Rhode Island and the home of an important U.S. naval base. By mid-century it had become a prominent summer resort for wealthy New Yorkers and Bostonians who preferred their own lavish cottages to hotels, and a construction boom

in the 1880s produced a spate of opulent mansions. *WGD,* s.v. "Newport"; Cheek and Gannon 1982, introduction; Van Slyck 2011.

4. A small demonstration plant (making use of storage batteries for peak hours) was running in Newport by January 1888 and overhead wires were in place by August, when a local newspaper complained about their appearance along fashionable Bellevue Ave. Plans were made a year later to triple the plant's capacity. Organization of the Edison Illuminating Co. of Newport seems to have proceeded slowly from its initial steps in January 1888 to incorporation in early 1889, when its officers included some of the most prominent names in Newport, such as Cornelius Vanderbilt, Louis Lorillard of the famous family of tobacco producers, and T. Mumford Seabury, a banker and former state senator. "A New Departure," *Newport Mercury,* 7 Jan. 1888, 1; ibid., 11 Aug. 1888, 4; G. Wright 1887, 202; State of Rhode Island 1888, 291–92; "Special Correspondence," *Electrical World* 14 (3 Aug. 1889): 77; John Henderson to TAE, 22 Nov. 1889; DF (*TAED* D8943AAQ); "Items of Interest from Various Locations," *American Gas Light Journal* 50 (4 Mar. 1889): 277; *Representative Men* 1908, 167–68.

5. Some of Newport's summer cottages were beginning to incorporate electric lighting; among them were the William G. Weld mansion (built on Bellevue Ave. c. 1882–1884), which had both gas and Edison lighting, and Ochre Court, designed for Ogden Goelet, a director of the Edison Illuminating Co. of Newport (Yarnall 2005, 126, 134–36). Because of the high economic hurdles to providing central station service (especially on the Edison low-voltage model) to "widely scattered" customers, owners of country homes in general often opted for isolated electric plants or, increasingly, on-site plants that generated illuminating gas from gasoline or naptha. One such gas system, the so-called Springfield machine, seems to have been disproportionately popular in Rhode Island, though only one is known to have been installed in Newport by this time (Linebaugh 2011, chap. 1, App. A; regarding low-voltage distribution, see e.g. Doc. 3002 [headnote]).

6. Jonathan H. Vail (1852–1926), having been closely involved with plans for Edison central stations and dynamo construction, became general superintendent of the Edison Electric Light Co. in 1887. Doc. 2973 n. 3.

7. Vail's letter was marked as answered on 21 May, but the editors have found neither the reply nor any further correspondence about this device.

–3190–

Telegrams: From/To George Gouraud

May 14, 1888[a]
London

Edison Orange

Important know Hamilton certain sailing if possible

[Orange]

Hamilton could sail any time but holding him for latest

& important improvements.[1] had public exhibit here great success[2] will cable you soon when he can go[3]

E[dison]

L and ALS (telegrams), NjWOE, DF (*TAED* D8850ABN, D8850ABO). First message written by Alfred Tate. [a]Date from document; form altered.

1. The editors have not identified changes Edison may have been making to the phonograph right at this time, possibly in connection with the exhibition discussed below. He would execute a patent application inside of two weeks for an improved diaphragm and reproducer (U.S. Pat. 488,190; cf. Doc. 3186). In the meantime, Hugh de Coursey Hamilton was enlisted to assist George Parsons Lathrop with a private phonograph demonstration for Mary Hemenway in Massachusetts planned for early June (Lathrop to TAE, 27 May 1888; Lathrop to Alfred Tate, 28 May 1888; both DF [*TAED* D8847AAN, D8847AAP]).

2. Edison referred to the 12 May start of a planned week-long exhibition at the Electric Club in New York City. The improved machine shown there was turned through a friction drive by an electric motor (described as noisy in at least one press report. Gouraud to TAE, 16 May 1888, DF [*TAED* D8818AKM]). It had a key and a pedal, by either of which a typist or scribe could pause the replaying of a recording. At that opening event, Ezra Gilliland presented a paper (to which Lathrop contributed as part of a press campaign) making broad and provocative claims that both Edison's newest machine and the rival graphophone were embodied in the original phonograph patents of a decade earlier (Charles Price to TAE, 8 May 1888; Lathrop to Alfred Tate, 25 Nov. 1888; both DF [*TAED* D8812AAQ, D8848AEW]; Gilliland 1888). Referring to Edison's subsequent efforts in electric lighting, Gilliland also imaginatively claimed that Edison's work on the phonograph since then "has necessarily been slow. This work, however, was not laid aside, but has been steadily kept up till the present date." This assertion was echoed in the *North American Review* article published in Edison's name in June, which dismissed as "rumors" suggestions that he had "allowed the phonograph to go adrift" (Edison 1888, 641). Among those reportedly present (in addition to Edison) were Lathrop, John Tomlinson, General William Tecumseh Sherman, attorney Robert Ingersoll, *North American Review* editor Allen Thorndike Rice, novelist William Dean Howells, and conductor Theodore Thomas. Gilliland's paper elicited a forceful and detailed rebuttal from Charles Sumner Tainter, principal inventor of one of the "infringing instruments" to which it alluded. Tainter's graphophone was on exhibition during the summer at the New York City office of the American Graphophone Co. ("The Talking Machine," *Nashville Daily American,* 14 May, 2; Tainter 1888).

3. Edison wrote his reply on the same piece of paper as Gouraud's cable; a letterpress version is in Lbk. 26:257 (*TAED* LB026257). Gouraud had cabled on 11 May: "What can be the delay! Three weeks ago you cabled 'Hamilton will sail in few days' I can only account for it on the ground that you have seen your aim towards some great ~~improvement~~ improvement or Economy in manufacture." The unmet promises of

Hamilton's imminent departure with phonographs and equipment for phonogram manufacture had left Gouraud to face an impatient corps of reporters, among other difficulties. In the absence of definitive news about Hamilton, Gouraud was beginning to plan a trip to New York to see the latest machines and discuss the new Edison Phonograph Works. Gouraud to TAE, 23 Feb., 7 Mar., 28 Apr., 11 May, all DF (*TAED* D8850AAR, D8850AAY, D8850ABI, D8850ABL).

–3191–

From Ezra Gilliland

NEW YORK. May 15th, 1888.[a]

My dear Edison:—

As the Phonograph is of no use without the wax cylinders can't we patent the cylinder in Canada and allow the agents to manufacture, and thereby comply with the patent laws and give full protection to our entire trade by so doing?[1]

Cockerill[2] sends me the enclosed letter,[3] which he took from the waste basket, to give us an idea of the thousand or more crank letters which they have received since the phonograph article was published.[4] He has asked me to come up and see him in regard to furnishing them with Phonographs.

I want to mention to you one fact which I may forget later on; without detracting anything from Lathrop's[5] efforts in working up the press, Price of the Electrical Review[6] did a great deal of good work by personally visiting a great many newspaper people and doing what he could to whoop the thing up.

Notwithstanding the bad weather, the Phonograph at the Club[7] is attracting crowds.[8]

I sent over one agent today and others will be coming along very soon and I will have your school room in full blast very soon.[9] Yours truly,

E. T. Gilliland

TLS, NjWOE, DF (*TAED* D8848ABI). Letterhead of Edison Phonograph Co. [a]"NEW YORK." preprinted.

1. "Canadian patent business is a perfect farce," Edison replied. Claiming that the Edison Electric Light Co. had lost $40,000 in manufacturing there, he concluded that "The cost of manufacturing in that country is greater than the cost of machines here with the duty added. I think the best thing we can do is sell American made instruments in that country and pay the necessary duties on entry." Gilliland evidently had been planing to establish a sales agency in Canada, although Edison did not receive new phonograph patents there until October. TAE to Gilliland, 6 June 1888; Alfred Tate to Gilliland, 2 Apr. 1888; Tate to

William Dean, 2 Apr. 1888; all DF (*TAED* D8818AMC; D8818AHT, D8818AHS); *Canadian Patent Office Record* 16 (1888): 497–98.

2. John Albert Cockerill (1845–1896), an experienced newspaper reporter, editor, and occasional publisher, became managing editor of the *New York World* in 1883. Originally from Ohio, he first rose to the position of managing editor by the end of 1870 at the *Cincinnati Enquirer.* He was briefly a part-owner of the *Washington Post* as well as managing editor at the *Baltimore Gazette* before Joseph Pulitzer recruited him for the *St. Louis Post-Dispatch*. Although Cockerill's St. Louis tenure ended abruptly in 1883 after an incident of gun-related violence, Pulitzer brought him to the *New York World,* where he remained until 1891. When Cockerill became president of the New York Press Club in 1888, Edison purchased an eight-dollar ticket to a Delmonico's banquet in his honor and gave it to George Parsons Lathrop. *ANB,* s.v. "Cockerill, John Albert"; New York Press Club to TAE (with TAE marginalia), n.d. [Jan. 1888]; Lathrop to TAE, 24 Jan. 1888; both DF (*TAED* D8812AAH, D8812AAG).

3. Not found.

4. The *New York Evening World* published on 12 May a long and laudatory article signed by George Parsons Lathrop. It was based on a phonograph demonstration and Edison interview that probably occurred during a reception for the press at the laboratory the previous day, which the rival *New York Sun* also covered at length. The two illustrations in Lathrop's article later appeared in the printed version of Gilliland's phonograph presentation to the New York Electric Club on 12 May (to which Lathrop contributed). "Thomas A. Edison's Latest," *New York Evening World,* 12 May 1888, [3]; "Will Keep Music on Tap," *New York Sun,* 12 May 1888, 2; "The New Edison Laboratory," *Electrical World* 11 (19 May 1888): 259; Gilliland 1888; Lathrop to Alfred Tate, 25 Nov. 1888, DF (*TAED* D8848AEW).

5. Journalist, novelist, and poet George Parsons Lathrop (1851–1898), who had produced a flattering 1885 interview of Edison (Doc. 2811; see esp. n. 11) and the recent *World* article (see note 4), was an enthusiastic proponent of the phonograph (cf. Doc. 3165 n. 1; Cupples and Hurd to TAE, 16 May 1886; Lathrop to TAE, 27 May 1888; both DF [*TAED* D8847AAE, D8847AAN]). Lathrop had entertained hopes of receiving stock shares of the Edison Phonograph Co. and would shortly begin angling instead for an interest in the prospective Amusement Co. (Lathrop to TAE, 24 Jan. 1888, DF [*TAED* D8812AAG]; see Doc. 3217). Lathrop had also owned a small stock interest in the International Railway Telegraph Co., which was controlled by Edison and Gilliland (International Railway Telegraph Co., certificate of proceedings, 7 Apr. 1887, NNNCC-AR [*TAED* X119F2C]).

6. Journalist and editor Charles Wilson Price (1857–1934) began as a printer's apprentice at the *Barnesville Enterprise* in his native Ohio, and he was among the founding staff of the *Topeka Daily Capital* in 1879. He moved to New York in 1885 as associate editor of the *Electrical Review,* a pioneering weekly trade journal founded by George Worthington in 1882, and became acquainted with Edison and Samuel Insull. Price would eventually succeed Worthington as editor and become the journal's largest shareholder ("In Defense of Insull," *NYT,* 8 May 1934, 22; "C. W. Price, Editor, Falls Dead Here," *NYT,*

12 May 1934, 16; "Obituary. George Worthington," *Electrical Engineer* 13 [10 Feb. 1892]: 146; Doc. 3069 n. 1). An organizer of the New York Electric Club, he served as secretary and corresponded with Edison on club business, such as Edison's $500 contribution to its mortgage fund in December 1887. He was currently working on an illustrated article about Edison's laboratory for the *Electrical Review* (Tate to Price, 31 Dec. 1887, Lbk. 25:109 [*TAED* LB025109]; Price to TAE, 16 Apr. 1888; Price to Tate, 28 May and 1 June 1888; all DF [*TAED* D8807AAY, D8807ABB, D8807ABD]; *TAED* s.v., "Price, Charles Wilson"; "A Monument to Electricity," *Electrical Review* 12 [7 July 1888]: 1–3, 6–7).

7. When the New York Electric Club was founded in May or June 1886, Edison was elected a vice president. George Worthington and Charles Price of the *Electrical Review* were among the organizers, and the club initially shared space with the journal's editorial offices. In addition to lectures and demonstrations, the club offered social events to members. Worthington to Samuel Insull, 21 May and 28 July 1886; Charles Price to TAE, 5 June 1886; all DF (*TAED* D8611E, D8633R2, D8611H); "No 18 in Theirs," *New York Sun,* 11 June 1886, [1].

8. The phonograph exhibit at the Electric Club was planned to continue for about a week after the 12 May demonstration. Gilliland 1888.

9. The editors have not identified the prospective agent. Gilliland concurred with Edison's plan to create a "school room" for training agents. Writing in April, he urged Edison to ready such a facility for a large number of trainees. Each agent would "have an employee; a practical man, who will be educated thoroughly in the handling of the machine, but acting on your suggestion, which I think an excellent one, we will endeavor to have every person having anything to do with it, thoroughly instructed in the management of the machine." In early May, Edison personally offered to a young machinist and aspiring electrical engineer "a place as Expert on phonograph ie to Learn all about phonogh & then take a position in some city wages while Learning $12. afterward $15. & higher if you paddle your canoe properly." About the same time, he assured a longtime benefactor that "We are bringing men in here all the time, instructing them and sending them out as experts in connection with the phonograph." The editors have found no evidence that such was the case, and nearly a month passed before Gilliland solicited recruits for "a limited class of young men who will be trained as phonograph inspectors under Mr. Edison's personal supervision. From six weeks to two months will probably be required to gain the necessary proficiency." TAE marginalia on Charles White to TAE, 6 May 1888; TAE to Grosvenor Lowrey, 8 May 1888; Gilliland to TAE, 23 Apr. and 5 June 1888; all DF (*TAED* D8814ABX, D8815ABE, D8848ABC, D8848ABW).

–3192–

Alfred Tate to Edgar Stillman Kelley[1]

[Orange,] May 22, 88.

Dear Sir:—

Replying to your letter without date,[2] Mr. Edison desires me to say that he will be very pleased to have you come over any time and test the Phonograph.[3] We have a "Weber Grand"[4a] here in the Laboratory and it is at your service. Yours truly,

A. O. T[ate]. Prvt Secy

TLS (carbon copy), NjWOE, DF (*TAED* D8818AKV). [a]Quotation marks added by hand.

1. Edgar Stillman Kelley (1857–1944), a native of Sparta, Wisc., was a composer, conductor, and teacher. He studied piano first with his mother and F. W. Merriam and later with Napoleon Ledochowski and Clarence Eddy in Chicago, continuing his education in Germany at the Stuttgart Conservatory from 1876 to 1880. His first major success after returning to the United States came with the Chicago Symphony's performance of his *Macbeth* overture in 1883. Kelley was based in New York City from 1886 to 1892, where he taught theory and piano and also worked as a conductor, composer, and arranger. In his correspondence with Edison, he used New York's Chickering Hall as his return address. *GMO,* s.v. "Kelley, Edgar Stillman"; *ANB,* s.v. "Kelley, Edgar Stillman."

2. Kelley reflected that during his sojourn in Germany, he had become "deeply interested in your phonograph, when it first appeared, and witnessed a number of experiments with it." Having just read George Parson Lathrop's *New York World* article on the latest phonograph, he believed it would become "an aid to the members of the musical profession." Kelley noted that "Many machines have been invented to reproduce in visible form the tones produced upon the piano forte—among them the pianograph but none have been practically successful," the object of such a device being "to preserve musical improvisations." Kelley to TAE, n.d. [12 May 1888], DF (*TAED* D8847AAR).

3. Kelley planned to visit Orange on 29 May, though it is unclear whether he did so; he also hoped to come, perhaps for a second time, during June. He had definitely seen the phonograph by early July, when he sent Edison an article he wrote for *American Musician* about the device and its possible use by musicians. "Its a very nice article," Edison commented, instructing Alfred Tate to "Read it & thank him" (Kelley to Tate, 27 May 1888; Kelley and William Sherwood to TAE, 1 June 1888; Kelley to TAE, 3 July [with TAE marginalia]; all DF [*TAED* D8847AAM, D8805ADG, D8807ABI]). According to a newspaper account, Kelley came with a number of musicians, including noted cellist Adolph Hartdegen, vocalist Annie Hartdegen, and pianist William Sherwood (who may have brought along one of his students). They reportedly tested the phonograph's ability to capture and reproduce with fidelity "harmonies, modulations, melodic figures, and sequence, or perhaps some interlocking passages which the composer might otherwise strive in vain to recall." Kelley declared himself satisfied with the results ("No More Lost Chords," *Oakland Daily Evening Tribune,* 18 July 1888, 4; Kelley to Tate, 27 May 1888, DF [*TAED* D8847AAM]).

Kelley would continue to think about the uses of the phonograph in musical composition and education. In an extended article published in 1911, he noted that it allowed composers to preserve their improvisations so they would not "lose some of their happiest inspirations through inability to record with sufficient rapidity the ideas as they occur to them," an ability that turned out to be essential for the development of jazz in the twentieth century. The instrument also allowed a composer to test variations by playing the piano against the background of one or more recorded parts. Kelley explained that as an educational tool, it allowed teachers to produce model recordings for students to repeat and imitate. It also permitted the recording and preservation of the music of indigenous peoples from around the world. Moreover, Kelley believed the phonograph allowed "multitudes" who would not otherwise have a chance to attend live performances to experience music, which would open new audiences for symphonic music. Kelley 1911, 283–84; *OCJ,* s.v. "Recorded Jazz."

4. Instruments produced by the Weber Piano Co. of New York, founded about 1851 by Albert Weber (and run by his sons since his death in 1879), were noted for their high level of craftsmanship. *DAB,* s.v. "Weber, Albert."

–3193–

From Allen Thorndike Rice

New York. May 23, '88[a]

My dear Mr. Edison,

Would it be possible to induce you and Mrs. Edison to give me the pleasure of your company at dinner, at my house—85 Fifth Avenue—on Monday, May 28th, at half past seven? I am asking Mr. & Mrs. Depew,[1] Gl. Sherman,[2] Mr. & Mrs. W. K. Vanderbilt[3] and one or two other friends. If you and your wife could join in it would give me sincere pleasure.

Trusting to find you disengaged, I am, Very truly yours,

A T Rice[4b]

Mr. Vanderbilt is very anxious to hear the phonograph, and it occurs to me that you might possibly be willing to lend me one of yours for Monday evening—if mine should not be ready by that time.

Certainly the Exhibition at the Electric Club was a marvelous success, and we all thank you for it.[5]

<Friend Rice— My wife has an engagement & cannot come[6] but I will accept your kind invitation & will arrange to have a phonograph there— Yours Edison>

ALS, NjWOE, DF (*TAED* D8805ADA). Letterhead of *North American Review.* [a]"*New York.*" preprinted. [b]Followed by "over" as page turn.

1. Chauncey Mitchell Depew (1834–1928), a Yale graduate, attor-

ney, and former New York State office holder, was president of the New York Central Railroad. He served the Vanderbilt family's railroad interests in various legal and executive capacities from 1875 and was a U.S. Senator from 1898 to 1911. Mrs. Depew was the former Elise Ann Hegeman (1848–1893), the daughter of New York druggist William Hegeman. The couple married in 1871. *ANB,* s.v. "Depew, Chauncey Mitchell"; Eardeley 1918, 196; "Mrs. Chauncey M. Depew Dead," *NYT,* 8 May 1893, 1.

2. William Tecumseh Sherman (1820–1891), known for his Atlanta campaign in the Civil War, had succeeded Ulysses Grant in charge of Union forces in the western theater in 1864. He rose to the rank of general in 1869, when he was named to replace Grant as commander of the U.S. Army. Retired since 1884, Sherman moved in 1886 to New York, where he lived the remainder of his life. *ANB,* s.v. "Sherman, William Tecumseh"; *DAB,* s.v. "Sherman, William Tecumseh."

3. William Kissam Vanderbilt (1849–1920) assumed increasing responsibilities in the Vanderbilt family railroad empire after the deaths of his grandfather, Commodore Cornelius Vanderbilt (1877), and his father, William H. Vanderbilt (1885), from whom he also inherited about $65 million. By this time, he was assisting his older brother Cornelius, chairman of the board of the New York Central, whom he succeeded upon the latter's death in 1899. Mrs. Vanderbilt was the former Alva Erskin Smith (1853–1933), daughter of a Mobile, Ala., cotton planter and merchant, and the granddaughter of U.S. Representative Robert Desha. The couple married in 1875; she divorced him in 1895. The Vanderbilts' New York home at 660 Fifth Ave., designed by Richard Morris Hunt, was considered an architectural masterpiece. They were also building "Marble House," a resplendent summer cottage in Newport, R.I., at a cost of $2 million. Alva Vanderbilt, in particular, was recognized as a cofounder of the Metropolitan Opera House. *ANB,* s.v. "Vanderbilt, William Kissam"; U.S. Census Bureau, 1967? (1860), roll M653_17, p. 343, image 343 (Mobile Ward 3, Mobile, Ala.); Armstrong 1993, 2:323.

4. Charles Allen Thorndike Rice (1851–1889), publisher and editor of the *North American Review,* was known generally by his middle and last names. A native of Massachusetts, Rice earned bachelor's and master's degrees at Oxford. He returned to the United States and became a journalist and bought the *North American Review* in 1876. The *Review* was started in Boston in 1815 as a largely literary bimonthly and had been through several iterations over the years. Rice moved its offices to New York in 1878, made it monthly the next year, and in general wholly transformed its content. Under his direction, the *Review* plunged into contemporary and controversial topics, though it remained politically neutral. The *Review* enjoyed wide esteem at this time and was nearing the peak of its circulation. Rice had printed a series of William Sherman's letters under the title "Sherman's Opinion of Grant" in the *Review,* and he had been a guest of the Vanderbilts at a large costume ball at their New York mansion in 1883. *ANB,* s.v. "Rice, Charles Allen Thorndike"; Rice 1886, 200–208; Mott 1966 [1938] 2:221, 249–55; "All Society in Costume," *NYT,* 27 Mar. 1883, 1.

Rice had been interested in the phonograph since 1878, when the *North American Review* printed an article attributed to Edison but ghostwritten by Edward Johnson, "The Phonograph and Its Future" (Edison and Johnson 1878; see Doc. 1283 n. 1). In June 1888, the *Review* published over Edison's byline "The Perfected Phonograph" (Edison 1888) about the new wax-cylinder phonograph and Edison's slightly updated predictions about its future use.

5. Sherman and Rice had attended Ezra Gilliland's 12 May demonstration at the New York Electric Club, the start of a planned week-long exhibition. See Doc. 3190 esp. n. 1; Gilliland 1888; "The Phonograph at the Electric Club," *Electrical Review,* 12 (19 May 1888): 1–3.

6. Mina Edison was in an advanced state of pregnancy and gave birth to her first child, Madeleine, on 31 May. Edison-Miller family *Holy Bible,* Cat. 104945, NjWOE (Glenmont).

–3194–

From Samuel Insull

New York, N.Y. May 24, 1888.[a]

My Dear Edison:—

Whenever I come to New York, I hear a great deal of talk about the new dynamo you are working on for us.[1] A week or two ago, I even heard a man state on your authority, that the dynamo would be sold for $40%[b] less than the present type of machine used by us, when we get to making it regularly. This morning, I was asked down town, when we would be able to deliver some of these machines.

I write this letter to point out to you that we have a great deal of money tied up in our present form of machine: that the whole of our present stock would have to be worked off, before it would be possible to place the new machine on the market, as otherwise we should lose from 200 to 250 thousand dollars, being the floating stock that we have on hand all the time.

I think your work on the new dynamo should be kept as quiet as possible. In addition to the stock which we have to get rid of, it should be remembered that to start making a machine so radically different from our present form of dynamo, would involve the expenditure of a great deal of money in patterns, special tools, jigs, etc. In fact it would be an absolutely[c] radical change in our dynamo department.

In view of such a fact, I think that anything new that you may have, we should be very careful to keep to ourselves until we are ready to place it on the market.

I have wanted to get out to see you on this matter, but have only been able to remain away from Schenectady a day at a time. I am going home to-night. Yours very sincerely,

Saml Insull

I may go to Orange Sunday[2] so as to discuss this whole matter with you. If it is at all possibly I will do so.[c]

TLS, NjWOE, DF (*TAED* D8835ACY). Letterhead of Edison Machine Works, Samuel Insull treasurer and general manager. [a]"*New York, N.Y.*" preprinted. [b]"$" canceled and "%" written by hand. [c]"ly" written by hand. [d]Postscript written by Insull.

1. Insull likely referred to a multipolar dynamo, a class of machine whose induction coils encountered more than one magnetic field in a single rotation. The editors know little of Edison's development of such a machine. He had filed a patent application (Case 716) for one, probably at the start of 1887, but no patent resulted and the application has been lost (Dyer & Seely to TAE, 14 Oct. 1889, DF [*TAED* D8954ADG]). By February 1888, Charles Batchelor was building a large armature for one at the Orange laboratory, using parts fabricated by the Edison Machine Works (John Kruesi to Batchelor, 17 Feb. 1888; Batchelor to Edison Machine Works, 21 Feb. 1888; both DF [*TAED* D8835ABH, D8818AEN]). He tested it (with Robert Lozier) in May and early June, in the process sketching its ring-type armature. Arthur Kennelly also participated and recorded the diameter of the armature (33 inches) and other specifications. After those initial trials, Batchelor outlined changes to the design (N-87-12-00; N-87-12-26; all Lab. [*TAED* NB006AAC, NB006AAE, NB006AAF, NB006AAG, NB006AAH, NB006AAI, NB006AAJ, NB011AAE, NB011AAF]; details of Batchelor's and Lozier's tests are in N-88-05-31, Lab. [*TAED* NB043AAL]; Kennelly's notes are in N-88-04-18:79–88 and N-88-06-06:1–19; all Lab. [*TAED* NB035079, NB035082, NB035088, NB044001, NB044004, NB044019]). In August, the Machine Works made a five-ton casting for a multipolar machine, probably the one that was then tested in early December at Orange. John Vail of the Edison Electric Light Co. saw it there and hoped that Edison would hasten its development (Orange Laboratory to William Gilmore, 6 Aug. 1888; Edison Machine Works to Orange Laboratory, 6 Aug. 1888; both DF [*TAED* D8835ADW, D8835ADX]; Arthur Kennelly Notebook 1:46, Lab. [*TAED* NM023046]; Cat. 1337:60 [item 560, 5 Dec. 1888], Batchelor [*TAED* MBJ004060A]; Vail to Edward Johnson, 3 Dec. 1888, Vail [*TAED* ME014]). Various designers had developed a number of multipolar dynamos in recent years, none of which seems to have offered a clear advantage or taken a commanding position in the market. In general, multipolar dynamos offered relatively low-speed operation (Edison's December prototype was tested at about 820 revolutions) and compact construction; the U.S. Navy installed Edison multipolar machines on several vessels by June 1889 (Thompson 1893, 1:27–18; Field 1890, 268; Veeder 1889, 247–49, 271–73).

2. 27 May.

–3195–

From Samuel Clemens

Hartford, Conn. May 25/88.[a]

Dear Sir:

I had only part of a day at my disposal, but I shall try again, soon, & shall hope to find you on deck & still open to invasion.[1] However, I accomplished part of my mission, anyway: I spent an hour & a half with the phonograph in Dey street,[2] with vast satisfaction.

I had had[b] the hope that if I could see you I might possibly get my hands on a couple of phonographs <u>immediately</u>, instead of having to wait my turn. Then all summer long I could use one of them in Elmira, N.Y.,[3] & express the wax cylinders to my helper in Hartford to be put into the phonograph here there[b] & the contents transferred to paper by type-writer.

That is still my project [-----][c] & I meant to go down yesterday to try again; but finding I couldn't, I wrote Mr. Gilliland & asked him to try & let me have a phonograph now. I can load it up while I wait for the second one, as we don't leave for Elmira till the middle of June.[4]

My case is pretty urgent & if you can give it a puissant push I shall be unspeakably obliged to you. Truly Yours,

S. L. Clemens[5]

<Did you answer him E[dison]>

ALS, NjWOE, DF (*TAED* D8805ADA1). [a]"Hartford, Conn." preprinted. [b]Interlined above. [c]Canceled.

1. Clemens wired Edison from New York's Murray Hill Hotel on 21 May: "Can you appoint an hour for tomorrow when I may run over & see the phonograph." This telegram was delivered to Edison's New York office at 40 Wall St. and did not reach him at Orange for three days. By the time Edison replied, "Will be glad to see you this afternoon or any time to-morrow convenient to yourself. I'm here all the time," Clemens had already left for Connecticut. Clemens had made several notes to himself since the latter part of 1887 to try to see Edison. Clemens to TAE, 21 May 1888; TAE to Clemens, 24 May 1888; both DF (*TAED* D8847AAH, D8847AAI); Twain 1979b, 347, 374, 386, 390.

Clemens did finally visit the Orange laboratory in company with the Canadian writer George Iles sometime in June 1888 (TAE deposition, p. 2 of attachment, 25 Sept. 1888, Misc. Legal [*TAED* HX88028]). In 1927, Edison recalled that

> He told a number of funny stories, some of which I recorded on the phonograph records. Unfortunately, these records were lost in the big fire which we had at this plant in 1914.
>
> When Mr. Twain and Mr. Iles were ready to go back to New York a rain storm came up, and as they opened the door a gust of rain blew in on them both. Said Twain to Iles, "I guess we are caged for awhile." Iles, noticing a carriage at the door, belonging to a visitor, suggested "Let us take this carriage." "No," said Mark, "It is not

ours." Iles replied "That don't matter, let's take it anyway." Twain, in his drawling way said, "Business man's idea! business man's idea!" [TAE to Cyril Clemens, 10 Jan. 1927, MMC (*TAED* X042DG)]

2. The Edison Phonograph Co. had its office at 19 Dey St., New York.

3. Clemens and his family spent most summers during the 1870s and 1880s at the Quarry Farm in Elmira; this was the home of Theodore and Susan Langdon Crane, the adopted sister of Clemens's wife, Olivia, herself an Elmira native. The Cranes built an octagonal study for Clemens near the main house, and it was there that he had written portions of several novels (including *The Adventures of Tom Sawyer, Adventures of Huckleberry Finn,* and *The Prince and the Pauper*). At Elmira in July 1888, Clemens would resume writing *A Connecticut Yankee in King Arthur's Court,* on which he had been working intermittently since 1886. *REMT,* s.v. "Elmira, New York"; H. Smith 1979, 5–10.

4. Edison did not answer this letter until 5 June, when he replied that he was "at present conducting a series of experiments in connection with Phonograph cylinders for mailing purposes. Just as soon as these are completed I will see that you are supplied with a couple of Phonographs." On 24 May, Clemens had addressed a letter (not found) to the Edison Phonograph Co., in reply to which Ezra Gilliland wrote that no machines were ready because of "Changes in the form of the phonograph." He, too, promised that Clemens would have one of the first to be manufactured, likely within a few weeks. "Our efforts to deliver it promptly," Gilliland continued, "will not be diminished by the knowledge of the fact that one of 'Mark Twain's' books is dependent upon it" (TAE to Clemens, 5 June 1888, DF [*TAED* D8818ALX]; Gilliland to Clemens, 6 June 1888, MTP [*TAED* X045C]). Despite visiting Edison at Orange before the end of June, Clemens did not receive the promised machines on which his English publisher, Andrew Chatto, still expected him to dictate some of *A Connecticut Yankee*. "I hope you will soon tell the story of Smith of Camelot to Edisons phonograph & let us have it," Chatto wrote on 27 July. But three days later, Clemens canceled his order (Chatto to Clemens, 27 July 1888; Clemens to North American Phonograph Co., 30 July 1888; both MTP). About that time, Edison was telling inquirers that he could not furnish phonographs until September, when the new factory would presumably be open (TAE to Clement Studebaker, 30 July 1888; TAE to Edwin Fox, 30 July 1888; both DF [*TAED* D8818AQC, D8818AQD]).

Clemens had entertained broader ideas about the phonograph than his immediate purpose of dictating a manuscript in progress. He had considered writing an article about it, and his brief outline of a prospective book about the future included a chapter in which the phonograph had supplanted books and newspapers. Clemens was also heavily invested in the invention of a new typesetting machine and may have envisioned using the phonograph to reduce composition costs still further (Twain 1979b, 298, 346–47). He did deploy the phonograph in *A Connecticut Yankee,* where it appears among the American material and political innovations introduced to Arthurian England (Twain 1979a, 443–44).

Clemens finally managed to get a phonograph in 1891. He enlisted his friend, the novelist and critic William Dean Howells, to visit the New England Phonograph Co. (a subsidiary of the North American Phonograph Co.) in Boston to see if the machine was suitable for dictating literary works. Howells reported favorably, and Clemens rented one for dictating *The American Claimant,* the novel on which he was then working. He wanted to record 75,000 words, which he estimated would require 175 cylinders. His right arm, he explained to Howells, "is nearly disabled by rheumatism, but I am bound to write this book (and sell 100,000 copies of it—no, I mean a million—next fall). I feel sure I can dictate the book into a phonograph if I don't have to yell." He did not, however, like using it. "I filled four dozen cylinders in two sittings," he told Howells in April, "then found I could have said about as much with the pen and said it a deal better. Then I resigned." Though he considered it adequate for correspondence, he claimed that "you can't write literature with it, because it hasn't any ideas and it hasn't the gift for elaboration, or smartness of talk, or vigor of action, or felicity of expression, but is just matter-of-fact, compressive, unornamental, and as grave and unsmiling as the devil." Even so, according to his official biographer, Twain continued to use the machine for *The American Claimant* (Twain to Howells, 28 Feb. and 4 Apr. 1891, both in Twain 1917, 2:543–44; Paine 1912, 3:919). He also used the phonograph in an extended passage of the novel, in which Col. Mulberry Sellers, a mad-cap scientist and the American claimant to a British earldom, has devised such a machine for maritime service: "You store up profanity in it for use at sea.… Five years from now *all* the swearing will be done by machinery" (Twain 1899, 146–49).

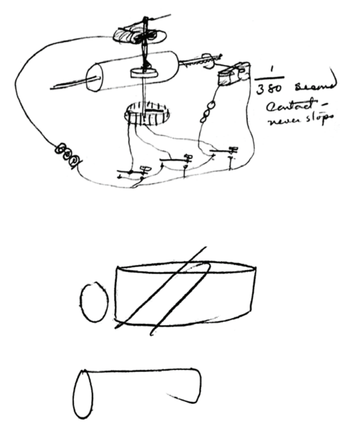
5. Samuel Langhorne Clemens (1835–1910), the American author and humorist known as Mark Twain. *ANB,* s.v. "Twain, Mark."

–3196– [Orange,] May 25 1888

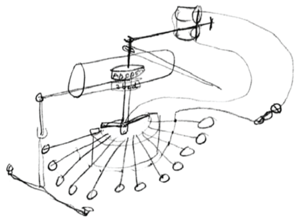
Notebook Entry: Typewriter

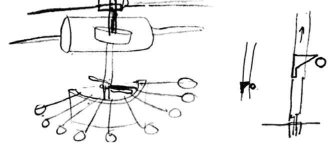
Principles of Typewriters[1]

[A][2a]

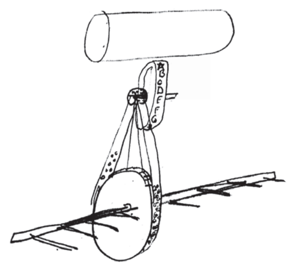


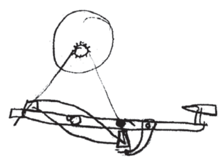
Fundamental principles Typewriters[a]



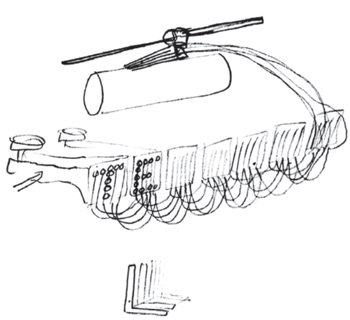


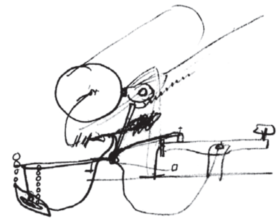
Fundamental   Typewriters



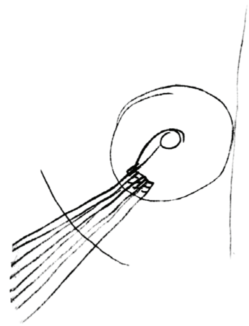


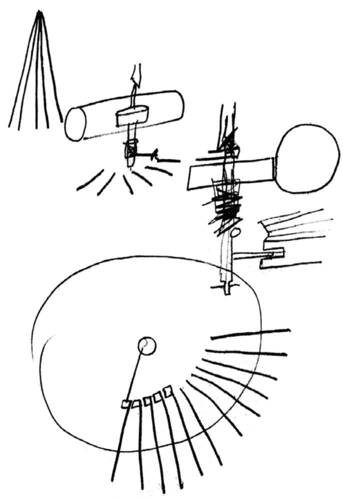
Fundamental— Typewriters[3]



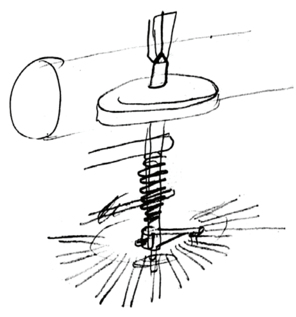


good

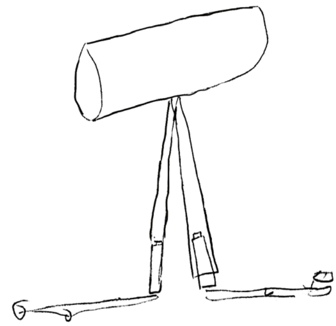




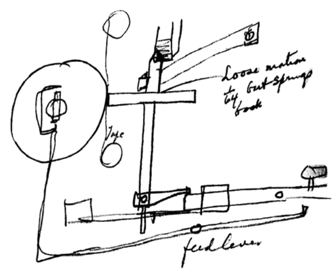
60/500/ 8 in sec

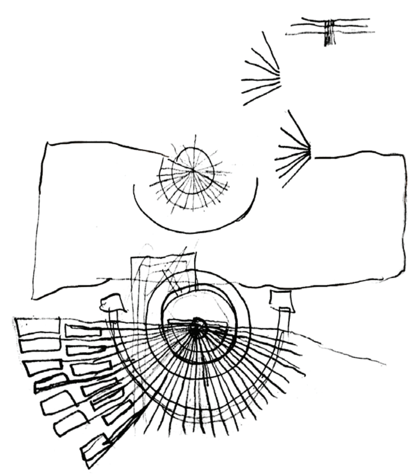


Drive types up by momentum[4]



Fundamental Typewriter[5]





X, NjWOE, Lab., N-88-01-03.1 (*TAED* NA020AAD). Document multiply signed and dated. [a]Drawing followed by dividing mark.

1. At this time Edison was experimenting on typewriters for the A. B. Dick Co. for the purpose of creating stencils for the Edison mimeograph (see Doc. 3185). Edison and his friend James McKenzie had designed a typewriter for this purpose (and filed for a patent) in 1878, based on a design that he had included in his 1875 foreign patent applications for the electric pen, and Edison briefly returned to the subject of stencil typewriters in 1885 (see Doc. 2788). Previously, he had designed typewriters for use by the Automatic Telegraph Company in 1870–71; he attempted in the following year to convert his private-line Universal printer into an electric typewriter similar to the designs shown in the first four sketches below. Bills to A. B. Dick Co., 1 and 23 May 1888; Dick to TAE, 26 May 1888; all DF (*TAED* D8855AAQ2, D8855AAQ3, D8803AAL); U.S. Pat. 295,990; Docs. 1629 n. 3, 132–33, 234–35.

2. Figure label is "1⁄380 second contact—never stops."

3. The first sketch below is similar to 1872 typewriter designs based on Edison's roman-letter chemical-recording automatic telegraph. See Docs. 236 and 256.

4. This design and the one following may be related to Edison's typewriter patent application of 1878 (see note 1).

5. Figure labels below are "Loose motion 1⁄64 but springs back," "[tape?]," and "feed lever."

–3197–

To Ezra Gilliland

[Orange,] May 28, 88.

My Dear Gilliland:—

Your several letters have been received.

With reference to yours 24th inst., you can go ahead and get out your descriptive pamphlet; there is practically no change in design, so your cuts will do; the prices quoted in your letter are O.K.[1]

The changes and improvements which have been made in the Phonograph will add nothing to the cost, but rather cheapen it I think.

Your action in regard to cabinets &c. meets with my approval.[2]

Referring to yours 26th inst., in relation to exhibiting Phonograph in Boston,[3] I have promised Lathrop to show it privately[4] to Mrs. Hemingway[5] and the Forbes family.[6] You could arrange to exhibit it before the American Institute of Technology[7] the week after. I don't think I would bother with the Club;[8] the Institute exhibit will answer the same purpose and be more tony. Yours truly,

T.A.E. M[aguire]

TL (carbon copy), NjWOE, DF (*TAED* D8818ALJ). Initialed for Edison by Thomas Maguire.

1. This paragraph and the two following are based on comments that Edison wrote on two letters that Gilliland sent on 24 May, asking if the prices and illustrations he was putting into a descriptive pamphlet (see Doc. 3165) would still be accurate in light of "changes and improvements that are being made in the Phonograph." Gilliland's price quotations were $85 for the basic machine, $100 with nickel plating, and $135 in a cabinet. Gilliland to TAE (with TAE marginalia), both 24 May 1888, DF (*TAED* D8848ABQ, D8848ABQ1).

2. In one of his 24 May letters, Gilliland suggested designing a cabinet similar to those already available for typewriters. He envisioned "something like a small desk" with a battery compartment, drawers for storing wax cylinders, and a top to cover the phonograph. He thought it should be wide enough to accommodate a typewriter and sell for about $30, and he had arranged with his brother, James Gilliland, to make a model. He asked if his action "meets with your approval, or do you prefer attending to these matters yourself?" Edison wrote simply "OK." DF (*TAED* D8848ABQ).

3. This paragraph closely follows Edison's draft reply on a 26 May letter in which Gilliland sought approval of plans to exhibit the phonograph in Boston, first at the Massachusetts Institute of Technology and then at the Boston Electric Club. Gilliland to TAE, 26 May 1888, both DF (*TAED* D8848ABT).

4. George Parsons Lathrop was planning to demonstrate a phonograph at Mary Hemenway's country estate in Readville, Mass. Gilliland had recently suggested that "Lathrop's friends" could attend one of the Boston demonstrations rather than be given a special exhibition to induce their purchase of Edison Phonograph Co. stock. Lathrop to TAE, 27 May 1888; Gilliland to TAE, 25 May 1888; both DF (*TAED* D8847AAN, D8848ABR).

5. Heiress and philanthropist Mary Porter Tileston Hemenway (1820–1894) was born and raised in New York City, the daughter of a prosperous shipping merchant. She moved to Boston following her marriage in 1840 to Edward Augustus Holyoke Hemenway, an influential merchant in early trade between the United States and Chile, who died in 1876. Mary Hemenway's interest in the phonograph was presumably cultivated in connection with her philanthropic sponsorship of the Hemenway Southwestern Archaeological Expedition (1886–1894) and its ethnographic work with Hopi and Zuñi tribes. By the end of May 1888, she purchased 150 stock shares of the Edison Phonograph Co. for $148 per share or $22,200, a sum about which there would later be some confusion. *NAW,* s.v. "Hemenway, Mary Porter Tileston"; *ANB,* s.v. "Hemenway, Mary;" Eustis 1955, xi–xiii and passim; Feaster 2001, 3–4, 7 nn. 15–22; cf. Doc. 3372.

6. The Forbes family and its elaborate kinship network had essentially defined the Bostonian upper class and its influence on American capitalism since the eighteenth century and, as Gilliland put it, had "absorbed the whole Bell Telephone Co." The editors have not identified which individuals were interested in the phonograph at this time, but some family members were expected to attend the phonograph demonstration with Mary Hemenway. Farrell 1993, 154–55; Gilliland to TAE, 25 May 1888; Lathrop to TAE, 27 May 1888; both DF (*TAED* D8848ABR, D8847AAN).

7. Although Gilliland referred to the "American Institute of Technology," the exhibit was actually planned for the Massachusetts Institute of Technology, which had occupied buildings along and near Boston's busy Boylston St. since opening in 1865. MIT professor Charles Cross was to deliver the accompanying lecture, but the event was canceled when arrangements were not finalized before the school closed for summer. Massachusetts Institute of Technology 1895, 5, 14–16; Gilliland to TAE, 26 May and 20 June 1888, both DF (*TAED* D8848ABT, D8848ACH).

8. Established in 1887, the Boston Electric Club kept rooms at 66 Boylston St., a short distance from MIT. Among its organizers was longtime Edison associate William Hammer, who had since resigned as one of its vice presidents. "Anniversary of the Boston Electric Club," *Electrical Review* 12 (30 June 1888): 5; "Correspondence. Boston," *Elec. and Elec. Eng.* 6 (Nov. 1887): 450.

–3198–

To Bergmann & Co.

Orange, N.J., May 29, 88.[a]

PHONOGRAPH DICTATION.[b]

Dear Sirs:—

In reference to your letter of the 24th inst., returning bills for material and labor in connection with experiments on Indicator and Voltmeter, I would say that I was getting these up not for the Lamp Company, but for Bergmann & Co.[1] The instrument is perfection itself, and its cost is about one-half that of the Howell Indicator,[2] in addition to which it standardizes itself, depending upon gravity. I had no idea that you could object to my doing this, but if you do not wish the experiments continued in your interest, I am sure the Lamp Company will be very glad to avail themselves of it.[3] Yours very truly,

<Tate— Save this letter Dont send[c] There is very little use doing anything for Bergmann— in the last 8 yrs I have spent thousands of dollars of my own money to devise things which others got the benefit of without paying. When[d] I desire to get simple Experimental money back there Is a now hereafter I shall act the big hog myself and eat all of my own swill— Notify Bergmann that we will discontinue the weekly receipt of funds from him[e] & will make an accounting. Edison>[4]

TL, NjWOE, DF (*TAED* D8802AAY). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" preprinted. [b]"PHONOGRAPH DICTATION." stamped on document. [c]"Dont send" interlined above. [d]Obscured overwritten text. [e]"from him" interlined above.

1. Alfred Tate prepared this reply based on Edison's draft and instruction to "Let me see your letter." Edison wrote his draft on a letter from Philip Klein, secretary of Bergmann & Co., who declined to pay Edison's bill for experimental labor and materials on a recording pressure (voltage) indicator ($604.26) and a voltmeter ($15.29). Klein argued that it should be paid by the Edison Lamp Co., which manufactured and sold the instruments, and not charged against the advances made by his firm for Edison's experimental costs (Klein to TAE, 24 May 1888; TAE bill to Bergmann & Co., 23 May 1888; both DF [*TAED* D8802AAW, D8802AAX]; see Doc. 3145 esp. n. 1). Laboratory time sheets indicate that experimenters A. E. Cousens and Franz Schulze-Berge worked nearly full-time on a pressure indicator from about the middle of February through March, with Schulze-Berge also working sporadically on a voltmeter during that period (employee time sheets for weeks ending 16 Feb. to 5 Apr. 1888, Time Sheets, WOL).

2. John Howell of the Edison Lamp Co. developed a voltage indicator in 1886 that was significantly more accurate and reliable (and less expensive) than instruments used in Edison central stations and isolated plants at the time. It quickly became the standard for Edison installations and remained so for years. Howell's indicator, like others of the time, gave instantaneous readings but did not record them. Doc. 2538 (headnote).

3. Edison was probably not fully informed about a simmering dispute over the right to manufacture voltage indicators (and at what price). In March, Francis Upton justified the Edison Lamp Co.'s claim against that of Bergmann & Co. on the grounds of his firm's investment in perfecting the instrument and expertise in manufacturing it. He urged Edison not to intervene, to which Edison promised: "I will take no sides." But when Bergmann's refusal to reimburse experimental costs rippled into July, Edward Johnson, president of the Edison Electric Light Co., apprised Edison that "You may not be aware that I took the Indicator business out of Bergmanns Hands & put it in the Lamp Co. [and] that Bergmann has never forgiven this arbitrary act and is sore over it." Johnson promised not only to "rub out all the sore spots" but to "put right the general experimental Matter." Upton to TAE (with TAE marginalia), 19 Mar. 1888; Johnson to TAE, 10 July 1888; both DF (*TAED* D8833AAW, D8805AEI).

4. The editors have not found such a notice. Reimbursements from Bergmann & Co. appear to have ceased after April, though the state of Edison's account records makes it difficult to draw firm conclusions about the resolution of this dispute. Cf. Doc. 3145 esp. n. 1.

–3199–

To Richard Dyer

[Orange,] May 31 1888

Dyer—

I forget if I spoke in former phono patent in connection with friction driving of belt driving— If not This is a feature I want to Cover—[1] by the way why dont you send me out a good patent ofs draughtsman and let him stay here in my draftg room for few days—[2] I have a lot of things Latest new phono complete, Device for recording Music—Toy phono—Nickle Amusement machine,[3] new transformer[4]—Improvements in getting rid Focault Currents in Dynamos—Impvts in phonograms, Clockwork phonograph, Hand turning phonograph, Type writer & a Lot of things. I will shew him how to draw them he can do it with[a] pencil just as they are to be & afterwards finish in Regular way here or in NY—You using the pencil outlines for specifications—[5]

AL, NjWOE, DF (*TAED* D8846AAY). [a]Obscured overwritten text.

1. Edison probably had in mind an application filed in November 1887 and still pending at the Patent Office that became his U.S. Patent 386,974. It included a distinctive form of electric motor and its friction gearing to the phonograph shaft. Edison included a belt drive, among many details of the phonograph's construction, in a long and complex application filed on 30 July 1888. The resulting patent was issued (with twenty-nine claims) in June 1893. U.S. Pat. 499,879; see Doc. 3209 (headnote).

2. In the absence of a reply from Dyer or his firm, the editors cannot ascertain that Edison sent this letter. The patent applications that Edison is known to have completed during the summer do not represent the full range of ideas listed in this document (see App. 5).

3. This device presumably would be operated by dropping a coin in a slot, and Edison likely was thinking of it in connection with the proposed Amusement Phonograph Co. (cf. Doc. 3217). Ezra Gilliland later took credit for originally suggesting that a coin-operated device be placed on the phonograph, and he later discouraged a similar unsolicited suggestion (cf. Doc. 3165 n. 2). The notion of automatic coin-operated machinery was not new, but its feasibility had only been proven in 1883 in Britain with the success of a patented vending apparatus for picture postcards. The idea—and number of patents—quickly snowballed and the list of coin-operated equipment used in Britain and the U.S. grew to include telephones, beverage dispensers, gas meters, electric lights, cameras, and coin-release opera glasses, among others. At Christmastime in 1888, *Puck* playfully suggested a list of coin-operated automatic toys such as "Drop a Nickel in the Slot and Get Water Squirted at You" and "Drop a Dime in the Slot and Get Tripped Up." Early in 1889, the *Electrical Review* of New York printed a tongue-in-cheek notice that "Rumor has it that ere long one of the chief classes in the Patent Office will be 'Put-a-nickel-in-the-slot' improvements." Some of those new patents were already being assigned to entities like the Automatic Selling Machine Co. and the American

Automatic Vending Machine Manufacturing Co. Costa 2013, 9–18; Welch and Burt 1994, 32; Harlan Ballard to Alfred Tate, 12 July 1888, DF (*TAED* D8822AAZ); "Holiday Gifts!! Holiday Gifts!!," *Puck* 24 (5 Dec. 1888): 256; *Electrical Review* 13 (9 Feb. 1889): 4; see, e.g., U.S. Pats. 374,345; 412,469.

4. Possibly the device described in Docs. 3142 n. 17 and 3189 n. 2.

5. Dyer & Seely's draftsmen often prepared patent drawings from Edison's sketches, but it would not have been far out of the ordinary for them to work from physical models. Laboratory time sheets for May seem to indicate that Edison's machinists, experimenters, and draftsmen spent more of their time on the phonograph than any other single project, but there was also significant effort (especially by machinists) on the transformer, toy phonograph, and hand-powered phonograph. The records do not reveal time devoted specifically to anything identifiable as a coin-operated device. Time Sheets, WOL.

SALE OF EDISON'S U.S. PHONOGRAPH RIGHTS Docs. 3200, 3208, and 3215

In May and June, Edison's friend Ezra Gilliland and his attorney John Tomlinson negotiated the sale of Edison's phonograph patent rights to Jesse H. Lippincott, a Pittsburgh businessman and industrialist who also lived and worked in New York. The deal would take the North American sales and marketing (though not the manufacture) of Edison's phonograph—his "baby"—out of his hands and entrust them to a new entity created by Lippincott, with whom he had no history. The circumstances surrounding it, as well as Edison's motives and even the extent of his personal involvement, are murky, clouded by a dearth of contemporary evidence and the eruption of a bitter dispute months later.

Edison's experience and inclination led him to focus on making phonographs rather than selling them, and he had reserved manufacturing rights to himself when forming the Edison Phonograph Company in October 1887. His hopes for getting the small factory at Bloomfield, New Jersey, running fully in early 1888 had been disappointed, however, and by springtime, outside events were overtaking his plans.[1] In March, the American Graphophone Company, which controlled the rival machine specially adapted for office dictation, made a distribution and sales contract with Lippincott, agreeing to produce up to 5,000 machines annually for him to sell.[2] Both Edison and Gilliland, who had charge of the Bloomfield factory, seemed to be aware of this arrangement—and Lippincott's role in it—by the end of the month.[3] At about that time, Gilliland and Franck Maguire, an associate in Washington, D.C., with some inside knowledge of the graphophone, began sketching plans for an agency business to market the phonograph in assigned territories in the United States.[4] In that context, Edison was finalizing plans by the end of April for a new company, the Edison Phonograph Works, to manufacture his instrument in a new factory on a grand scale. The plant came with a similarly grand price tag, $135,000 for the building, equipment, and initial expenses.[5] Some of the requisite money would come from the sale of stock in the new manufacturing firm, though at least one potential large subscriber did not take up the opportunity.[6] And in the meantime, Edison was still working in fits and starts to create a machine suitable for a mass market, finally producing the "perfected" phonograph in mid-June.[7]

It was amid this ferment in the recorded sound business that Jesse Lippincott may have made an overture to Gilliland to gain control of the U.S. and Canadian markets for Edison's phonograph. The story of their negotiations can be reconstructed only with some gaps and contradictions.[8] According to one version (an affidavit drafted in September 1888), by late April or early May Lippincott "knew Mr. Gilliland" and approached him on the strength of his (Gilliland's) position as the exclusive sales agent of the Edison Phonograph Company. Lippincott's sworn deposition in November told a somewhat different story about meeting Gilliland in May: "I was not acquainted with Mr. Gilliland prior to my first interview with him on this subject, but I got Mr. [Harry] Thayer, [an engineer] of the Western Electric Company to introduce me to him. After introducing me he left us together." In any case, Lippincott and Gilliland talked the matter over several times before 1 June, when they sat down for the first time (at Gilliland's New York office) with Tomlinson, who owned a stake in Gilliland's agency contract with the Edison Phonograph Company. Tomlinson wrote out the proposed terms of sale with the understanding that he would submit them to Edison in a day or two. (Lippincott's copy of that memorandum is Doc. 3200.) On 3 June, Tomlinson telegraphed Lippincott, who was by then in Pittsburgh, that "my parties"—presumably Edison and Gilliland—would accept the offer. The next day, he sent Lippincott a copy of Gilliland's agency contract, which Lippincott also proposed to buy out.[9]

For his part, Edison claimed that he was busy with other matters and reluctant to sell in any case, so he initially relied entirely on Gilliland and Tomlinson to negotiate for him. Such a hands-off strategy for a large transaction (especially for the phonograph) seems improbable; the available evidence is too slender either to confirm or disprove that version of events, though Edison clearly knew by 6 June that a deal was in the offing, if not necessarily Lippincott's involvement in it.[10] His chronologies of key events, reconstructed in three statements for later litigation, are uncertain. In September, Sherburne Eaton, who replaced Tomlinson as Edison's personal lawyer, drafted a statement (with dates left blank) in which the inventor declared that in early May, Tomlinson had brought up the name of "one Jesse H. Lippincott, a stranger to me," as the representative of "a syndicate…formed with a large amount of capital behind it, to buy up all phonograph patents for the United States and Canada." In a separate undated affidavit, Edison described a meeting at which Tomlinson and Gilliland strenuously urged him to accept the terms offered by the as-yet unrevealed suitor (whom he thought might have been Theodore Vail of the Bell Telephone Company). That meeting, he stated, "was the first time I heard that Lippincott was the party they were dealing with. I asked about his connection with the Graphophone and what he proposed to do with it."[11] The date of this meeting was left blank but Edison indicated that it coincided with a laboratory visit by author Mark Twain, who came sometime in mid-June.[12] According to another undated Edison affidavit, Tomlinson disclosed Lippincott's name sometime between late May and 12 June. Lippincott referred in Doc. 3215 to having personally discussed with Edison terms of the sale about 12 June or a few days thereafter.

Edison responded to some—but not all—of the terms proposed in Doc. 3200, which leaves open the question of whether he had seen that version of the offer, something he would later emphatically deny. He wrote out his own memorandum (Doc. 3208) before meeting Lippincott on or about 12 June. After Lippincott made another set of modifications (Doc. 3215) and Edison his own further changes, they discussed the matter throughout the night of 27–28 June before signing an agreement on 28 June. Edison promised to convey all but 150 stock shares in the Edison Phonograph Company for $500,000, effectively giving Lippincott control of the phonograph in the United States and Canada.[13] The contract generally adhered to terms of the progressive revisions in these documents but made no mention of Gilliland's agency contract with the Edison Phonograph Company. To make his position unassailable, Lippincott also secured the right to purchase that agreement for 2,500 shares in the new company he was to form.[14] He organized the North American Phonograph Company in July and transferred to it his sales rights for both the phonograph and graphophone; those rights were then to be licensed to "sub-companies" that would operate commercially in particular geographic regions.[15]

The cash portion of Lippincott's deal with Gilliland, worth $250,000 and spelled out in the eighth paragraph of Doc. 3200, would have severe consequences.[16] Edison later claimed the terms were misrepresented to him; when he recognized the details at the end of the summer, he was enraged (see Docs. 3247, 3255, and 3258).[17] Believing he had been willfully deceived about the total cash Lippincott would put up for the phonograph, he broke with Gilliland and Tomlinson and ended up suing them. The falling out made newspaper headlines and deprived Edison of Gilliland's able assistance with the machine's refinement and manufacture, as well as his friendship.[18] That friendship, once so warm, may have been strained since the end of 1887, when Gilliland, himself an accomplished inventor and manufacturer, critiqued the prototype that Edison had declared ready for the market.[19] Lippincott, having precipitated the ugly breach more or less unwittingly, doggedly kept trying to fulfill the phonograph's commercial promise while meeting his obligations to all parties, and the strain was blamed for his subsequent broken health and early death.[20]

1. See Docs. 3102 n. 5 and 3123.

2. The company had contracted for a small number of machines to be made by Western Electric but had, as yet, no means of producing large quantities itself. See Docs. 3215 esp. n. 4 and 3267; American Graphophone Co. agreement with Lippincott, 26 Mar. 1888, Misc. Legal (*TAED* HX88018A).

3. Gilliland's offhanded reference about Lippincott in late March suggests that both he and Edison knew the man's identity and about his deal for the graphophone. Gilliland to TAE, 31 Mar. 1888, DF (*TAED* D8848AAV).

4. Maguire described himself as a former close friend of inventor Charles Sumner Tainter, whom he reported was unhappy with his treatment by the American Graphophone Co. Maguire to Gilliland, 28 and 29 Mar. 1888, both DF (*TAED* D8848AAS, D8848AAU).

5. Edison hired architect Joseph Taft, who had built the Orange laboratory complex, to design the new factory. According to a summation

at the start of 1889, the land, building, tools and equipment, and initial materials ended up costing roughly $240,000. TAE to Gouraud, 26 Apr. 1888, Lbk. 26:248 (*TAED* LB026248); TAE to Taft, 3 May 1888, DF (*TAED* D8818AJV); Edison Phonograph Works statement, 1 Jan. 1889, DF (*TAED* D8957AAA).

6. Besides Edison, the largest investor in the Phonograph Works was Robert Livingston Cutting, Jr., a longtime participant in Edison's electric lighting, ore milling, and other enterprises. Edison also solicited Eugene Crowell, former president of the Edison Electric Light Co., and tried to interest officers of the Germania Bank in some fashion (Edison Phonograph Works minute book, 5 May 1888, pp. 3–4, CR [*TAED* CK101]; Edison Phonograph Works list of stockholders, 14 Jan. 1890; TAE to Crowell, 27 Apr. 1888; Alfred Tate to Samuel Insull, 4 June 1888; Lbk. 36:47, 26:250, 265 [*TAED* LB036047, LB026250, LB026265]; Tate to Germania Bank, 20 June 1888, DF [*TAED* D8818ANF]). A small Edison coterie was apparently soliciting investors (including the pioneering ethnologist Mary Hemenway) at about the same time for shares in the patent-holding Edison Phonograph Co., though it is not clear whether cash raised that way could be put into the new factory. Gilliland was skeptical of this effort in any event, believing that Edison greatly underestimated the company's potential profits and the value of its stock (Gilliland to TAE, 25 and 26 May 1888; TAE to Gilliland, 28 May 1888; all DF [*TAED* D8848ABR, D8848ABT, D8818ALJ]; see also Doc. 3258 n. 4).

7. See Doc. 3209 (headnote).

8. Cf. Wile 1991, 24–28.

9. Lippincott affidavits, 21 Sept. and 28 Nov. 1888 (pp. 1–5), 1888; Tomlinson to Lippincott, 3 and 4 June 1888; all Misc. Legal (*TAED* HX88027, HX88035, HX88035B, HX88035C).

10. Tomlinson to TAE, 6 June 1888, DF (*TAED* D8848ABY).

11. TAE draft affidavit (para. 3), 25 Sept. 1888 and attached undated statement (pp. 1–3), Misc. Legal (*TAED* HX88028); TAE draft affidavit (pp. 4–8), n.d. [1889?], Miller (*TAED* HM89ACG).

12. Edison later recollected that Lippincott's visit concident with Mark Twain was his second trip to the laboratory and occurred on 21 June. However, journalist George Parsons Lathrop, who made two visits to the laboratory in June, later fixed the likely date of this meeting as 13 June. TAE draft affidavit (p. 7), n.d. [1889?], Miller (*TAED* HM89ACG); Lathrop to Alfred Tate, 25 Nov. 1888, DF (*TAED* D8848AEW).

13. Lippincott was to make a series of cash payments between July and November 1888 (to be divided among Edison and minority shareholders of the Edison Phonograph Co.); in the meantime, Edison's stock certificates would be held in trust by the Garfield Safe Deposit Co. Edison objected at the last minute to the requirement in Doc. 3200 that he buy back stock of the old Edison Speaking Phonograph Co., and that item was dropped in exchange for Edison giving up his royalty (see Docs. 3215 n. 6 and 3261). In addition, he was to repurchase 150 shares in the Edison Phonograph Co. owned by Mary Hemenway of Boston. TAE draft affidavit (pp. 6–12), n.d. [1889?], Miller (*TAED* HM89ACG); cf. Doc. 3372.

14. These agreements were but two in a series of contracts over the ensuing weeks to transfer and align rights among the interested

parties, which also included the Edison Phonograph Co., the Edison Phonograph Works, and (after its formation on 14 July) the North American Phonograph Co. Lippincott's purchase of Gilliland's agency contract was consummated on 17 July (regarding the date of the agreement between those two parties, see Doc. 3258 n. 4). TAE agreement with Lippincott, 28 June 1888, *New York Phonograph Co. v. National Phonograph Co.,* pp. 854–59, Lit. (*TAED* QP0100854); Lippincott agreements with Gilliland, 27 and 28 June and 17 July 1888, all Misc. Legal (*TAED* HX88035F, HX88035G, HX88023D).

15. See Wile 2004 regarding the company's formation. North American Phonograph Co. incorporation papers, 14 July 1888, CR (*TAED* CK201001); Lippincott agreement with North American Phonograph Co., 17 July 1888, *New York Phonograph Co. v. National Phonograph Co.,* pp. 1051–53, Lit. (*TAED* QP0101051). The Wisconsin Phonograph Co., the Metropolitan Phonograph Co. [New York], and the New England Phonograph Co., were among the first "sub-companies" organized, and they were licensed by October 1888. More than thirty such firms were on the books by mid-1890. The North American company was said to have about the same relation to its regional licensees as the American Bell Telephone Co. had with its affiliates (TAE agreement with Lippincott, Edison Phonograph Co., Edison Phonograph Works, and North American Phonograph Co., 12 Oct. 1888, FFmEFW [*TAED* X104A051]; Doc. 3351 n. 10; Martin 1890, 112; see also Welch and Burt 1994, 29–30).

16. The stock buy-back arrangement was the subject of a separate contract between Lippincott and Gilliland on 28 June 1888. Misc. Legal (*TAED* HX88035G); see Doc. 3258 n. 4.

17. Alfred Tate, Edison's secretary, recalled decades later that Lippincott, troubled by his arrangement with Gilliland, had called him to his office at the end of the summer to disclose it, and that he (Tate) broke the information to Edison. Tate recalled those events happening in quick succession within a few days of Gilliland's departure to Europe in early August, but his memory does not fit the sequence of events detailed in the available documents. Tate 1938, 172–74.

18. Spates of articles about the matter appeared in January and again in May 1889, after Edison filed suit. Most presumed that Edison had been "swindled" or "robbed," although at least two included Gilliland's denials of wrongdoing. More than a hundred clippings were gathered into a laboratory scrapbook labeled "Frauds, Ingrates &c. &c." Cat. 1160, Scraps. (*TAED* SB019); on Gilliland's claims, see particularly "Serious Charge," *Cincinnati Enquirer,* 19 Jan. 1889; and "What the Defendants Say," *NYT,* 13 May 1889; both Cat. 1160:11a, 26b, Scraps. (*TAED* SB019011a, SB019026b).

19. Doc. 3123 n. 3.

20. Lippincott suffered a sudden paralyzing illness in October 1890 and retired to Massachusetts, where he died a few years later at age fifty-two. "Jesse H. Lippincott Dead," *Pittsburgh Post-Gazette,* 20 Apr. 1894, 4; Obituary, *NYT,* 20 Apr. 1894, 2.

–3200– [New York,] June 1st 1888.

John Tomlinson Memorandum: Sale of Phonograph Rights[1]

1. Buy all stock of Edison Phonograph co. & Edison Speaking Co.[2] for $500,000.

2. Edison to reserve 133,000 to buy out Speaking Phono Co.

3 Edison to have manufacturing at cost & 20%

4. Instrument to be called Phonograph or Edison Phonograph & best instrument to be put on the market.

5. Edison to be paid royalty of 5% on price to Company for 15 years & to assign new inventions to Co. for 15 years.

6. New Company to be formed which shall buy up all it considers of value. The company to be called U.S. Phonograph Company.[3] Its capital stock to be not less than $3,000,000. nor more than $5,000,000.

7. Persons to be connected with Co., Lippincott,[4] Robinson,[5] Whitney[6] &c.

8. Gill contract[7] to be bought for $250,000. worth of stock of new Company, value of stock to be based on price at which sales are made to original promoters. $50,000. of 250,000 to be paid in cash & Co. to agree to buy balance 4 mo from completion of agreement at $200,000. cash. All present and future patents of Gilliland to go in.

9. Definite answer within 15 days. Affair to be consummated before Aug. 1st. 88.

TD (copy), NjWOE, Misc. Legal (*TAED* HX88035A).

1. See headnote above. This copy of the document was made by Jesse Lippincott from Tomlinson's original and attached to his affidavit and Edison's own statement. Lippincott affidavit (p. 4), 28 Nov. 1888, Misc. Legal (*TAED* HX88035); TAE draft affidavit (pp. 12–13), n.d. [1889?], Miller (*TAED* HM89ACG).

2. When the Edison Speaking Phonograph Co. was incorporated in 1878 in the glow of Edison's initial success with the phonograph, it held the American manufacturing and marketing rights for the machine (exclusive of toys, dolls, and clocks). Though now moribund, the firm's legal status and rights had been points of contention among principal stockholders since Edison decided in late 1887 to circumvent the company by forming a new one. Edison claimed to own the great majority of its stock (10,350 shares) with minority ownership scattered among thirteen individuals (1,650 shares), but the company's records appear to show Uriah Painter holding a majority. See Docs. 3102, esp. nn. 4–5, and 3120; Edison statement (p. 6), 25 Sept. 1888, Misc. Legal (*TAED* HX88028); Edison Speaking Phonograph Co. minutes, 25 July 1888, UHP (*TAED* X154A7DK); cf. Doc. 3215.

3. See Doc. 3208.

4. Jesse H. Lippincott (1842–1894) was a businessman, manufacturer, and investor with a wide range of holdings. After serving the Union in

the Civil War, he started in business as a grocer in Pittsburgh, near his birthplace in Westmoreland County, Pa. He founded the Banner Baking Powder Co. (later merged into Nabisco) and, in 1872, was an organizer and officer of the Rochester Tumbler Co. of Rochester, Pa., down the Ohio River from Pittsburgh. By 1888, that firm had become one of the leading glass manufacturers in the United States and Lippincott its president. An original stockholder in Pittsburgh's Bell Telephone Co., Lippincott by now had interests in banking, mineral water, coal, and gas, and he was in the process of incorporating the American Electric Motor Co. in New Jersey. Though still closely associated with Pittsburgh and western Pennsylvania (he belonged to the South Fork Fishing & Hunting Club, owner of the large South Fork dam whose failure in May 1889 would devastate Johnstown, Pa.), Lippincott had also lived and worked, at least part time, in New York City since 1885. "Jesse H. Lippincott Dead," *Pittsburgh Post-Gazette,* 20 Apr. 1894, 4; Obituary, ibid., 20 Apr. 1894, 2; "Held for Conspiracy," *NYT,* 29 Aug. 1888, 2; "With A Phonograph," *Pittsburgh Dispatch,* 24 Mar. 1889, 2; "Banner Baking Powder is There," *Pittsburgh Daily Post,* 21 Sept. 1889, 10; Bausman 1904, 2:740–41; "New Corporations," *Electrical Review* 12 (23 June 1888): 3; see also Landmarks Design Associates and Wallace, Roberts & Todd 1993, 411, 445.

5. John Robinson, of New York City, became an incorporator and the founding treasurer of the firm comtemplated in this document, the North American Phonograph Co. North American Phonograph Co. incorporation certificate (p. 3), 16 July 1888, CR (*TAED* CK201001); Trow 1889, 201.

6. George I. Whitney (1847–1917) was a prominent Pittsburgh banker and broker with a variety of other business interests, including coal and a local cable railroad. He had also been one of the organizers of the city's Bell Telephone Co. Williamson et al. 1898, 1:493–95; Obituary, *Phi Gamma Delta* 40 (5 Mar. 1918): 453–54.

7. Under an October 1887 agreement with the Edison Phonograph Co., Ezra Gilliland was the company's exclusive sales agent. Doc. 3123 n. 1.

–3201–

Notebook Entry: Phonograph

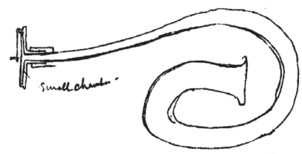
[Orange,] June 1 1888

Ideas for articulation experiments on phonograph Sheet pin'd to this June 1 1888[1]

Instead Bolting Cloth use thick silk=[2] Ditto 006 glass—003 if can get it— see if shellac films can be made that is 002 or 001 thick that would answer for receiver—[a]

Perhaps the Condensation wave is diferent from the rarefaction wave—hence put some weights on end of record lever vary amounts & notice articulation[3a]

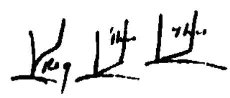
There is no doubt but a very small angle long tube is the best— Have John[4] Draw the lines on long one I think Speaking ~~fun~~ tube should be thus[5]



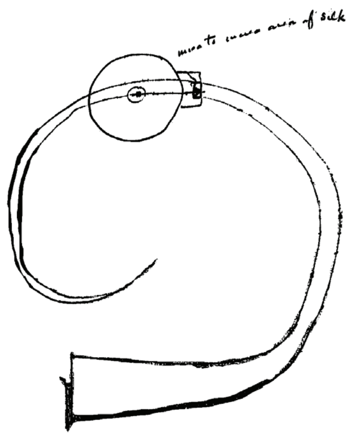
End of tube swell out so end is sufficient dia for mouth piece   guess 3 @ 3½ ft long[6] best.

Possibly great deal noise is recorded by waves striking on recording side of diaphragm   This could be covered with 1/16 inch brass with hole through for knife— perhaps the ~~kni~~ the lever should be connected to diapm through very fine hole .010 by wire & thus dampen the Waves of great amplitude—[a]

perhaps the abnormal big amplitude fundamentals could be damped by this shape of the knife—[7]



[A][8]



also this size

In new machine shorten rubber to 1/16 & if too stiff diminish size from 3/64 to 1/32 or thereabouts. use longer needle as this is more Elastic. Bohemian hard glass[9] needle would be better as its 3 times lighter and far more elastic. Dont forget saphire pointed Recorder also Osmium Iridium—

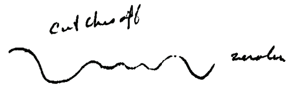
It seems to me that the internal chamber of the Receiver & Tube is wrong   it should be just the opposite of the recorder

Sharpen recorder Knife & buff to flat edge also sharpen to very fine edge and rub over glass with Rouge on—

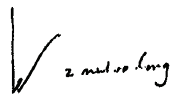
Try phosphor Bronze[10] Knife—Ditto Spegileissen[11]—Hard speculum metal ditto platinum Iridium 10 pct—ditto agate ditto Bohemian glass buffed—

[B][12]

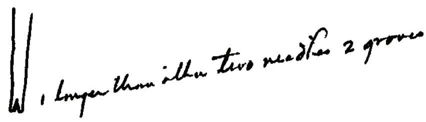
[C][13]



2 not so long[14b]

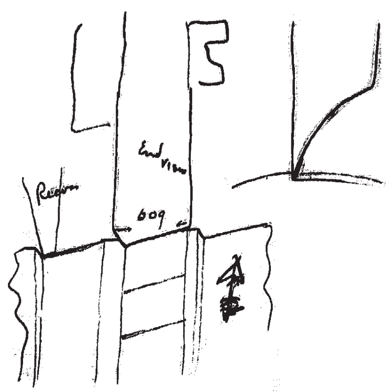


1 longer than other   two needles 2 grooves[15b]



This is probly the best form cutting point as it brings out weak vibs & diminishes strong but its hard to manufacture

Try this[16]



This makes the sensitive vibs very deep & enormously dampens the fundamentals—use nearly all of space

Maybe the angle should be[17]

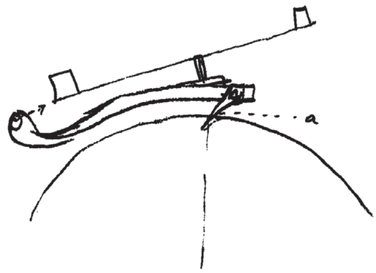
Better than this[18] would be an Aluminum Bronze[19] or brass Knife with sharp but buffed edge without razor edge teeth or[c] Saphire or Iridosmine so as to insure a perfectly smooth cut without furrows to collect wax dust by action of receiver—[a]

Claim in patent new phono—

1 Double Recorder for Copies—[20]
2 Talking tube
3rd False shell—[21]
4 Double ie[d] 2 or more shells on one cylinder for news paper work[22]
5th Belt driving
6 pivoted pulley guides—
7 oil cup covered in top motor shaft—
8 Belt tightner—
9 Simultaneous raising specticle & traveller[23] arm Spec 1st
10 Final raising of traveller on setting Spec[c] way back—
11 wax[c] guard
12 Eccentric straight edge screw-index etc
13 Removeable section of traveller Thread nut—
14 False bearing prevent cylinder coming off—
15 patent of agate Center—[24]
16 Indexd governor—pulley driven—
17 ~~Silver contact, revolvable~~
18 4 or more pole motor—details—
19— Diaphm & Knife in line with center of arm—
20— Screw with head at bottom on receiver—
21— Center wax guard over center
22— End nut for stopping or reversing
23— Magnet[c] contact for governor
24— Buffed Recorder & Repoder
25 angle of Transmitter—Shaving K[nife] angluar
26— glass recvr—Recorder bet Rubber—
27 Mailing box [r----g?]—[e] also other—
28 Double Recording—

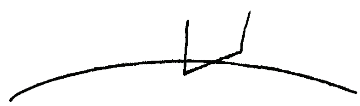
29— Extra Shellac on silk dia—
30— Round buffed recver point—
31— flexible paper cylinders—
32— Ceresine & Gum Dammar=or Beeswax only see Payne—[a]

Ivory cutting point—[25a]



Perhaps this is the true angle of Recorder as amplitude will then depend on speed of Wax up to certain point & dampen enormously the fundamentals a side hitting wax if cylinder too Slow— Besides it will make a clean cut & be easy & not make diapm fry![26]

This same thing can be done but Theoretically not so well by as the chip comes off hard & will break wax if too deeply tracked while you can track to great depth other way[b]



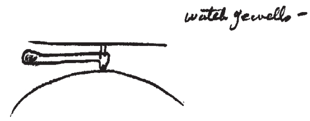
In new patent show how fine Recording point can be used and cylinder used 3 times before turning by shifting position of Recorder— no more will be turned off—[a]

New patent— ~~Repro~~Multiplying Cylinders[27]

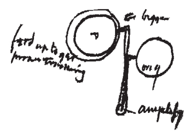
1st Vac
2nd p[lum]b[a]go
3rd Bronze powder
4— Silver salt & reducing agent.
5— between electrodes revolving.
7— Several funnels several phonoghs
8 Hydraulic pressure— S
9 Talking etc directly on tin— [C P ----?][e] case hardener—
10 from very hard wax cylinder itself & soft oleic residue or oleat.

11. Harden Record by Hydraulic as with Billiard balls celluloid—[28]

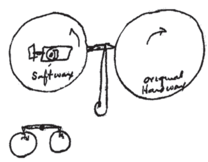
Try a wheel recorder[29b]



Little Cotton in chamber of glass Trans to dampen little.[a] [D][30]

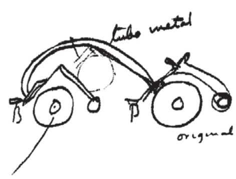


Duplicating process   slow running[31b]

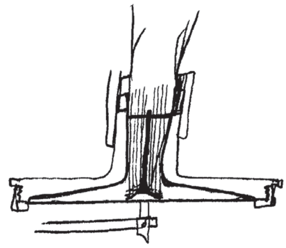


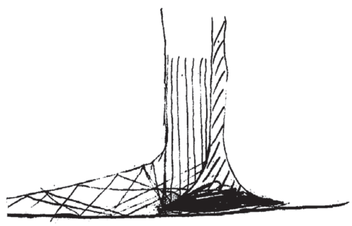
double recording to get even dampening of diaphragm[a]

Multiplying—[32]



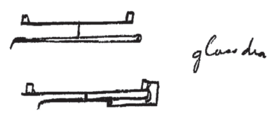
very fine Recorder point very sensitive diaphm— —Original has widest possible point, large diaphragm for recording & Receiver consistant with good Recording & Reprodcg & widest Receiving point so as not to Knock down vibration. Then try Lowering pitch so as to get better record perhaps a very slight deposit of nickel over surface might allow of duplication of many thousands by process on other page & this—



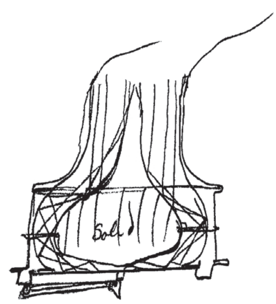


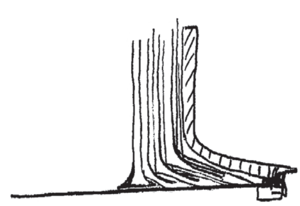
<good>

Imitate human Ear on diapm Reproducer[33] Translate Vibration great amplitude into one small amp great power[34]

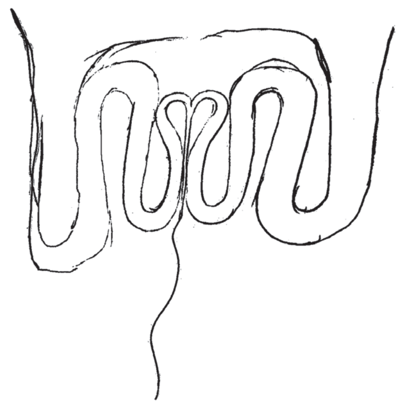


also load Receiver with a ball[35]





Condensed funnell



X, NjWOE, Lab. (*TAED* NA024AAB). Document multiply dated. [a]Followed by dividing mark. [b]Drawing followed by dividing mark. [c]Obscured overwritten text. [d]Circled. [e]Illegible.

1. There are no obvious pinholes in this notebook page indicating the attachment of a loose paper. The sheet Edison had in mind likely was the one from which he copied ideas into a notebook two days later (see Doc. 3202 n. 1).

2. Edison referred to material for the reproducer diaphragm, already the subject of a completed patent application. See Doc. 3186 n. 2.

3. Condensation (now called compression) and rarefaction indicate the phases of a sound wave in which the pressure at a specific point is highest and lowest, respectively. Both Edison's improved phonograph and the graphophone mapped sound waves onto an up-and-down tracing in a pliable medium, and Edison may have been experiencing distortion caused by the variable resistance that such a medium would offer to a cutting (or indenting) point at different depths. This was the fundamental problem of vertical recording that prompted Emile Berliner, at about this time, to register sound waves laterally onto a thin film, which became the defining characteristic of his gramophone recording machine. Tyndall 1875, 59–67; Berliner 1888, 435–36.

In mid-July, Edison signed a patent application on the general principle of improving articulation, especially of hissing consonants, by making the recorded wave line asymmetrical instead of a smooth curve. The editors have found no draft or obvious antecedent notes about that idea, but the June articulation experiments could have led Edison in the direction of such a conclusion, and he evidently made some microscopic examinations of recordings. In the patent, Edison described various mechanical means to change the angle of the recording point against the recording surface so as to create a line that would "move the reproducing-diaphragm with sufficient abruptness to reproduce the sound-waves with clearness." He found that "the recorded waves can be given the desired abruptness at one end—*i.e.,* the point of greatest depth of the recorded wave can be transferred from the center of the wave to near either end." Though written broadly, the application moved quickly through the Patent Office and issued before the end of the year as U.S. Patent 393,966.

4. John Ott.

5. Figure label is "small chamber—."

6. Edison occasionally used the "@" symbol to express a numerical range; see, e.g., Docs. 2314, 2322, and 2501.

7. Figure labels are "Reg," "This," and "This."

8. Figure label is "mica to [increase?] area of silk."

9. Bohemian glass is a lightweight, hard, crystal-like composition of the silicates of potash and lime, frequently used for chemical apparatus. Doc. 1891 n. 3; Lock 1881, 3:1067.

10. A copper-tin-phosphorous alloy formulated not long before 1873, phosphor bronze was highly regarded for making exceptionally clean castings, and it was often used in precision applications such as bearings, cogs, guns, and locks. Doc. 2892 n. 14; *KAMD,* s.v. "Phosphor Bronze."

11. Edison meant spiegeleisen, a lustrous manganese-iron compound used in making steel. *OED,* s.v. "spiegeleisen."

12. Figure label is "out."

13. Figure labels are "cut this off" and "zero line."

14. Figure labels are "1" and "2."

15. Figure labels are "1" and "2."

16. Figure labels are "Recver," "End view," and "009."

17. Figure labels are ".009" and "0045."

18. Figure label above is "scraper."

19. An alloy of five to ten percent aluminum in ninety to ninety-five percent copper, aluminum bronze was valued for its hardness, clean castings, and resistance to corrosion. Commercially available for many years by this time, it was often used in precision instruments and bearing journals. *KAMD,* s.v. "Aluminum"; *Appletons' Cyclopaedia,* s.v "Alloys. Aluminum alloys"; "Manufacture of Aluminum," *Hunt's Merchants' Magazine and Commercial Review* 42 (Mar. 1860): 377.

20. Edison executed a patent application on 14 July covering the "means for making a double record of matter to be recorded…so that one record can be preserved while the other is sent to the person for whom the matter is intended…. I connect two of my phonograph-recorders together by means of a rigid arm, so that they will be arranged side by side, and I provide a speaking-tube, which is branched at the recorders, so that it will connect with both of them" (U.S. Pat. 437,423). Charles Tainter, however, had patented in April a graphophone machine with a similar duplicating feature (U.S. Pat. 380,535). Tainter's machine was illustrated and described in the 14 July issue of *Electrical World* ("The Graphophone," *Electrical World,* 12:16–18).

21. See Docs. 3177 and 3253.

22. The June issue of the *North American Review* included an article under Edison's byline on "The Perfected Phonograph" that suggested, among many possibilities, that reporters could use the machine to dictate their stories and to create accurate records of their interviews. The article harkened to one published under Edison's name (but written for him by Edward Johnson) ten years earlier in the June 1878 *North American Review.* Edison 1888, 647, 649; see Doc. 1283.

23. The traveler (or travel-arm) linked the spectacle carrying the recording and reproducing points with the feed screw on the mandrel shaft to govern the spectacle's lateral motion along the cylinder. The

screw mechanism guided the point so that it tracked through the soft recording material without damaging the groove. Cf. Edison's U.S. Pat. 443,507; F. Wile 1926, 191.

24. Edison referred to a thrust bearing for the motor shaft; regarding this and other mechanical features listed here, see Doc. 3209 (headnote) and U.S. Patent 499,879.

25. The point is labeled "a." Edison was concerned about the proper angles of contact between the cylinder surface and the recording point (also the turning-off knife) and attributed some unwanted noise in sound reproduction to microscopic tears in the surface of the recording medium caused by improper cutting. He completed two related patent applications at the end of June and two more in mid-July intended to address this general problem. U.S. Pats. 393,465; 448,780; 393,967; 448,781; also cf. Doc. 3289.

26. Edison and his assistants had often used some variation of "frying" or "frying pan" to describe the static-like sounds of induction in a telephone receiver. He may have had in mind a similar sort of noise produced by the unwanted agitation of the phonograph diaphragm. See, e.g., Docs. 973, 1261, 1278, and 2870 n. 5.

27. The editors have not found evidence of such a patent application at this time for duplicating cylinder recordings, but Edison's notes below suggest that his ideas likely were related to the vacuum deposition process discussed in Doc. 3157 n. 2. He gave a more detailed description of using that process to duplicate recordings in the final paragraph of an exceptionally long caveat he drafted in September:

> I coat the surface of the cylinder with say silver by Electro Vacuous process then plate the outside ⅛ inch thick with Copper put the cylinder on a mandril true the outside by grinding to a taper fit this on a taper steel die then disolve wax or other material out, & then put in a blank cylinder…of ~~Recordable~~ plastic (when hot) material force in a plunger spread the same against the record & then allow the same to cool it will contract sufficient away from the record to allow of its being taken out. [Draft caveat, p. 52, Caveat 111 case file, PS (*TAED* PT031AAB1)]

Years later, a similar vacuum electro-deposition process (for gold rather than silver) became the basis for the commercial duplication of Edison recordings.

28. To manufacture celluloid, gun-cotton (nitrated vegetable fiber) was heated with camphor under great pressure. The process dissolved the fiber to create a uniform mass that would harden when cooled. Wahl 1879.

29. Figure label is "watch Jewells—."

30. Figure labels are "feed up to get proper tracking," "bigger," "orig," and "amplify."

31. Figure labels are "Soft wax" and "original Hard wax."

32. Figure labels are "tube metal" and "original."

33. It is not clear in what respects Edison sought to "imitate" the complexities of the human organ for hearing. Nor is it clear to what degree he was aware of what was, by this time, a substantial scientific tradition of abstracting the ear's function from its structure, though he

was certainly familiar with the work of Hermann von Helmholtz, one of the pioneers of that tradition. In that vein, Alexander Graham Bell and Clarence Blake had physically attached ears excised from cadavers to experimental phonautograph devices in 1874. Sterne 2003, 50–70; cf. Docs. 2788 n. 8, 2925 esp. n. 2.

34. Figure label is "glass dia[phragm]."

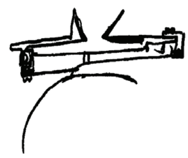
35. Figure label is "Solid."

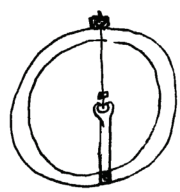
–3202–

Notebook Entry: Phonograph

[Orange,] June 3rd 1888

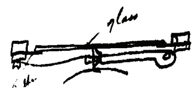
guidepoint for receiver—



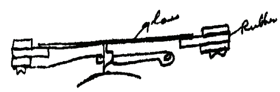


Ideas copied from mem May 20/88[1] Articulation Expts

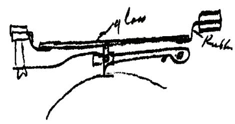
[A][2]



[B][3]

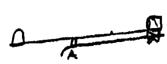


[C][4]



[D][5]

[E][6]



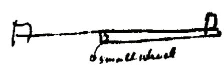
A. Bone—Steel. Tin tipped— Quartz tipped. Saphire tipped Raw hide; Rhinocerous horn Hog Bristle—Silkworm gut bamboo—bone; glass, bohemian Aluminum Bronze— wind receiver [---][a] Rubber deaden reed action Felt Recvr diapm—d[itt]o Cork, do Heavy silk shellacd for transmitter Spcl Spectacle use larger dia for trans Reg way—Specially for music

[Memo?][a] Steel 004 @ 006 dia[b]

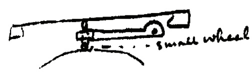
Double grooved Record use 2 Receiver points or

1⁄32 apart 2 Receiver needles one track doesnt run into other

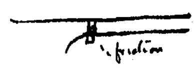
[F][7]



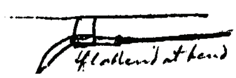
[G][8]



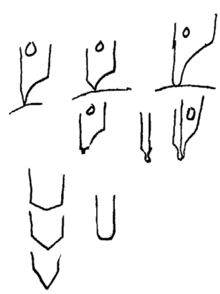
[H][9]



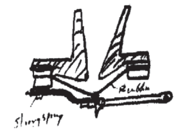
[I][10]



paper—(Rubber, Hard)—Cork diams make adjustable opening bottom speaking tube.— Try every form specially long slight angle taper speaking tubes—



Rubber streatched near limit of elasticity.[11]



[J][12]

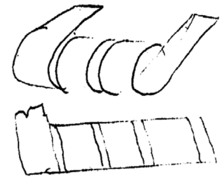
All these Expts with shim & thick rubber rings & glass.

Try Hyatts dodge of heating silk cloth between plates & pressure[13] to make Receiving diaphrams

glass tubes in Receiver to give mouth chamber imitation—try various sizes—[14]

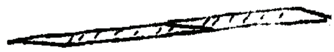
Insert in speaking tube[c] or transmitter side hole adjustable to try experiments also open fine guaze cloth stop air rush & not vibrations

flat band spiral for talker tube

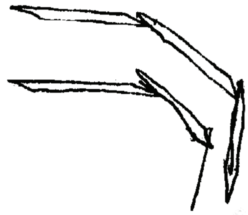


narrow thin band of metal for Listening tube

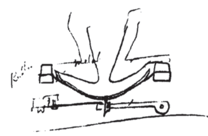
also Lap principle



Taper in opposite direction for talk & Listening[d]



Try .006 glass plate between 1⁄32 Rubber rings for Reproducer
[K][15d]



List of diaphramic materials for Transmitter & Reproducer[16]

Sheet Shellac
Hard Rubber
Sheet Sulphur
phosphide of Iron
Melted Sheet Orpiment
Melted Asphaltene poured in sheet.
Carbonized paper—Tamadine,[17] Asphaltene, parchment paper[e]
Porcelain
Hardest toughest stiffest glass .004 instead .006.
Ivory
Horn
Can Iceland Spar be got in Sheets
Hardened Steel
plated sheet nickel, Steel Iron formed by plating entirely

All the Resins poured in sheets after melting= d[itt]o gums[18]

X, NjWOE, Lab., N-88-06-01.1 (*TAED* NA024AAD). Document multiply dated. [a]Illegible. [b]Text and drawings from this line to "run into other" written in right margin and set off by vertical dividing mark.

[c]Obscured overwritten text. [d]Drawing followed by dividing mark. [e]"Carbonized paper…paper" interlined above "Porcelain."

1. The editors have not positively identified the 20 May memorandum but speculate that it may be a loose-leaf sheet of Edison's "Ideas for Articulation Experiments on phonograph." Of the dozen or so sketches there, several appear closely related to those in the present document. Edison did not date the page, but Mina did so under her own signature on 20 July (Unbound Notes and Drawings [1888], Lab. [*TAED* NS88ABT]). Mina sometimes witnessed and dated her husband's papers in batches after the fact, as she did on about a dozen pages on 26 May (a few days before giving birth to her first child; see, e.g., Unbound Notes and Drawings [1888], Lab. [*TAED* NS88ABP]; Cat. 1153, Lab. [*TAED* NM022AAJ]). Perhaps Edison's "Articulation" notes were overlooked at that time; in any case, they are related more closely to his work in the latter part of May than to anything in his laboratory records around 20 July.

2. Figure labels are "Rubber" and "glass."

3. Figure labels are "glass" and "Rubber."

4. Figure labels are "glass" and "Rubber."

5. Figure label is "membrane streatched like Ear."

6. Figure label is "A."

7. Figure label is "small wheel."

8. Figure label is "small wheel."

9. Figure label is "friction."

10. Figure label is "flattend at bend."

11. Figure labels are "Strong spring" and "Rubber."

12. Figure labels are "Very thick glass" and "Thick rubber."

13. John Wesley Hyatt (1837–1920) was an inventive pioneer and manufacturer of celluloid, a smooth and hard plastic material made by nitrating cotton or other plant fibers under heat and pressure. His factory in Newark was established in the early 1870s with the help of Marshall Lefferts, who was also an important mentor to Edison. Edison was also living in Newark about that time, and he and Hyatt were clearly acquainted by the end of the decade, and probably well before (*NCAB,* s.v. "Hyatt, John Wesley"; Israel 1998, 55–56; Hyatt to TAE, 31 May 1878; TAE to Hyatt, 22 Sept. 1880; both DF [*TAED* D7802ZNH, D8004ZFQ]). Hyatt does not appear to have published or patented a process involving silk, but one of his business and inventive partners, Charles Lockwood, had done so on behalf of the Bonsilate Co., one of Hyatt's enterprises. In 1884, Lockwood patented a "process of rendering silk plastic by heat and pressure" that would transform fabric into a "very dense and glossy" material suitable for "veneering, inlaying, facing, wrapping, or covering upon other materials" (Meikle 1995, 5–19; Mossman 1997, 27–31; U.S. Pat. 305,205; cf. U.S. Pat. 305,205; Howell and Tenney 1886, 599; Shaw 1884, 1:618–19).

14. Figure label is "cork."

15. Figure labels are "Rubber" and "metal."

16. By late summer, Edison had settled on a recording diaphragm made of thin glass. Reproducing diaphragms were silk with a thin layer of shellac. The reproducing point was attached to the diaphragm through a small piece of cork (for speech) or rubber (for music). "Speech Recorders and Reproducers," *Iron Age* 42 (6 Sep. 1888): 340.

17. Tamidine (variously tamadine) was a form of celluloid invented by Edward Weston. The United States Electric Lighting Co. adopted it for their incandescent lamps about the end of 1882 by cutting filaments from tamidine sheets. Doc. 2479 n. 2; Howell 1897, 47.

18. Edison wrote this last line at the top of a new page dated 16 June and before the first paragraph of Doc. 3213. The editors have included it here based on its similarities to the content and appearance of this document.

–3203–

From Everett Frazar

New York, June 4th, 1888.[a]

My dear Mr. Edison:

On Saturday night last, June 2nd, at the meeting of the New England Soc'y,[1] on your behalf, as requested, I extended the invitation to the Society to visit your laboratory on Thursday evening, June 9th at 8 p.m., to the extent of 150 members, gentlemen only.[2] A loud call was at once made for tickets for ladies in the families of members. I was then obliged to make use of your further favor and kindness by stating that you would give a matinee exhibition of the phonograph on Saturday, June 9th at 4 p.m. At the close of the meeting, 41 members had taken tickets, with applications for 67 ladies. Without doubt, the whole number of 150 gentlemen in the evening and 150 ladies in the afternoon will all be made up, and I am sure you will confer upon them a great pleasure in allowing them to inspect your laboratory and to witness exhibits of the wonderful phonograph. I was appointed chairman of a committee with Messrs. Harvey[3] and Bere,[4] to take charge of the matter for the Society and will call at the laboratory at half past seven on Thursday evening, probably with the other two gentlemen of the committee, to assist you in receiving them. Kindly bear in mind these dates and should you have anything to suggest, please use the telephone in Orange[5] on Tuesday or Wednesday evening.

I congratulate you upon the addition to your family and trust that Mrs. Edison and the little one are,[6] as I hear, getting on nicely. Yours very truly,

Everett Frazar

TLS, NjWOE, DF (*TAED* D8847AAT). Letterhead of Everett Frazar. [a]"New York," preprinted.

1. Everett Frazar was a former president of the New England Society of Orange. Among the founders (in 1870) was Wendell Phillips Garrison (a brother-in-law of Henry Villard), who invited Edison's membership at the end of 1887, telling him that it was "the Society of

Orange, containing the very élite of the place"; Edison was elected in January. Like several organizations around the U.S. with similar names, the group in Orange was a fraternal society which celebrated such ties to New England as the origins of some members and an allegiance to idealized notions of the New England spirit. The group was active in local politics and in the promotion of improvements such as the development of public schools, libraries, and a music hall. It sponsored a lecture in February by pioneering photographer Eadweard Muybridge. Garrison to TAE, 19 Dec. 1887; New England Society to TAE, 10 Jan. 1888; both DF (*TAED* D8711ABD, D8812AAA); Garrison and Hart 1895, 45; Whittemore 1896, 230, 232, 284; Garrison 1895; Conforti 2001, passim, esp. 94, 145, 188, 222; see Doc. 3188 n. 3.

2. When the Society solicited an "informal 'talk'" by Edison, he responded that "my talents will not support me on the lecture platform, and when information is desired in this manner, I always furnish a substitute." He offered, however, his laboratory's "large room which I am fitting up for projection lectures. Some time during the winter I will be very happy to entertain the New England Society, and furnish men and apparatus for the purpose." His offer was warmly received, but no definite plans were made for several months. According to a printed announcement that Frazar likely enclosed with this document, a phonograph demonstration was planned for 7 June (Thursday) and a "ladies' exhibition" (see below) for two days later. Tate confirmed these arrangements on 6 June. TAE to Garrison, 21 Dec. 1887; David Kennedy to TAE, 14 Jan. 1888; Frazar to TAE, 4 June 188; Tate to Frazar, 6 June 1888; all DF (*TAED* D8717ABZ, D8812AAC, D8812AAW, D8818ALY).

3. An attending surgeon at the Orange Memorial Hospital, Thomas W. Harvey (1853–1938) had been educated at Princeton University and the College of Physicians and Surgeons. Harvey was born in New York City but had resided in Orange since his childhood and was now the curator of the New England Society. His father was iron and steel manufacturer Hayward Harvey, inventor of a process for strengthening armor plate. "Dr. T. W. Harvey," *NYT,* 9 Apr. 1938, 17; Garrison and Hart 1895, 47; Whittemore 1896, 286–87.

4. Portrait artist William Jacob Baer (1860–1941) had trained at the Royal Academy in Munich and moved to the Brick Church area of East Orange upon his return to the United States. Around this time, Baer taught life painting classes for a club of local artists and engravers (known as the Carbonari). With his wife, Laura Schwenk Baer, he was a model for *The Idlers,* a painting by Robert Blum, his friend and fellow Cincinnatian. Though he would move his artistic life to Greenwich Village and also teach at the Chautauqua School in summertime, Baer remained an East Orange resident at the time of his death. Dearinger 2004, 22; "William Jacob Baer," *New York Herald Tribune,* 23 Sept. 1941, 22; Whittle 1919, 327.

5. Frazar lived on High St. in Orange, a short distance from Edison's Llwellyn Park home. Baldwin 1890, 105.

6. Madeleine Edison (1888–1979), Mina Edison's first child, was born on 31 May.

–3204–

From Ezra Gilliland

New York. June 6th, 1888.[a]

My Dear Edison:—

Mr. Pulitzer of "The World"[1] sails for Europe on Saturday, to be gone several months. He is exceedingly anxious to have a Phonograph with him in Europe. Mr. Cockerill has written me a letter on the subject,[2] and Mr. Coulter,[3] the assistant manager has called several times. There is no doubt that this would be a great card for us and they have said to me that we would lose nothing by complying with his request.

I have spoken to Col. Gouraud[4] and he appreciates the importance of the matter and is willing that it should be done if possible. I did not encourage them to think they could get one on Saturday, but said that we could probably arrange to have one very soon thereafter. Mr. Coulter explained to me, that Mr. Pulitzer would take a man with him competent to manage it, so that if we can get a good machine, there is no doubt but that he will make it work successfully. I need not dwell on the value to us of the free advertising we would get if this thing is carried out.

Please do the best you can in the matter and give me at least a letter of encouragement that I can show them. Yours very truly,

E T Gilliland

<Write Gilliland & tell him That I have promised Mr Villard & Dr Siemens of Berlin[5] one & that I will furnish Mr Pulitzer one, and I will send a good man who will deliver the phonoghs above mentioned & will divide his time between Mr Villard & Mr Pulitzer so they may be Enabled to give dinner parties etc & exhibit the phonogh— all that I ask is that my expert shall always be present to work it himself— I will be able to send these in about 3 weeks— answer if satisfactory E[dison]>[6]

TLS, NjWOE, DF (*TAED* D8848ABX). Letterhead of Edison Phonograph Co., E. T. Gilliland, general agent. [a]"New York." preprinted.

1. Already an experienced journalist and publisher, Joseph Pulitzer (1847–1911) bought the *New York World,* a small religious newspaper, in 1883. Pulitzer quickly remade it into one of New York's most popular and distinctive newspapers by combining sensational human interest and crime stories with high-minded public spiritedness and a one-cent price. Its circulation increased ten-fold in just two years. Pulitzer's eyesight started deteriorating rapidly in 1887, leaving him nearly blind within five years. *ANB,* s.v. Pulitzer, Joseph"; Doc. 2825 n. 4.

2. The editors have not found or otherwise identified John Cockerill's letter.

3. William F. Coulter (1848–1889) an Ohio-born journalist, worked at the *St. Louis Post-Dispatch* under the ownership of Joseph Pulitzer. When Pulitzer bought the *New York World,* he hired Coulter to work at that paper. "William F. Coulter Dead," *New York World,* 31 Jan. 1889, 3.

4. George Gouraud sailed for New York on 21 May and would have arrived about a week later. Juliet Snow to TAE, 24 May 1888, DF (*TAED* D8850ABP).

5. Werner von Siemens (1816–1892), preeminent German electrical engineer, inventor, and entrepreneur, was a cofounder and principal of Siemens & Halske, a major manufacturer and developer of electrical equipment. Docs. 1851 n. 1, 2173 n. 19, 2448 n. 3.

6. Edison's marginalia was the basis for a typed reply prepared by Alfred Tate (TAE to Gilliland, 12 June 1888, DF [*TAED* D8818AMO]). Pulitzer went to Europe without a phonograph or an explanation of its absence, much to the reported annoyance of William Coulter. Gilliland offered (through Charles Bruch of the Edison Phonograph Co.) to demonstrate the machine for Pulitzer in Europe, but the publisher found an opportunity before returning home to see Gouraud's machine at "Little Menlo" and record a message there for John Cockerill on 1 September (Doc. 3246; Bruch to Gilliland, 6 Aug. 1888; Gilliland to TAE, n.d. [c. 15 Aug. 1888]; both DF [*TAED* D8848ADC, D8848ADD]).

–3205–

From Ezra Gilliland

New York. June 6th, 1888.[a]

My Dear Edison:—

I enclose a copy of a letter[1] which I propose to send out to about fifty first-class men that we know and have already spoken to a few and the most of them say that they will be able to recommend some good young men.

I have had a talk with Gouraud and explained to him the importance of having men skilled in the setting up and adjustment of the machines, and particularly important to him, being so far from headquarters. He will avail himself of our school.

I suggest that we represent to these young men whom we propose to educate for our business, that we fix a range of pay that they are to receive from $35 to $50 per month, according to the importance of the position which they fill, with a prospect of increasing it as the business developes. I remember that in some of our conversations on the subject, you were in favor of using machinists and instrument makers for this work; all of this class of people with whom I have talked, expect to be put on salary at once and expect to receive full wages. As Phonograph inspectors are not going to be called upon to file or fit, but simply to adjust, I don't think it will be of enough advantage to us to have men who have learned a trade, to justify the payment of the larger salary that they will require.

I propose to adopt the plans of the Sewing Machine Co.'s in the selling and setting up of machines; that is, the salesmen and canvassers obtain the order, the machine is delivered by our wagon and an inspector, who, will also be an instructor will follow and set up the machine and instruct the purchaser in the use of it.[2]

The class of men that we will have as salesmen, men of good address and competent to make a sale, will be too expensive to utilize their time as inspectors and instructors. For instance, I have engaged one canvasser for New York who has sold as high as 28 typewriters in one month, giving him a profit of upwards of $400.

The typewriter companies pay only about $50 or $60 per month to the inspectors who go around and put their machines in operation.[3] I find that sewing machine and typewriter people do not employ mechanics who have learned a trade, as inspectors and adjusters, but take good bright fellows and educate them up in that business. If you approve of my plan, and are ready to receive them, I can send out as many men as you can take care of.

With very few exceptions, all of the parties whom I have negotiated with to act as our agents, expect me to furnish this class of help. I think we had better represent to these young men that it will take about two months to become sufficiently skilled in the business to enable them to fill a position. This will about fill in between now and the time we are ready to deliver machines.

I am very anxious to get out and see the new machines and shall do so very soon, but I have from 20 to 30 callers per day, which together with our mail, occupies the entire day, and on account of my being sick, we some hundred or more letters behind. However, I have engaged more help and we will be caught up by tomorrow night. Yours truly,

E. T. Gilliland

<Gilliland— You are wrong partially[b] in your assumption I propose to educate mechanics so each agency has one mechanic This mechanic was to teach as many men as required at the agency— If I attempt educating directly myself it would require whole Laboratory— 30 good men is all that would be necessary & these could teach a thousand & then afterwards be cheap of Repair Shop etc=[4] E[dison]

TLS, NjWOE, DF (*TAED* D8848ABV). Letterhead of Edison Phonograph Co., E. T. Gilliland, general agent. [a]"New York." preprinted. [b]Obscured overwritten text.

1. Gilliland's enclosed circular letter was dated 5 June and typed on Edison Phonograph Co. letterhead identifying himself as general agent and Edison as president. It asked recipients to recommend unemployed men between eighteen and twenty-five years of age, promising that such candidates would be trained at the laboratory in Orange "under Mr. Edison's personal supervision" for six weeks to two months. Gilliland circular, 5 June 1888, DF (*TAED* D8848ABW).

2. Gilliland referred to a common sales arrangement for sewing machines in the United States, where many customers bought on the installment plan, necessitating regular visits by dealer representatives to collect payments (Corn 2011, 30–47). As one observer noted in 1875,

> when a sewing-machine is sold, the trouble and expense to the dealer has just begun. He must furnish a skilled operator to give an unlimited number of instructions, ceasing only when the purchaser feels that the machine has been fully mastered, and the great variety of work to which the modern sewing-machine is adapted can be accomplished. [Fairfield 1875, 35]

3. Leading manufacturers of typewriters, complex machines with many precision moving parts, built adjustability into their products. The ability to make adjustments after assembly and shipping facilitated large-scale production, and the capacity to compensate for wear was also used as a selling point. Hoke 1990, 150–58.

4. Edison's marginalia was the basis for a typed reply addressed to Gilliland on 12 June. DF (*TAED* D8818AMM).

–3206–

From George Westinghouse

Pittsburgh, Pa. U.S.A. June 7th, 1888.[a]

Personal.

Dear Sir:

Information has recently come to my knowledge which prompts me to write you this letter relative to a recent conversation which Dr. Otto A. Moses[1] reports to have had with you.

Dr. Moses came to Pittsburgh some weeks ago with reference to a scheme for the consolidation of all electric light companies in some form of a trust.[2] I refused to have anything to do with it, and told him that I saw no reason at all for our combining with a lot of people who had nothing to give, and that I would only consider, under any circumstances, some sort of an arrangement with the Edison Company whereby harmonious relations would be established, and incidently in the conversation, I believe I said to the Doctor that I thought it would be a profitable thing for both the Edison Company and The Westinghouse Electric Co.[3] if we were to lease the

Edison Company. I gave Dr. Moses no authorization to act for myself or this company in any particular, but I have since learned that he has called upon you to discuss business matters, and I believe the only justification for his so doing is the remark which I made to him in connection with my refusal to join the trust. I have to-day written the Doctor to hereafter confine himself exclusively to that class of business for which he was employed, namely, special investigation of technical and patent matters. Further, about the time the Doctor called upon you there appeared in the Pittsburgh papers, and I believe the same was telegraphed from Pittsburgh by the Associated Press, a statement which was wholly unwarranted by anything we knew of relative to an amalgamation or consolidation of the Edison Company and ourselves.[4] The source of this statement is an entire mystery to everyone connected with The Westinghouse Electric Co., and believing it to be an injustice to you as well as to ourselves, we wrote to the editor of the paper that first published the report as per enclosed.[5]

I believe that there has been a systematic attempt on the part of some people to do a great deal of mischief and create as great a difference as possible between the Edison Company and The Westinghouse Electric Co., when there ought to be an entirely different condition of affairs.[6]

I have a lively recollection of the pains that you took to show me through your works at Menlo Park when I was in pursuit of a plant for my house, and before you were ready for business, and also of my meeting you once afterwards at Bergman's factory;[7] and it would be a pleasure to me if you should find it convenient to make a visit here in Pittsburgh when I will be glad to reciprocate the attention shown me by you.[8] Truly yours,

Geo. Westinghouse Jr[9]

TLS, NjWOE, DF (*TAED* D8828ABV). Letterhead of Westinghouse Electric Co. [a]"*Pittsburgh, Pa. U.S.A.*" preprinted.

1. Otto A. Moses (1846–1905) was a chemist whom Edison hired as a laboratory assistant in 1879 and was one of Edison's representatives at the Paris Electrical Exposition in 1881. After leaving Edison's employ soon afterward, Moses remained in contact with him and the Edison lighting companies, especially concerning his own inventive work in arc lighting. Moses was active at this time in the affairs of the National Electric Light Association. Docs. 1754 n. 6, 2120 (headnote), and 2501 n. 15; "National Electric Light Association," *Railroad and Engineering Journal* 61 (Mar. 1887): 135–36; *Proceedings of the National Electric Light Association* 2 (1888): 259, 292, 423; "Notes," *Electrician* 21 (14 Sept. 1888): 580.

2. Moses was evidently a freelancer, often described simply as an electrical expert, and the editors have learned little more about his relations with Westinghouse than the information in this document. He had been in Pittsburgh in late April, reportedly to see the Westinghouse firm's new alternating current (AC) electric meter, which he publicly endorsed. He had also been there in February, following a trip to Europe, when he lectured to the National Electric Light Association on the development of electric lighting in the United States and abroad, singling out the Westinghouse AC system for special praise. "To Measure Electricity," *Pittsburgh Daily Post,* 26 Apr. 1888, 3; "Light of Luxury," *Pittsburgh Commercial Gazette,* 21 Feb. 1882, 2.

3. The Westinghouse Electric Co. was formed in 1886 to consolidate the electrical development, manufacturing, and sales activities of the eponymous inventor and businessman. Inside of three years, the firm reportedly had sold central stations with an aggregate capacity of 350,000 lamps and developed a capacity for manufacturing 5,000 lamps per day. Docs. 3008 n. 17, 3108 n. 7; Pope 1889, 85; "The Consolidated Electric Light Co.," *Commercial and Financial Chronicle* 48 (30 Mar. 1889): 428.

4. Identical brief notices of an impending merger appeared in late May in several papers under a Pittsburgh byline. According to those reports, the Edison Electric Light Co. had made an offer to Westinghouse Electric that was "not yet quite satisfactory to the Westinghouse Company, but that the consolidation of the contending corporations will be speedily effected is no longer doubted" ("Will They Consolidate?," *Brooklyn Daily Eagle,* 27 May 1888, 16). Meanwhile, Westinghouse was busily strengthening his patent positions. His firm reportedly had received more than half of the sixty-nine grants in electricity issued by the Patent Office in a recent week, and it was in the process of securing an electric meter that would be crucial for the commercial success of alternating current distribution ("American Notes," *Electrician* 21 [22 June 1888]: 217; see Doc. 3250).

The two companies also engaged in dozens of separate patent suits between themselves, including a high-stakes contest filed in federal court in Pittsburgh. In that case, the Westinghouse interests (through an affiliated firm) charged the local Edison illuminating company in nearby McKeesport, Pa., (as a proxy for the entire Edison organization) with infringing the broad claims of incandescent lamp patents they had acquired from William Sawyer and Albon Man, early rivals of Edison. Though a win by Westinghouse might, as a Pittsburgh paper predicted hopefully, "annihilate the Edison claims" for incandescent carbon filaments, the court ruled against the plaintiff in October 1889 (a judgment later upheld by the U.S. Supreme Court). Joseph Bradley decision, May 1889, *Edison Electric Light Co. v. United States Electric Lighting Co.,* Complainant's Proofs, Vol. 1, pp. 382–98, Lit. (*TAED* QD012B0382); "Edison Is Knocked Out," *Pittsburgh Daily Post,* 18 July 1888, 3; *Intell. Prop. New Tech. Age,* 3.B.5 (pp. 219–24); see Doc. 3359.

5. The editors have neither found the enclosure nor otherwise identified the published response.

6. Among the incidents Westinghouse may have had in mind was Harold Brown's highly charged letter to the editor of the *New York Evening Post*. Dated 24 May, the letter appeared in print on 5

June, just three days before a meeting of New York City's Board of Electrical Control. Brown lambasted the poor condition of arc light wires throughout the city but reserved his harshest criticism and most inflammatory language for alternating current lighting systems, which he said presented to the public a "constant danger from sudden death" that could be mitigated only by a 300-volt limit on their wires. Brown's letter was read into the record at the Board's 8 June meeting, where expert responses were solicited; it later drew several sharp rejoinders (subsequently published) from the Westinghouse company. "Death in the Wires," *New York Evening Post,* 5 June 1888, 7; "High Potential Systems Before the Board of Electrical Control of New York City," *Electrical Engineer* 7 (Aug. 1888): 360–69; Doc. 3224 (headnote); Brown's letter and its repercussions are discussed in Jonnes 2003 (165–71).

Westinghouse may also have been thinking of an 82-page "WARNING from the EDISON ELECTRIC LIGHT CO." that asserted the primacy of the company's patents, cautioned consumers against putative patent infringers, and reiterated its arguments against the Westinghouse AC system; the booklet was printed without date about March 1888. The Edison company evidently also circulated a printed "confidential" memorandum advising its agents that the Westinghouse firm had suppressed results of a commercial trial of their lighting system against Edison's in Philadelphia. It is not apparent when George Westinghouse heard that allegation, but he was corresponding with principals in the story by 20 June. Their rebuttals—and Westinghouse's own—were published by his company on 3 July, to the satisfaction of a Pittsburgh newspaper, which gloated that the "exposure is so complete that one wonders how the Edison company will get out of the hole in which it seems to have been put." Edison Electric Co. pamphlet, n.d. [Mar. 1888?], PPC (*TAED* CA019B); "A Warning from the Edison Electric Light Company," *Railroad and Engineering Journal* 62 (Mar. 1888): 102; Westinghouse Electric Co. circular, 3 July 1888, DF (*TAED* D8828ABZ); "The Electrical Companies," *Pittsburgh Daily Post,* 6 July 1888, 2.

7. The editors have no information about these prior meetings. Westinghouse and Edison evidently had some acquaintance by early 1883, when Edison advised the co-owner of a patent (with his assistant Henry Byllesby, who later went to work for Westinghouse) to try to interest Westinghouse. Westinghouse and his wife Marguerite (née Walker) had lived at "Solitude," on the outskirts of Pittsburgh, since about 1870. William Stern to TAE, 13 Feb. 1883, DF (*TAED* D8303ZAQ); *ANB,* s.v. "Westinghouse, George"; Leupp 1918, 64, 74.

8. Edison replied that he was wholly devoted to laboratory research and, like Otto Moses, lacked authority in business affairs of the Edison Electric Light Co. He graciously—but noncommittally—acknowledged the invitation to visit Pittsburgh. TAE to Westinghouse, 12 June 1888, Lbk. 26:270 (*TAED* LB026270).

9. The name of American inventor and businessman George Westinghouse (1846–1914) was synonymous with his railroad air brake, but he was also a leading manufacturer of railroad signal devices and, more recently, electric lamps and related equipment in Pittsburgh. Although a relatively late entrant into the electric lighting business, Westinghouse had quickly attained engineering and commercial

advances in the generation and distribution of electric power—specifically alternating current (AC)—that made his firm a major rival of the Edison lighting interests. Doc. 3008 n. 14.

–3207–

To John Birkinbine[1]

[Orange,] June 9, 88.

Dear Sir:—

In the matter of separating the magnetic iron ores of your Company[2] I would propose the following:—[3]

I will design and have constructed and shipped to Port Henry, N.Y.,[4] one or more of my Magnetic Separators of a general design similar to the one now in place at Orange, N.J.,[5] you to have the apparatus errected in a suitable building; the details of such erection to be subject to my approval and inspection. The cost of the manufacture and installation to be borne by your Company.

Your Company are to provide all necessary crushers, rolls, screws &c. for the proper reduction and sizing of the ore ready for the hopper of the Magnetic Separator. The apparatus to be started by and operated by my representative, who shall not be detained for more than a month. If he is required longer than that time you are to pay for his time and board; if not over a month no compensation to be made for his services.

For all separated ore ready for shipment your Company is to pay me a royalty of ten cents per ton, of 2,240 lbs., in quarterly installments. But in view of establishing the initial plant I will agree that if at any time royalties are reduced to or below ten cents per ton, then your Company shall from the time of such reduction pay but 80 per cent of the price charged any other producer of separated magnetic iron ore.

The payment of royalties to commence from the time that the experimental test under the charge of my assistant is terminated.

It is understood that the number of Magnetic Separators is not restricted, but Witherbees, Sherman & Co. can, under the agreement herein proposed, use as many of Magnetic Separators as are required for the mines which they operate.[6] Yours truly,

The Edison Ore Milling Co.
Thos A. Edison, Pres't[a]

TL, NjWOE, DF (*TAED* D8818AMJ). [a]Signature lines written by Alfred Tate.

1. John Birkinbine (1844–1915) was an internationally known engineer and a pioneer in mining and metallurgy. At this time, he was a consulting engineer with Witherbees, Sherman & Co., which controlled iron mines in upstate New York. A native of Reading, Pa., he attended schools there and in Philadelphia and Pottstown before entering the Polytechnic College of Philadelphia. His military service in the Civil War, including scouting for the Union in the Gettysburg campaign, ended his college studies. After the war, he worked for a time in machine shops and then became an assistant to his father, the chief engineer of the Philadelphia Water Department. He received his early training in the mining industry at Weimer & Birkinbine of Lebanon, Pa., which manufactured blast-furnace equipment, and then as manager of the South Mountain Mining & Iron Co. in Cumberland County, Pa. In his long career, Birkinbine was employed on iron works, furnaces, hydraulic development, and other engineering projects throughout North America. He was instrumental in organizing the United States Association of Charcoal Iron Workers. Birkinbine was also a special agent of the United States Geological Survey, for which he prepared reports on iron and manganese ores, and a metallurgical engineer for the U.S. Bureau of Mines. He later served as president of the American Institute of Mining Engineers (1891–92) and the Franklin Institute for a decade from 1897. With his wide network of associations, Birkinbine had a deep and practical understanding of how the iron and steel trades were quickly adapting to new materials, new processes and, above all, big new markets. *NCAB* 12:199; "Necrology," *Journal of the Franklin Institute* 179 (June 1915): 722–24; "Death of John Birkinbine," *Iron Age* 95 (20 May 1915): 1144; Philadelphia Bureau of Water 1896, 100.

Birkinbine likely came in contact with Edison through his consulting relationship with Whitherbees, Sherman & Co., which had New York offices in the Merchants' and Manhattan Building on Wall St., where Edison also had an office that Alfred Tate still used. In October 1887, the firm had arranged with Edison to test samples of iron ore. Doc. 3087 n. 3; Tate to George Worthington, 22 Feb. 1888; Whitherbees Sherman to TAE, 4 Oct. and 14 Nov. 1887; all DF (*TAED* D8818AEP, D8747AAK, D8747AAT).

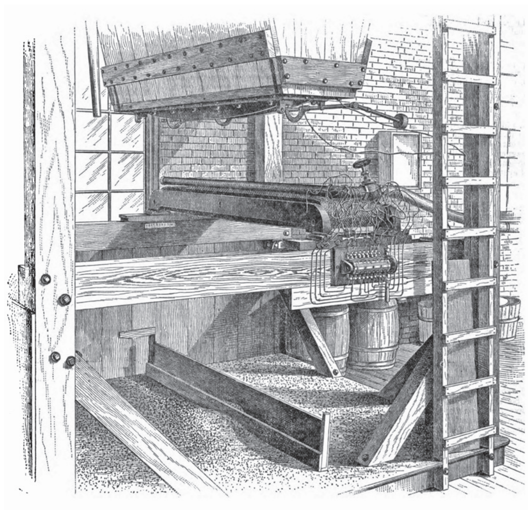
2. That is, Witherbees, Sherman & Co.

3. Having evidently visited the Orange laboratory in May to watch Edison's ore separator in action, Birkinbine wrote on 7 June to ask about returning with "some parties" to see it. He hoped at that time to "arrange a base of agreement" with Edison. Witherbees, Sherman & Co. to TAE, 24 May 1888; Birkinbine to TAE, 7 June 1888; both DF (*TAED* D8845ABG, D8845ABJ).

4. Witherbees, Sherman & Co. owned a number of mines in the Port Henry, N.Y., district southwest of Lake Champlain. In 1888 and 1889, the company experimented at its Old Bed and New Bed mines with Wenström and Monarch magnetic ore separators. Old Bed ore contained phosphorous-bearing apatite at levels higher than could be used in the Bessemer steel process. New Bed ore, a magnetite, was low in phosphorous but was combined with a siliceous gangue. For either to be usable, the iron had to be separated from these materials. Witherbees, Sherman had sent shipments of ore to Orange for trials on the Edison machine and had also tested a Conkling separator. "The

Mineville Magnetite Mines," *Iron Age* 72 (17 Dec. 1903); Birkinbine to TAE, 15 Oct. 1888 and 3 May 1889; Witherbees, Sherman & Co. to Edison, 4 Oct. 1887 and 14 May 1888; all DF (*TAED* D8845AEN, D8949AAZ, D8747AAK, D8845ABA); Birkinbine and Edison 1889a, 738–43; Birkinbine 1891, 666.

5. Edison had a "large machine for separating iron ores" finished by 15 June (A. G. Bradstreet to TAE [with TAE marginalia], 12 June 1888; TAE to Bradstreet, 15 June 1888; both DF [*TAED* D8845ABM, D8818AMR]). It was based on William K. L. Dickson's model incorporating both Dickson's earlier work on ore hoppers and his decision, in February, to present a single face of a large bar magnet to the falling material (see Doc. 3159; E-2610:51, 63, Lab. [*TAED* NM031051, NM031063]). This machine was likely the one used to make the tests described by Birkinbine and Edison (Birkinbine and Edison 1889a), and it was illustrated and described in *Iron Age* at the end of the year and soon after in an article by Birkinbine. It consisted of a magnet weighing (according to different accounts) two or three tons, wound with 500 pounds of copper wire to which a dynamo supplied 25 to 30 amperes of current at 110 volts. By year's end, a fan and air ducts for blowing dust from the magnet had been added to the machine ("The Edison Magnetic Separator," *Iron Age* 42 [6 Dec. 1888]: 847–48; Birkinbine 1888–1889b, 100–103).



Edison's magnetic ore separator at the Orange laboratory at the end of 1888.

6. Edison had been anticipating, at least outwardly, a deal with Witherbees, Sherman & Co. since March. In mid-May, he answered an inquiry about the machines by stating one was "about being erected" for that firm "for dephosphorizing magnetite= They will be manufactured at Edison Machine Works— We cannot set a price until our 1st plant is in successful operation," which he hoped would be at the start of July (TAE marginalia on Brewer & Co. to TAE, 17 Mar. 1888; TAE marginalia on Fraser & Chalmers to TAE, 10 May 1888; both DF [*TAED* D8845AAI, D8845AAZ]). In fact, it does not appear that an Edison machine entered service at Port Henry. An 1888 article detailing experiments being done with an Edison separator in Humboldt, Mich., noted

that Witherbees, Sherman was trying "various magnetic separators at their mines, near Port Henry," but these were Monarch and Wenström apparatus (Birkinbine 1888–1889c, 195). As late as September 1890, Birkinbine reported that none of the four Edison magnetic separating plants in the United States (plus one at the laboratory) was in New York State, though he did expect one to be ready in the near future close to West Point (Birkinbine 1891, 666–67). Although Witherbees, Sherman & Co. continued to send ore for experimental processing at the laboratory, for some reason they did not reach a definite agreement with Edison. Birkinbine alluded in May 1889 to an unspecified "misunderstanding which seems to exist in your mind regarding Messers Witherbees, Sherman & Co." (Birkinbine to TAE, 3 May 1889, DF [*TAED* D8949AAZ]).

–3208–

Memorandum: Sale of Phonograph Rights[1]

[Orange, c. June 11, 1888][2]

Royalty 10 per cent to be added to factory prices to Co.

Sole manufacture in perpetuity for Co. on basis actual Co. plus 20 per cent, both for supplies, phonographs and special things, accessories etc.

Called Am[erica]n Phonogh Co.[3]

Company to respect all foreign biz of E. who is to be allowed manufacture here for export and Amn. Co. not to sell directly or indirectly outside of U.S. and Canada.

After date of turning biz over any future improvement on phonogh to go to Co. free, but any special phonogh or special extra which is sold as an extra E. to get 15 per cent royalty for invention. Clocks are excepted from all contracts.

Experimental expenses to extent of 30,000 to be allowed for first year 20,000 for 2nd. year and 15,000 for third years & 10,000 thereafter for three more years, & 5000 thereafter for 7 years.

These expenses are to be actual cost as per Laboratory methods of charging (i. e.) no profit to Edison.

E. to be satisfied that parties are biz men & scheme is'nt to be a stock speculation & run by a lot of lunkhead directors.

Price of complete phonogh outfit not to be more at any time than $85. that public shall always be permitted to buy outright at that price or less, complete outfits as good as are rented.

Mfg duplicate records (i.e.) publishing of music, novels, operas etc. to be reserved to factory that is to say if E. succeeds in devising a process of printing duplicates of Records commercially the factory is to manufacture such duplicates at regular allowance of profit & E. is to get his royalty on same as an extra (i.e.) 15 per cent, patents of course to go to Co.

TD (copy), NjWOE, Misc. Legal (*TAED* HX88035D).

1. See Doc. 3200 (headnote).

2. In a subsequent affadavit, Jesse Lippincott claimed that Edison had written this memorandum in pencil and given it to his attorney John Tomlinson before Lippincott arrived (in the company of Tomlinson and Ezra Gilliland) at the Orange laboratory on 12 June or a day or two afterward. Lippinscott had the document transcribed and included with his sworn statement as attachment "D." Edison corroborated that approximate date in separate undated draft affidavits, to one of which he appended this document. He also emphasized that he had opposed the sale of his phonograph rights up until the time he agreed, after considerable arguments from Gilliland and Tomlinson, to draw up this memorandum of acceptable terms. Lippincott affidavit (p. 8), 28 Nov. 1888; TAE draft affidavit (attachment, pp. 4–5), n.d.; both Misc. Legal (*TAED* HX88035, HX88028 [images 26–27]); TAE draft affidavit (pp. 4–8, 12–13), n.d. [1889?], Miller (*TAED* HM89ACG).

3. The proposed new name (instead of U.S. Phonograph Co.) would invite some mental association (if not confusion) with the existing American Graphophone Co. At the suggestion of Jesse Lippincott, the firm was incorporated as the North American Phonograph Co., perhaps to more fully reflect its geographic ambitions. Lippincott to TAE, 13 July 1888, DF (*TAED* D8848ACU).

THE "PERFECTED" WAX-CYLINDER PHONOGRAPH Doc. 3209

The phonograph in Doc. 3209 is a production model based on the prototype Edison sent on 17 or 18 June to George Gouraud, his British agent, who had just spent several weeks in Orange watching over its development.[1] The prototype was "the first one of the new model" to leave the laboratory[2] and had been, Edison noted, "put together very hurriedly, and is not finished."[3] The new design, "perfected" over the course of about a month, became the template for phonographs that the Edison Phonograph Works would manufacture for years at its soon-to-be-completed factory in Orange. Much later, the design would also become the focus of a persistent myth about Edison and his work habits.

Edison had unveiled a different phonograph to the press and select guests at separate events on 11 and 12 May.[4] The introduction came about six months after the start of his renewed efforts to develop the dormant phonograph for a large market—a market also sought by backers of the rival graphophone—and they followed false starts and unkept promises.[5] The first event was an open house at the laboratory for newspaper reporters. The second was the start of a week-long exhibition at the Electric Club in New York City, where Ezra Gilliland, Edison's collaborator, made a formal presentation. The reincarnated phonograph appeared in press accounts as the "perfected" version of the crude recording machine that had astonished the world a decade earlier.[6]

Edison had already tried out some of the new machine's most obvious departures from the original 1878 design in an experimental model in October 1887 (Doc. 3105). Among them were the cylinders of hard wax, replacing fragile tinfoil sheets as a recording medium, and the battery-powered electric motor with governor, used in place of a hand crank. Separate devices for recording and reproducing sound, each with a point and a diaphragm, were mounted on a single frame—called a "spectacle" because of its appearance—that could be pivoted to engage one or the other with the cylinder.[7] The new instrument, equipped now with a fingertip stop-and-start mechanism and the ability to replay part of a recording, was adapted to office dictation and typesetting, though not necessarily without the intelligent discretion of a stenographer.[8] It was capable of recording and replaying music as well. Edison claimed in an interview with George Parsons Lathrop that, counting "every little screw," it had about 1,500 separate parts, many of them cut to exacting specifications.[9]

The demonstrations evidently revealed some unexpected problems. Edison cabled George Gouraud a few days afterward that despite the recent "great success," he was again delaying shipment of machines to London while he made the "latest & important improvements."[10] Nevertheless, he instructed Ezra Gilliland on 24 May to go ahead and publish drawings already in hand for a long-awaited promotional pamphlet because "There is practically no change in design so your cuts will do."[11] Edison's surviving notes and records, largely silent on development of the phonograph through the winter and spring, give little information about what he had in mind. On 31 May, he told his patent attorney that he had the "latest new phono complete," among several recent inventions. He also asked if a prior patent application covered a belt drive for the instrument. That query was a clue to the changes he was making in the drive train, which was a modification of the one used on the experimental model of late 1887.[12]

The drive train was wholly redesigned by mid-June. Gone was the bevel friction gearing, a clear suspect for causing noise and vibration. In its place was a double pulley on the vertical motor shaft, with one belt running directly to the governor (now unmistakably placed above the bedplate) and the other twisting through right angles to a pulley at the end of the mandrel shaft, which carried the wax cylinder on one end and fine screw thread (for sliding the spectacle) on the other. From there (as in the May demonstration model), another belt drove the coarse screw thread (called the "kick-back") on which the spectacle frame could be engaged to return it from one end of the cylinder to the other.[13]

Edison also remodeled the motor, making perhaps the most important, if least visible, changes there. The motor used in May may have been sufficient from an electrical standpoint, but it had a disruptive "rattle," according to a London news correspondent whose critical report Gouraud said was "widely copied" in Britain.[14] Ezra Gilliland, in his illustrated paper for the Electric Club, had described it as having "a large balance wheel with a nicely adjusted governor. It is connected to the phonograph with a noiseless friction gearing."[15]

Charles Batchelor began working on a new motor immediately after the May exhibition.[16] When redesigned, the motor (shown in Edison's patent on the new phonograph) was a multipolar device whose four poles produced stronger and more uniform magnetic fields than the familiar bipolar design. The armature was a Gramme ring "of considerable size, so as to act as a fly wheel and so as to have a considerable surface velocity with a relatively low axle speed"—low enough that only a modest reduction was needed to drive the mandrel.[17] The bottom end of the armature shaft, shaped to a point, would bear on a smooth piece of agate. That arrangement (again according to the patent) significantly reduced friction: "The motor being nicely balanced on its jewel step seems to require very little power to drive it and does not produce troublesome vibrations in the phonograph." (After some experience, Edison had the end of the shaft ride in a cupped metal bearing instead of a piece of quartz; cf. Doc. 3289.) The governor, belted to run much faster than the motor, would interrupt the armature circuit when its speed got too high.[18] Power to the motor would be controlled by the peg-type switch used in the New York demonstration machine. Inserting the peg into a hole in the bedplate closed the circuit with the battery; when removed to open the circuit, the peg could be stored in an adjacent hole. That, at least, was the arrangement Edison mentioned in the 30 July patent application.[19] Very quickly, however, he seems to have adopted the lever-type switch shown in the Doc. 3209 production model. In one position, it closed the electrical contacts; slid a few inches the other way, it broke the circuit and applied a friction brake to the motor pulley.

Edison made other changes to the machine's design and operation, including taking away the typewriter-like key for temporarily lifting the reproducer point from the cylinder surface. In its place was a handle (which could be moved by a foot pedal) for lifting the reproducer point[20] and engaging it with the return feed screw to back the point to any desired position on the cylinder for replay; in later versions, a thumbscrew served the same purpose.[21]

One important but scarcely visible modification appeared in the recording unit. Where the process of trimming a layer of wax from a cylinder (literally erasing a recording) had been a distinct operation (requiring a separate adjustment of the cutting depth), Edison now added a narrow trimming knife blade near the recording point so that erasing and recording were carried on simultaneously.[22] He also seems to have slightly reconfigured the spectacle to position the recording and reproducing units closer together so that the adjustment of one relative to the depth of cut in the wax would also work for the other.[23] These alterations, together with the larger modifications to the machine itself, contributed to more than a dozen patent applications that he completed in June and July.[24]

One notable element stayed the same. That was the option to project sound into a room by means of an acoustic funnel or to transmit it directly to the listener's ears through tubes connected to the reproducer unit.[25]

Little can be said about the battery, contained in a glass flask, that supplied electrical energy to the motor. Because batteries were such a versatile and important technology, the laboratory was almost continuously at work on them, but not until the first of May do records clearly indicate development of cells especially for the phonograph motor. In June, Edison uncharacteristically entertained an offer from someone outside the lab to adapt a battery to his specifications, apparently without success.[26]

Production models from the factory would be subject to continual refinement but were attractive and meticulously detailed. They had polished brass on the mandrel and other parts (partially supplanted later by a nickel finish) and a japanned bedplate atop a carefully crafted wood box around the motor; a substantial cabinet would become available later.[27] Continually trying to improve the sound quality, Edison worked through the summer, focusing particularly on wax materials and the recording and reproducing points.[28] In mid-July he cabled Gouraud: "Remarkable improvements, absolutely perfect."[29] Around the beginning of 1889, he also redesigned the spectacle and its built-in gauges (or determining devices) for setting the depth of the cut, and he eliminated the spectacle toward the end of that year.[30] The basic template remained the same, however, so that machines often could be retrofitted with newer components. Edison specifically intended to manufacture using interchangeable parts, as in the firearms or sewing machines industries, "so that any part of the machine may be supplied at any time" from stock.[31]

The month or so in which Edison and his staff "perfected" the commercial phonograph was eventful in other ways, too. He broke ground on the large factory where it would be made and began negotiating a far-reaching deal for the sale of his present and future patent rights on it.[32] And he became the father of a newborn daughter, whose identity in the public's mind was linked to the machine by his reported efforts to use one "baby," as he called the phonograph, to capture the other's cries.[33]

One unforeseen consequence of the new machine was the propagation, years later, of a compelling tale about its development. Biographer Matthew Josephson wrote dramatically of Edison summoning his assistants to a marathon work session; of anxious newspaper reporters hanging around the laboratory gate, their papers printing bulletins about the "orgy of toil" within; and of Edison emerging, disheveled and haggard after five days and sleepless nights, to be photographed with the new machine. While conceding that "The 'five-day vigil' was a slight case of exaggeration," Josephson stated that Edison's laboratory notebooks "furnish evidence of a 'stretch of seventy-two hours' ending June 16." The story sounded plausible; it caught on and has been repeated many times since. It is consistent with Edison's 1909 reminiscence of five uninterrupted days of work, and the photo of him slumped by the machine would seem to lend it credibility.[34] Edison's recollection informed the caption under that photo in a 1910 biography and may have influenced a 1926 *Popular Science Monthly* sidebar on him as the "Napoleon of Invention." The brief article claimed that "Often, in desperate pursuit of an idea, he would go 48 and even 72 hours without sleep, eating little," adding: "One such spree produced the phonograph."[35] But the story of a five-day gestation of the improved machine is otherwise unsupported by documents or reminiscences of contemporaries, including William K. L. Dickson, the laboratory photographer.[36] In fact, time sheets give a more nuanced picture of its development at the laboratory, where assistants had been working steadily on sound recording among a large number of ongoing projects. In early April, around a dozen men had some portion of their wages charged to the phonograph account, about $116 in all. The number of men on the project and their combined wages ticked up into the first full week of May, when the account was charged more than $200 for the pay of 21 assistants; machinist Fred Ott alone put in 80 hours and received $28.67, a typical wage. About 30 men contributed in each of the first three weeks of June, their aggregate pay peaking above $400 in the first week. By the end of the month fewer than 20 men earned about $250 on the phonograph, though Ott alone clocked 98 hours on it. The project had clearly wound down by early July, when just a dozen men were engaged on it.[37]

1. See Doc. 3210.

2. TAE to Gouraud, 12 June 1888; Alfred Tate to Louis Glass, 28 June 1888; both DF (*TAED* D8818AMN, D8818ANY). Ezra Gilliland also took an unknown number of machines.

3. See Doc. 3210.

4. See Docs. 3190 n. 2 and 3191 n. 4.

5. See Docs. 3123, 3142, 3165, and 3190. Early in 1888, the new phonograph became, in Alfred Tate's words, "the resource that we are looking to now to provide ourselves with funds," and Gilliland had expected to have a machine on the market by the end of March (see Docs. 3153 and 3165).

6. "Perfect" was a relative term, at least in hindsight. The model unveiled in May is often retrospectively called the "improved" phonograph and the June version the "perfected" model. Though the definitive early publication about the latter (under Edison's byline) was titled "The Perfected Phonograph" (Edison 1888), the distinction was not made consistently. The earlier version was sometimes referred to as "perfected" and the latter as "improved," and the North American Phonograph Co., which sold the machines, did so under the "improved" nickname (see, e.g., "The Perfected Phonograph," *Manufacturer and Builder* 20 [1 June 1888]: 120; "The Edison Improved Phonograph,"

Electrician 21 [17 Aug. 1888]: 467; North American Phonograph instructions, n.d. [1889?], PPC [*TAED* CA028D]).

7. See Doc. 3219 and cf. U.S. Patent 400,647.

8. Historian Patrick Feaster analyzes the various means available to contemporary "dictators" and stenographers to produce a final clear text from a spoken message. He points out that even mechanical tools such as wax pencils for marking a recording, or the ability to stop and start or even alter a recording in process, did not do away with the need for the copyist to exercise judgment about the speaker's intentions. Feaster 2013.

9. "Thomas A. Edison's Latest," *New York Evening World,* 12 May 1888, 3.

10. See Doc. 3190.

11. Gilliland to TAE (with TAE marginalia), 24 May 1888, DF (*TAED* D8848ABQ1).

12. See Doc. 3199.

13. "Phonographs and Graphophones," *Engineering and Mining Journal* 46 (15 Sept. 1888): 214–16; "The New Phonograph and Graphophone," *Electrical World* 11 (6 Oct. 1888): 183.

14. Arthur Kennelly made electrical tests of a phonograph motor in February and tried some alterations to its internal connections in April (N-88-01-19:31, 88-04-18:10; both Lab. [*TAED* NB019031, NB035010]). The quotation is from "Mr. Edison's New Phonograph," *Daily News* (London), 14 May 1888, 3 (text of Gouraud cable [n.d.] confirmed in TAE to Gouraud, 16 May 1888, DF [*TAED* D8818AKM]). The *Daily News* article provided a mildly dissonant counterpoint to congratulatory coverage in the American press. Music reproduced through the large funnel "sounded as the music of a piano might coming through a thick partition. Every note could be heard, but much of the musical effect was lost." Regarding the phonograph's failure to reproduce every spoken word distinctly, the paper editorialized that Edison might "have to be content with the invention of one of the most ingenious toys the world has ever seen" ("Mr. Edison's Phonograph," *London Daily News,* 14 May 1885, 3).

15. Gilliland 1888. The motor armature in the prototype of October 1887 (Doc. 3105) was a heavy brass flywheel with coils attached to the periphery that rotated around four pairs of fixed magnets. The motor was centered under the machine so that the gear on the armature shaft bore directly on the edge of the mandrel (see also U.S. Pat. 386,974). In the May 1888 model, the motor was offset and drove a gear at the end of the feed screw to which the mandrel was attached.

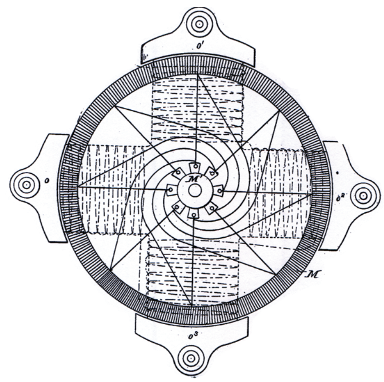
16. Batchelor's first extant drawings of field magnets for the new motor are dated 10 May (the day of the Electric Club exhibition) and 28 May. Edison continued to work on and test the new motor into late June. N-87-12-00, N-88-06-26; both Lab. (*TAED* NB006AAD, NB006AAH, NA026AAA).

17. U.S. Pat. 499,879. In the earlier mechanism, the driving gear was much smaller than the driven gear, producing a considerable speed reduction at the mandrel. Regarding the armature construction, cf. Doc. 3177 n. 6.

18. U.S. Pat. 499,879. Edison signed an application in late July reflecting many elements of the new design. It filled twenty-one

typed pages and included thirty-eight claims (winnowed to twenty-nine during several years at the Patent Office) and was so detailed that even the examiner seems to have gotten confused. The British journal *Engineering* published an account of the machine in September but did not describe the motor in deference to its lack of patent protection. Pat. App. 499,879; "Engraving Sounds," Engineering 46 (14 Sept. 1888): 247–49, 258.

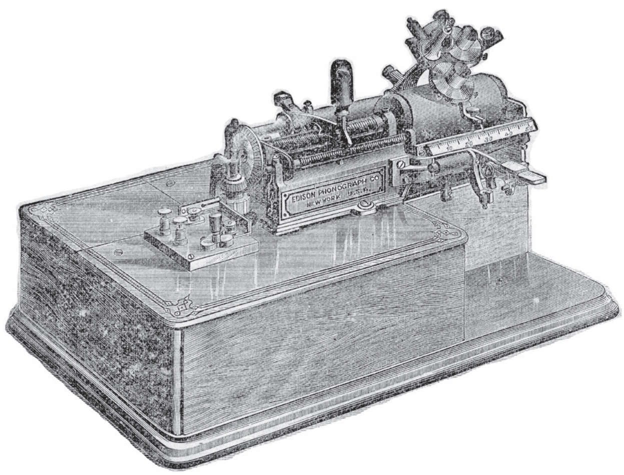
*Patent drawing of the improved motor, showing large ring armature **M** inside the four magnet poles.*



19. U.S. Pat. 499,879.

20. "Speech Recorders and Reproducers," *Iron Age* 42 (6 Sep. 1888): 340. An illustration of the machine with the key mechanism, as shown at the Electric Club, appeared in the 26 May 1888 issue of *Frank Leslie's Illustrated Newspaper* ("Novelties and Wonders at the Electric Club," 66:235). Edison later imagined, at least on paper, automating the process of lifting the spectacle from the cylinder (see Doc. 3289).

Phonograph shown in May at the Electrical Club; note the keys at right for stopping and starting.



21. The lever or thumbscrew slightly rotated what Edison called (in Doc. 3440) "an angle rod…placed in front of the straight edge," whose motion slightly lifted the sliding foot of the spectacle unit. See also Doc. 3433 n. 6.

22. See U.S. Pat. 448,781 regarding the wax trimming knife. The knife was moved to a new position in July, but its function remained

the same (see Doc. 3236 n. 1). Because loose chips of wax could cause problems (see Doc. 3267), printed instructions accompanying the machine instructed users to sweep them aside with a small brush ("never blow them away"). A small chute was added later to direct chips away from the cylinder surface. North American Phonograph instructions, n.d. [1889?], PPC (*TAED* CA028D); Doc. 3243 n. 3.

23. See U.S. Pat. 488,189.

24. See Docs. 3219 and 3223. Twelve applications were successful, though not all pertained directly to the phonograph machine itself. At least four others (Cases 793, 795, 796, and 797) relating in some way to wax cylinders, were not successful; see App. 5.

25. The ear tubes were necessitated by the new machine's emphasis on sensitivity rather than volume in its reproductions, unlike the old tinfoil phonograph. Hugh de Coursey Hamilton (who was assisting Gouraud) found that "If the tubes are not lengthened it does not diminish the loudness by increasing the capacity for listening at the same time, so that in exhibiting the Phonograph I allow six at once to hear as distinctly at though only one was listening." "Speech Recorders and Reproducers," *Iron Age* 42 (6 Sep. 1888): 340; Hamilton to TAE, 16 Sept.1888, DF (*TAED* D8850ADG1).

26. Time sheets for Arthur Colgate, 3 and 31 May 1888, Time Sheets, WOL; Derick Fitch to TAE, 31 May 1888; Gilliland to TAE, 12 and 20 June 1888; Fitch to Gilliland, 19 June 1888; Arthur Kennelly to Alfred Tate, 2 July 1888; all DF (*TAED* D8801AAK, D8848ACA, D8848ACE, D8801AAP, D8801AAT).

27. Cf. Doc. 3197.

28. See Docs. 3201 and 3202 (esp. n. 16).

29. See Doc. 3225.

30. Setting the cutting depth for turning off a cylinder became an automatic process, at least in Edison's estimation, by the end of 1889 (see Doc. 3440). In the meantime, there seems to have been at least one intermediate form of spectacle in which the cutting and playback depths were set manually according to built-in guides (see Doc. 3331 n. 3).

31. "A Perfect Phonograph," *San Francisco Bulletin,* 5 Sept. 1888, 4.

32. See Doc. 3200 (headnote).

33. See Doc. 3210 n. 5.

34. App. 1.F.18.

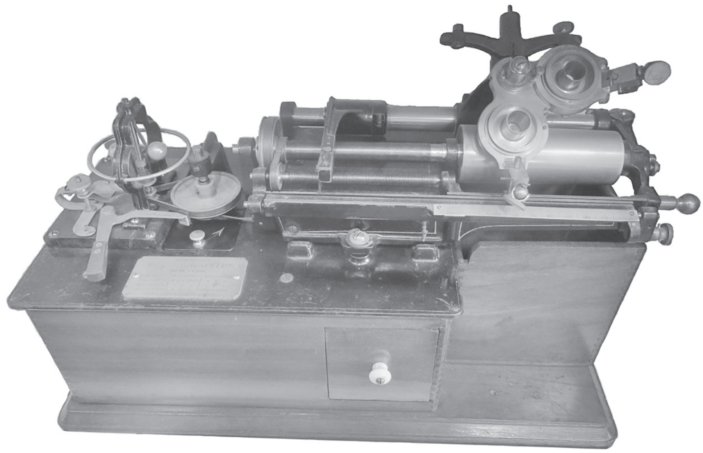
35. Dyer and Martin 1910, photo caption following p. 218; "The Napoleon of Invention," *Popular Science Monthly* 100 (May 1922): 22. The photo of a weary Edison with the machine became the basis for an iconic drawing by illustrator Richard Outcault.

36. Josephson 1959, 323–24 and photo following p. 320; cf. Dickson and Dickson 1894a, chap. 9.

37. Laboratory time sheets for weeks ending 19 April through 5 July; Time Sheets, WOL. Edison's monthly financial summaries of various projects show additional expenses for labor (and materials) not paid through the laboratory's payroll system. The editors conjecture that these charges may have been incurred at the small factory in Bloomfield.

–3209– [Orange, c. June 15, 1888]

Production Model: Phonograph[1]



M (51 cm long × 24 cm deep × 31 cm high), Miller, M.D.

1. See headnote above.

–3210– Orange, June 16, 1888[a]

To George Gouraud[1]

Ahem. In my Laboratory, Orange, New Jersey, June the 16th, 1888, three o'clock a.m.

Friend Gouraud,

Ahem. This is my first mailing Phonogram.[2] It will go to you in the regular United States mail from New York, *via* Southampton, North German Lloyd steamer Eider.[3] I send you by Mr. Hamilton a new Phonograph, the first one of the new model that has left my hands.[4]

It has been put together very hurriedly, and is not finished, as you will see. I have sent you a quantity of experimental Phonogram blanks, so that you can talk back to me. I will send you Phonograms of talk and music by every mail leaving here, until we get on to the best thing for the purpose of mailing.

Mrs. Edison and the baby are doing well. The baby's articulation is quite loud enough but a trifle indistinct; it can be improved, but is not bad for a first experiment.[5] With kind regards, Yours,

EDISON.

[P.S.][6] To Colonel George Edward Gouraud, Little Menlo, Beulah-hill, Upper Norwood, Surrey, England.

I should like you to keep quite private the details as to the construction of the Phonograph, *i.e.,* the new points, until I get my patents.

Send me some good music from England.

I hope you will talk to me by every mail. I shall be glad to be spared the labour of reading your writing.[7] Phonograms from you instead of letters will be a godsend.

PD (transcribed phonogram), "The Phonograph," *Standard* (London), 30 June 1888, item 39A, Clippings (*TAED* SC88039A1). [a]Place and date from document, form altered.

1. Gouraud transcribed these phonographic recordings and attached the text to a letter to the editor of the London *Standard* (see also note 6). The form of Edison's first message differs in a few respects from a typed carbon copy dated 12 June (TAE to Gouraud, 12 June 1888, DF [*TAED* D8818AMN]). The different dates and the absence of "Ahem" from the latter suggests that the carbon likely was a draft text from which Edison planned to speak, while Gouraud's version seems to have been transcribed from the actual recording. Gouraud apparently quoted from the first message to a meeting of the British Association in September, and his transcription was reprinted a few years later in an influential 1894 biography of Edison ("The British Association at Bath," *Mining Journal* 43 [22 Sept. 1888]: 1081; Dickson and Dickson 1894a, 133–34).

Gouraud announced the arrival of Edison's message—and of the phonograph machine—in a 26 June letter to the editor of the *Times* of London, referring to it as one of "the several long phonogramic communications to me," which evidently included Doc. 3212. His reply is Doc. 3218. "Mr. Edison's Phonograph," *Times* (London), 27 June 1888, 12.

2. According to the *New York Herald,* Edison showed reporters from Boston and the *Standard* (London) the new "mail phonograph," designed to facilitate experiments in shipping recordings across the Atlantic, on 15 June. Those experiments involved enclosing standard wax cylinders (2 inches by 4.25 inches long) in pasteboard cartons inside of wooden boxes. The early results were not encouraging. "Edison's Very Latest," *New York Herald,* 16 June 1888, 8; "Transatlantic Voices. What the Phonograms Bring over the Sea—How Can They be Mailed?," ibid., 17 July 1888, 8.

3. Mail for that day's sailing of the *Eider* was accepted until 6:30 a.m., and George Gouraud reportedly was aboard when the vessel raised anchor for Southampton at mid-morning. Edison reported (in Alfred Tate's words) that Gouraud left on the eighteenth with a phonograph, but that statement is seemingly at odds with Gouraud's subsequent account of the instrument's arrival at his house on 26 June, after his own

return there; more likely, Gouraud left as planned on the sixteenth and the instrument followed a day or two later ("Outgoing Steamships," *NYT,* 12 June 1888, 6; "Sailing for Europe," *NYT,* 17 June 1888, 9; TAE to Hannah Swan, 18 June 1888, DF [*TAED* D8818AMZ]; "Mr. Edison's Phonograph," *Times* [London], 27 June 1888, 12; "Edison's Very Latest," *New York Herald,* 16 June 1888, 8; cf. note 4). The *Eider* entered service in 1884 as one of the fastest ships of the North German Lloyd line (a principal Atlantic steamship company, formed by merger in 1857) on its Bremen-Southampton-New York route ("Arrival of the Eider," *NYT,* 3 Mar. 1884, 3; Drechsel 1994, 1:6–8; Gibbs 1952, 131–36.

4. Once back in London, Gouraud wrote at least two public letters about "why the phonograph in his possession cannot at once publicly be exhibited, as widely desired." One was published in the London *Standard* (see note 1), and another was quoted by the *Times* explaining that it was Edison's intent "to determine from actual experience as to the best form of phonogram and phonogram-envelope for 'mailing purposes.'" "Edison's Phonograph," *Times* (London), 30 June 1888, 9.

Alfred Tate would state that Hugh de Coursey Hamilton "went to England with Col. Gouraud," but Hamilton carried with him Edison's letter of introduction dated 17 June, a day after Gouraud's reported departure (cf. note 3). The phonograph's arrival at Gouraud's suburban London home on 26 June would fit with Hamilton's departure about 17 or 18 June. According to Edison's earlier draft of this phonogram (see note 1), he had originally planned to send the instrument on the thirteenth. Tate to Louis Glass, 28 June 1888, DF (*TAED* D8818ANY); TAE letter of introduction, 17 June 1888, Heitz (*TAED* X225AE); Gouraud to TAE, 27 June 1888, DF (*TAED* D8850ABR); "Mr. Edison's Phonograph," *Times* (London), 27 June 1888, 12.

5. Edison reportedly recorded the cries of his as-yet unnamed daughter Madeleine and, according to one account, intended to "take a record of the strength of the baby's lungs every three months." "Edison Experimenting with the Babe," *New York Star,* 2 June 1888; "Experimenting with a Baby," *Philadelphia Times,* 6 June 1888; both Clippings (*TAED* SC88025A, SC88026C); "Edison's Latest," *New York Herald,* 2 June 1888, 9; "Miss Edison's Lung Power," *New York Tribune,* 4 June 1888, 10.

6. This second message was appended by the *Standard* editors as a "Postscript to First Phonogram." It was not included in the version published in the 1894 biography by William K. L. Dickson and Antonia Dickson (see note 1).

7. For Edison's convenience, his office staff sometimes retyped letters received in Gouraud's notably poor handwriting.

–3211–

From Lewis Latimer

New York, June 16 *1888*[a]

Dear Sir

As the fourth of July is near at hand, I venture to hope you may deem the enclosed lines, a fit and proper speech for the Phonograph to make on the celebration of that day.

Trusting that you will not be <u>wasting</u> valuable time in reading them, I am Very Respectfully Yours,

L. H. Latimer[1]

<Tate= Write & thank him & say I will put it on & send Cylinder to England[2] Give to Miller—[3b] E[dison]>

ALS, NjWOE, DF (*TAED* D8847AAY). Letterhead of Edison Electric Light Co. [a]"*New York,*" and "*188*" preprinted.

1. Inventor and engineer Lewis Howard Latimer (1848–1928) was born in Massachusetts to escaped slaves whose legal peril drew the support of William Lloyd Garrison and other Boston abolitionists. He subscribed to a philosophy of racial uplift and assimilation, beliefs which shaped his technical career and animated his cultural interests, including his literary aspirations. After naval service in the Civil War, Latimer found employment in the office of Crosby and Gould, Boston patent attorneys (whose clients included Alexander Graham Bell), where he taught himself drafting and eventually became chief draftsman. Latimer met Hiram Maxim in 1880 and went to work for the U.S. Electric Lighting Co. in New York, for which he oversaw the installation of incandescent and arc lighting plants. He supervised manufacture of the firm's carbon lamp filaments (patenting several improvements himself) and, in 1881, he started a London lamp factory for the new Maxim-Weston Electric Light Co. Latimer designed his own incandescent lamp during a brief stint with the Olmstead Electric Lighting Co. of Brooklyn. Hired by the Edison Electric Light Co. in 1883, he worked in the engineering department from about 1885 and then was transferred to the company's new legal department about four years later on the strength of his comprehensive knowledge of the electric lighting business. After the formation of General Electric, Latimer became chief draftsman of the combined GE-Westinghouse Board of Patent Control in 1896, and he remained with General Electric until 1911. *ANB,* s.v. "Latimer, Lewis Howard"; Fouché 2003, chap. 3, esp. pp. 82–85, 107; Schneider and Singer 1995.

2. Alfred Tate sent a typed reply a few days later based on Edison's note. Only two recorded cylinders reached Gouraud by mid-July, and Latimer's text did not figure in the descriptions of the contents of either one (Tate to Latimer, 20 June 1888; Gouraud to TAE, 14 July 1888; TAE to Gouraud, 16 July 1888; all DF [*TAED* D8818ANA, D8850ABY, D8818APH]; see also Docs. 3212 and 3218, which is Gouraud's reply). One can only speculate what Latimer might have written to mark Independence Day, which was also the anniversary of his father's birth into slavery (Fouché 2003, 84). In July 1889, he sent Edison one of his poems. John Randolph thanked him and assured Latimer that Edison had "read it over very carefully and said it was d——m good" (Randolph to Latimer, 29 July 1889, LHL).

3. Edison probably meant Walter Henry Miller (1870–1941). A native of East Orange, Miller started as a machine shop apprentice at Edison's new laboratory in December 1887, initially working on a small dynamo. Years later, he recalled that the project "so please[d] Mr Edison, that he asked me to become a Phonograph expert." The editors have not learned what Miller was doing at this instant, but he was intimately involved with the phonograph by January 1889. He spent the remainder of his working life in sound recording for Edison, making critical contributions to the development of recording and playback devices and a process for copying recordings; he retired in 1931 as manager of the Recording Dept. of Thomas A. Edison, Inc. "Miller, Walter H.," Pioneers Bio.; Franck Maguire to Alfred Tate, 18 Jan. 1889, DF (*TAED* D8955AAC).

–3212–

Horatio Powers to George Gouraud

[Orange,] Edison's Library, June 16th, 1888.

Dear Colonel Gouraud,

Mr. Edison has kindly honoured me with an invitation[1] to give, in the Phonograph, an opinion of its merits.

The contemplation of its wonderful character and performances is overwhelming, and my feelings naturally seek vent in verse. But the Phonograph will speak for itself. Now listen to its voice,—[2]

ENCLOSURE[a]

[Orange, June 16, 1888][3]

THE PHONOGRAPH'S SALUTATION.[b]

I seize the palpitating air. I hoard
Music and Speech. All lips that breathe are mine.
I speak, and the inviolable word
Authenticates its origin and sign.

I am a tomb, a Paradise, a throne;
An angel, prophet, slave, immortal friend:
My living records, in their native tone,
Convict the knave, and disputations end.

In me are souls embalmed. I am an ear
Flawless as truth, and truth's own tongue am I.
I am a resurrection; men may hear
The quick and dead converse, as I reply.

Hail English shores, and homes, and marts of peace!
New trophies, Gouraud, yet are to be won.
May "sweetness, light," and brotherhood increase![4]
I am the latest-born of Edison.

HORATIO NELSON POWERS[5]

PL (facsimile), NjWOE, DF (*TAED* D8850ABQ1). [a]Enclosure is a PD (transcribed phonogram). [b]Followed by dividing mark.

1. The editors have not found such an invitation, but Powers had earlier conveyed the wishes of Gouraud (his brother-in-law) that the first new phonograph sent to England should "utter some words" appropriate to the occasion. Gouraud hoped to have messages from Edison and Mina, from Powers and his wife (Gouraud's sister), and "a poem suitable for the occasion." Powers offered "The Phonograph's Salutation," which he had completed by January 1888. Powers to TAE, 5 Jan. 1888, DF (*TAED* D8850AAD).

2. Gouraud incorporated a facsimile of the Powers letter and a typeset version of the poem into a printed program commemorating the arrival of "The First Phonogramic Poem" at "Little Menlo," his home in Surrey. The program stated that the poem was "spoken by the author into the phonograph at ORANGE, NEW JERSEY, U.S.A., 16TH JUNE, 1888." Gouraud also composed a letter to the editor announcing his receipt (on 26 June) of the recording and Edison's "first phonogram" (Doc. 3210). Gouraud played the Powers recording at an exhibition in late August and likely did so on other occasions as well (see Doc. 3244 n. 4). The Powers poem was also reprinted in the British press and inspired the London *Globe* to write a two-stanza supposed rejoinder from Edison with the refrain "Send me Mr. Gladstone's voice," which is sometimes ascribed to Edison (Dickson 1894, 136–37; cf. Picker 2003, 117).

3. The date refers to the recording—not the writing—of the poem, which Powers claimed in January was already complete (see notes 1–2).

4. Powers apparently quoted Matthew Arnold, who famously wrote that the ideal human life aspires "with all its organs after sweetness, light, and perfection!" Arnold 1869, 29–30.

5. Horatio Nelson Powers (1826–1890) was a noted poet, art critic, and Methodist-Episcopal minister who wrote for a number of periodicals, including regularly for *The Dial*. He was also Gouraud's brother-in-law and had introduced himself to Edison in 1881 and corresponded occasionally since then. Born in Amenia, N.Y., Powers was a graduate of Union College (1850) and the General Theological Seminary of the Protestant Episcopal Church in New York City. He was afterward ordained as a deacon of Trinity Church in the city and earned a doctor of divinity degree from Union College in 1867. Powers served as president of Griswold College in Davenport, Iowa (1864–1867) and of the Foundlings' Home in Chicago (1872–1874). From 1886 until his death, he was rector of Christ's Church in Piermont-on-the-Hudson, N.Y. He published several books, and a slightly revised version of "The Phonograph's Salutation" appeared in a posthumous collection. *ACAB*, s.v. "Powers, Horatio Nelson"; Obituary, *The Dial* 11 (Oct. 1890): 158; Powers to TAE, 5 Mar. 1881, DF (*TAED* D8120ZAI); Powers 1891, 69.

–3213– [Orange,] June 16 1888

Notebook Entry: Miscellaneous[1]

In Watts Dic under mercury are amalgams—[2] The Copper Hg Amalgam[a] used by Paris Dentists is plastic when powdered & Kneeded but hardens & can again be made plastic by powdering & Kneeding[3] Try phono Cylinder of it or wax paper etc coated.[b]

For Battery for phono

Try Copper troughs one filled with Hydride Copper other with oxide Copper=or if this dont work see if Hydride is a Conductor if so put in porous cell & use Copper pole—

also in Grenet Cell[4] use a Zinc filled with holes with mercury, or sulphate Hg—to keep it highly amalgamated Make ~~a~~2 Watson Cells[5] with low internal[6]— To get at proportions try Multiple arcing Reg Watson—

Make a storage battery with Hydride (solid) Arsenic as P pole & Carbon with depolzer or oxide Cu etc as neg—[b]

Ore Milling. Crush 150 mesh Roast & Crush 250 mesh & sift out with finest cloth or float, or after roasting pass down through Red Hot CO or H to reduce to Metallic Fe—

In seperator mix 100 mesh stuff with 50 pct of 80 mesh sand then after seperation sift out sand <good!>[b]

TAE

X, NjWOE, Lab., N-88-06-01.1 (*TAED* NA024AAE). [a]Obscured overwritten text. [b]Followed by dividing mark.

1. Two ambiguously dated lines of Edison's text at the top of the first page appear to be related to the prior entry (Doc. 3202); the editors have transcribed them there.

2. The 1872–1875 edition of Henry Watts's *Dictionary of Chemistry and the Allied Branches of Other Sciences* contained a substantial entry (longer than in some later editions) for "Mercury, alloys or amalgams of." Watts 1872–1875.

3. Watts 1872–1875 (see note 2) devoted two paragraphs to an amalgam of mercurous sulphate with a sulphate of "finely-divided copper" that was "used by the Parisian dentists for stopping teeth." This hard material had the unusual "property of softening and acquiring the consistence and elasticity of clay by continued pounding or kneading, and recovering its hard crystalline character when left to itself for a few hours." What suited it for dentistry was that it would neither expand nor contract in changing from a hard to a soft state or back again.

4. The Grenet or so-called "bottle battery" consisted of one zinc (negative) and two carbon (positive) plates suspended in a solution of potassium bichromate and sulfuric acid, typically in a flask or similar vessel. Portable and largely resistant to the polarizing effects of hydrogen gas, the cell produced a strong current and was recommended for medical purposes. Gage 1886, 189; Langley 1879, 161; cf. Doc. 3136.

5. The Watson cell, a copper sulphate battery, was introduced to the U.S. market in 1876. Like gravity cells (i.e., those having more than one

electrolyte) in general, it resisted polarization and produced a steady current, and it was also known for its low internal resistance. Doc. 1182 n. 3; Butler 1880, 302–3.

6. That is, small internal resistance.

–3214–

From Samuel Insull

Schenectady, N.Y. June 19th. 1888.[a]

My Dear Edison:—

I beg to draw your attention to a copy of a telegram[1] which I have just received from Mr. Frazar as follows:—

"Yokohama cables Edison's Japanese Iwadare[2] has contracted Westinghouse plant for Osaka, Japan; when you are next in New York call in my office; Iwadare represents new opposition Japanese Company."[3]

Iwadare, the Japanese in question, is the man who has been working for the Machine Works for three years. Several months ago we got him a position with the Rochester Co.[4] to give him an opportunity to learn the Central Station business. He left Rochester stating that he was sick, and another Japanese whom we had here, and whom you sent us to give a position, left here soon afterwards, stating that he was going to New York to nurse Iwadare. He has never returned.[5]

The action of Iwadare clearly shows that Mr. Frazar has been right in his statements that it would be fatal to our business to give the Japanese work in our shops. The one that has been treated better than anybody else, who has had every opportunity to learn our business, and who in fact has received that education which you stated would make the Japanese strong Edison friends, makes a deal with Westinghouse almost before he has left our employ.

Of course we will not take another Japanese in our establishment, but the trouble is we are "shutting the stable door after the horse has got out."[6] I would urge you very strongly to discharge the man you now have at Llewellyn Park.[7] You may not think he is getting any information, but you can rest assured he is getting information all the time. We looked upon Iwadare as an innocent kind of a boy, but from information which Mr. Frazar obtained when Prof. Fusioko[8] was here, it clearly showed that Iwadare was getting all the information he possibly could and transmitting it to his friends in Japan. I took no notice of Mr. Frazar's frequent requests that we should discharge all Japanese in our employ. I fear I have made a mistake in not listening to his appeals in the matter, and I am confident that you will make a very great mistake unless you take the same course that I am taking, namely, not allowing any Orientals in the establishment.[9] Yours very truly,

Saml Insull General Manager.

TLS, NjWOE, DF (*TAED* D8835ADD). Letterhead of Edison Machine Works; Samuel Insull, treasurer and general manager. [a]"*Schenectady, N.Y.*" preprinted.

1. The editors have not found the telegram, but Everett Frazar confirmed its contents in a letter to Edison on 21 June stating that Kunihiko Iwadare was gathering information to outfit a competing plant in Osaka (including dynamos, lamps, and fixtures from Westinghouse) and preparing to return to Japan (see note 2). Frazar concluded that "the Japanese cannot be at all depended upon; that after getting schooling in your establishments they are expected to turn out Edison disciples, but that, on the contrary, they are bound to make use of all information they can get and take just such goods as will suit their own purpose best. I am still of the opinion that you would do well to allow no Japanese to enter your employ. Far better that they should be referred to me. . . ." Frazar's letter went to the Edison Lamp Works, where Francis Upton forwarded it to Edison with his own endorsement of Frazar's recommendations. Edison wrote on Upton's cover letter: "File this as may want it when I bounce the Japanese." Upton to TAE, 26 June 1888, enclosing Frazar to Edison, 21 June 1888; both DF (*TAED* D8805ADW, D8805ADX); see also note 9.

2. After graduating from the Imperial Engineering College in 1882, Kunihiko Iwadare (1857–1941) worked at the Ministry of Industry as a telegraph engineer with supervisory responsibilities for telephone maintenance. He left in 1886 on a self-financed trip to the United States, where an acquaintance at Frazar and Co. introduced him to Charles Batchelor. That connection led to a placement in the Testing Room of the Edison Machine Works on Goerck St., and Iwadare followed the Machine Works to Schenectady in January 1887. In October of that year, while in New York City, Iwadare met a representative of what would soon be the Osaka Electric Light Co. (Osaka Dento), whom he advised to adopt an alternating current system to compete with the Tokyo Electric Light Co. (which Frazar and Co. served exclusively with the Edison system). Iwadare resigned from the Edison Machine Works in March 1888 and became chief engineer for Osaka Dento. Unable to close a deal with Westinghouse before sailing for Japan, Iwadare arranged for Thomson-Houston equipment instead and additionally gained exclusive rights for Osaka Dento to sell that supplier's equipment in Japan. While in New York, Iwadare also consulted with Harry Thayer of Western Electric, which was then seeking a relationship with the Japanese government. Eventually Iwadare handled the sales and manufacture of Western Electric equipment in Japan; in 1899 he co-founded the Nippon Electric Co., a forerunner of the NEC Corporation. Suzuki 2002, 7–9, 12–14; Mason 1992, 28–9, 31; "Iwadare, Kunihko," Pioneers Bio.

3. That is, the Osaka Electric Light Co. (Osaka Dento), which introduced the first alternating current system in Japan in 1889. W.

Smith 1894, 47; Minami 1987, 58.

4. The Edison Electric Illuminating Co. of Rochester was organized in April 1886. Among its first directors was Frank Hastings, who was intimately involved with Edison lighting enterprises. "More Light," *Rochester Democrat and Chronicle,* 21 Apr. 1886, 3; "Started on a Long Journey," ibid., 7 Aug. 1888:7; Docs. 2420 n. 24 and 2945.

5. Insull referred to Tei Hasegawa, an electrical engineering graduate of Imperial University in Tokyo. Hasegawa wrote to Edison from Schenectady in mid-July, claiming that John Kruesi had dismissed him from the Machine Works because of his friendship with Iwadare. Hasegawa disavowed Iwadare's intentions and, recalling that his introduction had come through the distinguished Ichisuke Fujioka, asked Edison for a new position, such as in the laboratory or the Lamp Works. Imperial University 1888, 171; Hasegawa to TAE, 11 July 1888, DF (*TAED* D8805AEJ).

6. A variation on an idiom of longstanding in English, the expression refers to the futility of trying to undo consequences of an event that has already occurred. *ODP,* s.v. "stable."

7. Insull meant experimenter Kiyoshi Sawai at the Orange laboratory.

8. Insull meant Ichisuke Fujioka (1857–1918), formerly a member of the engineering faculty at Kobu University and now chief engineer of the Tokyo Electric Light Company (Tokyo Dento). Fujioka likely was acquainted with Edison since 1884. His close working relationship with Tokyo Dento's president and dominant investor, Sakuro Yashima, led to the installation of a pioneering Edison plant at the Osaka Boseki Cotton Mills and a demonstration of arc and incandescent lighting at the Imperial Palace. They had toured United States—evaluating systems of electrical lighting, power, and transmission—and attended the February 1887 meeting of the National Electric Light Association in Philadelphia, where Fujioka announced forthcoming central stations in Tokyo, Osaka, Kyoto, and Nagoya, as well as capital expansion for Tokyo Dento. The company's first central station opened in November 1887, serving the Nihonbashi district of Tokyo, and three others were constructed in 1888, all using the Edison system. Doc. 2821 n. 5; Frazar and Co. to TAE, 22 Mar. 1886, DF (*TAED* D8630U); Minami 1987, 57–58, 149–50, 164; "The National Electric Light Association. The Meeting in Philadelphia," *Elec. and Elec. Eng.* 6 (Mar. 1887): 118; Fujioka 1887, 101; "Electrical Enterprises in Japan," *Journal of Electricity, Power, and Gas* 36 (20 May 1916): 385.

9. Insull would express to Alfred Tate his surprise about Edison's delay in dismissing the "Japanese now in his employ" because Edison had promised "that he would discharge him, provided I brought him the proof that Iwadare had gone back on us" (cf. notes 1 and 5). Insull held that Frazar's allegations about Iwadare were sufficient to act on, but Edison instructed Tate to "Tell Insull I want Mr Frazar to give me the proof but I cant discharge summarily a good man without some excuse." At the end of July, Frazar expressed concern that reports of Iwadare's contract with Westinghouse for a plant in Osaka (where a Thomson-Houston agent had also arrived) had discomfitted "Our Japanese friends of the Tokyo Electric Light Co." Edison instructed Tate to "write & say we will keep the Japanese out of our works hereafter & that Westinghouse plant will be a failure there on account of lightning

for which there is no protection in their system & none can be devised." Insull to Tate (with TAE marginalia), 28 June 1888; Frazar to TAE (with TAE marginalia), 31 July 1888; TAE to Frazar, 3 Aug. 1888; all DF (*TAED* D8805ADY, D8805AFE, D8818AQR).

–3215–

From Jesse Lippincott

[New York,][1] June 21, 1888.

My Dear Sir:—[2]

Referring to a conversation held with you a week ago I find that my associates are not satisfied to make the purchase coupled with all the conditions that you made. I will take them up in the order in which you penciled them.

First they are of the opinion that after paying you a large sum of money for what you now have, that they should not be obliged to pay a royalty for the use of what they already hold the title to.

Second. On account of my contract with the Graphophone Co. I am obliged to take so many instruments each year: That company is not willing to give you the exclusive manufacturing of said instruments.[3]

Third. We would of course agree not to sell any Phonographs for export except to Canada.

Fourth. "After date of turning business over any future improvements, on Phonograph to go to Company free, but any special Phonograph or special extra, which is sold as an extra Edison to get fifteen per cent royalty for invention, Clocks are excepted from all contracts." This we would agree to, the Patents coming to us.

Fifth. "Manufacturing, Duplicates records, publishing music Novels, Operas &c. for the Phonograph to be reserved to Edison's factory. This is to say if Edison succeeds in devising a process of printing duplicate records commercially valuable the Factory is to manufacture such duplicates at regular allowance or profit, that is twenty per cent of the cost, and Edison is to get fifteen per cent royalty," to this we agree the Patent coming to us.

Sixth. Both the Phonograph and the Graphophone to be put on the market, the former to be known as the Phonograph and the latter to be known as the Phonograph-Graphophone.

The Edison manufacturing Co. manufacture the Phonographs, supplies, &c., necessary for the United States and Canadian market, the orders for this territory to always have the preference, in date of execution over any orders for shipment to Foreign Countries. The E. Co. to receive 20% profit over actual cost on all Phonograph supplies &c.

Seventh. In regard to manufacturing Graphophones the Co. informed me that when they were prepared to let contracts for any considerable quantity of them, they will give the Edison manufacturing Co. the opportunity to estimate on them in other words to compete with other manufacturers for the work, at the present time they are being manufactured by the Western Electric Co.[4]

Eighth. The Company will probably adopt the course of both renting and selling instruments giving their patrons the option of either plan: They would not want to be absolutely committed to the price named by Mr. Edison but it is only natural to suppose that being competent business men, and having a large amount of money invested, they could not in their own interests afford to adopt a plan that would antagonize the public.

Ninth. In regard to experimental expenses we would be willing to allow fifteen thousand dollars the first year, ten thousand for second, seventy five hundred for third, and five thousand thereafter, for the next ten years. These expenses to be actual cost, making drawings constructing models and making experiments but to include no compensation or profit to Mr. Edison.

Tenth. The instrument herein referred to as the Phonograph to be the instrument or machine as manufactured by Mr. Edison at this date. One of which is to be immediately put in my possession.[5]

Eleventh. I am to have the right to require you to place upon any Phonographs manufactured by you, to be put upon the market by me, such names, numbers, and dates of Patents as in the opinion of my Counsel, shall be necessary for the protection of said Patents under the law.

If you are willing to accept the modified conditions as indicated in this proposal, as the basis of an agreement and as a sale, I am authorized to offer you the sum of five hundred thousand dollars to be paid as follows.

One fourth in sixty days from date of signing preliminary agreement, one fourth in ninety days from same date, and the remaining two hundred and fifty thousand dollars in four months from same date. You to deliver only the capital stock of the Edison Phonograph Company and the certificate you hold for twelve hundred shares of the Edison Speaking Phonograph Company and five shares in same Company held by

Mr. Batchelor we purchasing the balance of the stock of the Edison Speaking Phonograph Company and no part of the money paid to you to be used for that purpose. In other words, the half of million of dollars to go to you clean and clear.[6]

TD (copy), NjWOE, Misc. Legal (*TAED* HX88035E).

1. Lippincott wrote from his office in the seven-story Guernsey building at 160 Broadway. Landau and Condit 1996, 94.

2. See Doc. 3200 (headnote). Except as noted, the provisions outlined in this document were largely embodied (explicitly or implicitly) in one or another of the following: the principal contract with Lippincott that Edison signed on 28 June, a second major agreement with Lippincott and the North American Phonograph Co. that he signed on 1 August, and a complex series of ancillary agreements to align the rights of the various interested parties (including the Edison Phonograph Works and the Edison Phonograph Co.) over the intervening six weeks. The 1 August contract specified (art. 3) that the phonograph and "phonograph-graphophone" were to remain distinct instruments in all respects. TAE agreement with Lippincott, 28 June 1888; TAE agreement with Lippincott and North American Phonograph Co., 1 Aug. 1888; both *New York Phonograph Co. v. National Phonograph Co.*, pp. 854–59, 866–70; Lit. (*TAED* QP0100854, QP0100866).

3. Lippincott and the American Graphophone Co. had reached a fifteen-year sales agreement in March. The company was to provide him with at least 5,000 instruments per year (after the first year) at specified prices above the cost of manufacture, which he could sell in the United States and Canada (with the initial exception of Illinois, Wisconsin, and Michigan). Lippincott had no manufacturing privileges unless the company proved unable to supply the required number. Unlike his arrangement with Edison, he was a personal licensee and acquired no ownership rights to graphophone patents or stock. Lippincott agreement with American Graphophone Co., 26 Mar. 1888, Misc. Legal (*TAED* HX88018A); Wile 2004, 3–4.

4. The Western Electric Manufacturing Co. had contracted to make 300 graphophones over the winter but struggled to complete the order and was not eager to enter into a subsequent agreement. A principal maker of telephones, telegraphs, and other precision equipment in Chicago and New York, the firm started as a partnership of Elisha Gray and Enos Barton in 1869. It was reorganized in 1872 as Western Electric to reflect its close supplier relationship with the Western Union Telegraph Co., which acquired a good portion of its stock. It had since also contracted with Edison (for manufacturing electric pens) and Sholes & Glidden (typewriters) and, increasingly since about 1880, the Bell Telephone Co. Partly through the intercession of Ezra Gilliland, whose own manufacturing firm was unable to keep up with Bell's needs, Western Electric became Bell's principal supplier and eventually an integral part of the Bell system. Wile 1991, 24; Uriah Painter to Edward Johnson, 29 Jan. and 27 Feb. 1888, UHP (*TAED* X154A7AP, X154A7BC); Adams and Butler 1999, chaps. 1–2; see Doc. 817 regarding the electric pen.

5. Lippincott had photographs of the definitive phonograph by 13

July and expected the actual machine to be shipped to him the next day. Edison was also to have a graphophone for reference, which he acknowledged receiving by 16 July. Lippincott to Austin Herr, 13 July 1888, *Edison v. Hardin,* p. 118, Lit. (*TAED* QP009A118); Lippincott to TAE, 17 July 1888, DF (*TAED* D8848ACV).

6. According to the first article of the final agreement of 28 June (see note 2), Edison was to reserve $22,500 to buy back the 150 stock shares in the Edison Phonograph Co. held by Mary Hemenway of Boston. The muddled matter of the old Speaking Phonograph Co., including the value of its stock and what claims it might have on the inventions Edison was selling, remained unresolved through the summer, leaving Lippincott in a precarious position. Edison Speaking Phonograph Co. minutes, 25 July 1888; Uriah Painter to Josiah Reiff, 19 Aug. 1888; Edward Johnson to Reiff, 20 Aug. 1888; Lippincott to Johnson, 23 Aug. 1888; all UHP (*TAED* X154A7DK, X154A7DL, X154A7DN, X154A7DS).

–3216–

Charles Batchelor to Theodore Seward[1]

[Orange,] June 25, 88.

Dear Sir:—

In answer to your letter to Mr. Edison of June 23rd,[2] would say that the speaking capacity or time limit of the doll phonograph, as we are at present making the models, is about six or eight seconds, sufficient to be able to get on a small verse such as "Jack and Jill"[3] or "Mary had a Little Lamb." Of course it can be made to take much more, but at present that is what we are doing for the models.[4] Yours truly,

Batchelor

TLS (carbon copy), NjWOE, DF (*TAED* D8818ANS).

1. Musical educator and editor Theodore Frelinghuysen Seward (1835–1902), a distant cousin of the late cabinet secretary William H. Seward, was supervisor of music in the Orange, N.J., public schools and simultaneously the editor of *Musical Reform* and manager of the New York–based American Vocal Music Association. In 1888, he was appointed professor of vocal music at Teachers College in New York. Seward had studied music with Lowell Mason and George F. Root and briefly taught in New London, Conn., before moving to New York in 1862 to compile songbooks, one of which, *The Temple Choir,* sold more than 100,000 copies. He also became associated with the Fisk Jubilee Singers, an African-American *a cappella* ensemble of Fisk University students. After the group performed in New York in 1871, Seward was selected to transcribe their repertoire of spirituals and folk music. His 1872 compilation of *Jubilee Songs* was reissued in various forms with an increasing number of transcriptions that were considered authoritative for decades. *ANB,* s.v. "Seward, Theodore Frelinghuysen"; "Theodore F. Seward Dead," *NYT,* 1 Sept. 1902, 7; J. H. Hall 1914, 135; University of the State of New York 1897, 586; Leonard 1914, 732.

2. Two days earlier, Seward had written Edison that Lowell Briggs,

treasurer of the Boston-based Edison Toy Manufacturing Co. (and a licensee of Edison's phonograph patents), had expressed "much interest in my plan for the doll's conversation & is to have a conference with me the next time he comes to Orange." In preparation, Seward wanted to know the toy's "speaking capacity" in both the number of words and length of time. Seward to TAE, 23 June 1888, DF (*TAED* D8847ABB); Doc. 3076 esp. n. 7.

3. Cf. Doc. 3262.

4. Edison reportedly told the *New York World* that the doll could speak for up to one minute. An article published on 23 June stated that "the homely little prayer that John Quincy Adams uttered while dying—'Now I lay me down to sleep'—has just time to issue from its ruby lips before the instrument stops." According to the *World,* Edison explained that

> [The] baby's voice is an exact representation of the human voice. In fact, it is my own voice, for I speak to the phonograph, and the record is made of the tones of my voice upon the little waxen cylinder. Then, by an ingenious contrivance connected with one of the arms of the make-believe baby, the machanism is started in motion. . . . The accurate gauging of the utterances of the doll, so that they would come within the one-minute limit, has cost me a great deal of time and labor. ["Edison's Talking Baby," *New York World,* 3 June 1888, 16, Clippings (*TAED* SC88038a)]

The same article described the talking baby as "most perfect mechanical device. It is a wax doll of beautiful workmanship. The jaws are hung so naturally that one unacquainted with the fictitious character of the doll would imagine that they belonged to a genuine flesh and blood infant."

–3217–

George Parsons Lathrop to Alfred Tate

New London June 27/88.

Dear Tate:

Wiman[1] wants to know at once whether any arrangement can be made for Amusement Phono.[2] His man, Baldwin[3] has just written to me; & I have written to Edison by this mail.[4]

I shall be in N.Y., on my way to Gettysburg,[5] <u>Friday afternoon & evening</u>, & shall stop at the Murray Hill Hotel (41st St. & Park Avenue).[6] Can you not bring me, there, some decisive word from Edison? If he will make a definite contract with me, & let me close one with Wiman, I will attend to raising the money to pay for the machines. Wiman will pay a percentage on gross receipts, beginning at 30% & running up to 50% according to rate of receipts. This percentage can be divided up between Edison, Gilliland, the Phono Co., & the other parties in interest; so that all will share the same as if they held stock in a company, & without any of the bother & cost of running a separate company.

If nothing is done, now, probably the Graphophone will get hold of Wiman & grab the field. It seems to me it would be a great mistake to let them do so. It would injure Edison, Gill., & the Ed. Phono. Co., & would also be throwing away a business which can bring in from $1000 to $5000 cash per week.

Please make an effort to get at something definite & either see me at Murray Hill Hotel Friday P.M., or get a note to me there with full information.

I want to see you also about the proposed book.[7] Have heard from Clemens.

I leave for Gettysburg, Sat'y, 9 A.M.[a] Sincerely yours

G P Lathrop.

ALS, NjWOE, DF (*TAED* D8848ACM). [a]Obscured overwritten text.

1. A business associate of Edison's since the early 1880s, Erastus Wiman (1834–1904) was a Canadian journalist who became a financier and land promoter in the United States and helped develop housing, recreation, and transportation on Staten Island. Wiman was a partner and general manager of the credit reporting firm R. G. Dun & Co. A powerful figure in the telegraph industry (as president of the Great North Western Telegraph Co. of Canada and a director of Western Union), he had helped in Edison's efforts to commercialize the phonoplex and railway telegraph systems. He had also been a director of the Edison Electric Light Co. and related concerns. Docs. 2692 n. 1 and 2810 n. 1; *DCB,* s.v. "Wiman, Erastus."

2. The details and intended principals of such a prospective company remain unclear, but it presumably would employ the "amusement machine" mentioned in Doc. 3199. Lathrop knew of the idea by 12 June, when Edison suggested (in Lathrop's words) that "there should be a conference of all parties concerned in Amusement Phono. Co. matters, to meet here [at Orange] as soon as possible." Edison reportedly told the *New York World* soon afterward that he intended the new company "to make a regular business of the publication of music for use upon the phonograph, and already I have in view an enterprising publisher in New York to handle it for me and place it on the market. Of course, this will not be printed music, but merely impressions upon the wax cylinders of the phonograph." The idea is one that might have appealed especially to Wiman and his Staten Island Amusement Co. syndicate (see Doc. 2840 n. 12), and it was consistent with Edison's ongoing efforts to duplicate recordings. Edison decided just at this time to purchase the piano that he had borrowed for experimental recordings. At the same time, he was concluding the sale of phonograph rights to Jesse Lippincott (from which he specifically excepted the reproduction or publication of commercial recordings [see Docs. 3182 and 3215]), and little more seems to have been done about the proposed Amusement Co. Lathrop to Alfred Tate, 12 June 1888; Ezra Gilliland to TAE (with TAE marginalia), 27 June 1888; both DF (*TAED* D8848ABZ, D8848ACN); "Edison's Talking Baby," *New York World,* 3 June 1888, 16; Feaster 2007 (pp. 142–44) discusses the *World* article, the Amusement

Co. generally, and the ambiguity of U.S. copyright law regarding that sort of sonic publication (see also Doc. 3226).

3. Leroy Wilbur Baldwin (1865–1939), a native of Vermont, was associated with Wiman in organizing the American Automatic Weighing Machine Co., which controlled coin-operated scales. Baldwin later was an executive of numerous companies, among them the Empire State Trust Co., of which he was the founder and president. Carleton 1903, 1:380; "Leroy W. Baldwin, Empire Trust Head," *NYT,* 7 Mar. 1939, 18; "Leroy Wilbur Baldwin," *Successful American* 7 (July 1903): 424.

4. The editors have not found either letter.

5. Lathrop was among the dignitaries at ceremonies marking the twenty-fifth anniversary of the Battle of Gettysburg. He wrote a poem to read aloud on the occasion, but he became ill and instead headed to New York. "United at Gettysburg," *NYT,* 3 July 1888, 1; "Meade's Great Mistake," *NYT,* 4 July 1888, 1; cf. Doc. 3226.

6. The Murray Hill Hotel, on Park Ave. between 40th and 41st Sts., was designed by Stephen Hatch and opened in 1884. With 600 guest rooms on eight floors, it counted Mark Twain and Jay Gould among its celebrity guests. Hirsh 1997, 29.

7. A few days earlier, Lathrop informed Tate that he had left a note for author Samuel Clemens "broaching the subject of the memoirs." He advised Tate to "canvas the idea a little with T.A.E., so as to get a basis ready, & secure control of the work for ourselves." Lathrop evidently intended to write Edison's autobiography himself (possibly passing himself off as merely the "editor & compiler"). Tate replied on 28 June that he had not yet brought the matter to Edison's attention (nor did he mention the proposed Amusement Co.). Clemens's publishing house, the Charles L. Webster Co., ultimately did not find the autobiographical project acceptable. In 1890, Clemens and Frederick Hall, director of the Webster Co., discussed a possible Edison book on electricity aimed at a popular audience. "I don't think much of the Edison book suggested," Clemens told Hall, "still as a trade book it might pay for the plates, & even a little profit, maybe. [I am supposing of course that <u>he</u> doesn't write it. He couldn't. Never has a minute. Still, if you will remind me next time I am down, I will send Geo. Lathrop to ask him if he will dictate a book for us into the phonograph. I should think he could do that.]" But this book, too, did not materialize. Lathrop to Tate, 22 June 1888; Tate to Lathrop, 28 June 1888; both DF (*TAED* D8805ADT, D8818ANW); Twain 1979, 3:548–49 esp. n. 198; Clemens to Hall, 15 Oct. 1890, UCCL 04557.

–3218–

From George Gouraud

Little Menlo, Beulah Hill
Upper Norwood, England. 30th June 1888

<u>FIRST PHONOGRAM FROM EUROPE TO AMERICA</u>.[1]

Colonel Gouraud to Mr Edison.

Dear Edison,

Ahem. I cabled you the due receipt of your first Phonogram.[2] It was an indescribable sensation to us all to hear perfectly distinctly the familiar tones of your voice here in England 3000 miles from where you had spoken, and ten days after.

It is not too much to say that this event marks a new era in civilization. Everyone present who was familiar with your voice recognized it perfectly.[3]

The entire press [––~~has~~?][a] chronicled this latest triumph of your genius in appropriate terms.[4]

I am literally bombarded with letters and besieged ~~with~~ by visitors.

Everybody who sees or rather hears the Phonograph is of course delighted and astounded.

I predict for the Phonograph a success beyond all precedent.

What a blessing it is to be able to say all this to you without the trouble of writing, to say nothing of sparing you the trouble of reading my writing. <ha, ha, ha!>[b]

I congratulate you with all my heart.

My wife[5] and children[6] join cordially with me in kind regards to you and yours. Very sincerely yours

George Edward Gouraud

P.S. Hamilton is well and showing his characteristic zeal and energy.

TL (transcribed phonogram), NjWOE, DF (*TAED* D8850ABS1). [a]Canceled by hand. [b]Marginalia written in an unidentified hand.

1. This document is a transcription of Gouraud's recorded reply to Doc. 3210 and was later published in the *New York Herald*. Gouraud enclosed it with a note indicating that he had mailed two recordings of his message by different postal classes: "My first Phonogram to you is sent to-day per sample post [used for printed matter] and letter post. Please advise me in what condition they are received. If you deem it advisable to publish my first phonogram, kindly send me copies of the papers." Gouraud to TAE, 30 June 1888, DF (*TAED* D8850ABS); "Transatlantic Voices. What the Phonograms Bring over the Sea—How Can They be Mailed?," *New York Herald,* 17 July 1888, 8.

2. The editors have found only one relevant cable. Written on 26 June but not sent until the next day, it seems to refer to the quality of sound from the phonograph machine, which likely had been shipped separately from the phonogram. It read: "First phonograph received today every word perfectly clear and distinctly understood by every member of my family including child seven years old accept heartiest congratulations on this unparalleled triumph of mind over matter." Having apparently received both Edison's recording and the improved phonograph at about the same time, Gouraud again used the word "phonograph" (rather than "phonogram") and recycled phrases from this paragraph in his announcement to the *Times* of London. Gouraud

to TAE, 27 June 1888, DF (*TAED* D8850ABR); "Mr. Edison's Phonograph," *Times* (London), 27 June 1888, 12.

3. In addition to himself and Hugh de Coursey Hamilton, three females and two juvenile males are present in a group portrait from the initial playing of Edison's recorded voice on the first "perfected phonograph" received in England. The editors have not identified the women individually, but one likely was Gouraud's wife; the youngsters were their sons (see note 6). When this portrait appeared on the front page of the *Illustrated London News,* it was paired with an additional engraving from the 29 June demonstration at the Handel Festival in London's Crystal Palace, in which Hamilton also appeared. "The Edison Phonograph," *Illustrated London News,* 93 (14 July 1888): 29–30, 82.

4. Gouraud later sent Edison a copy of his letter to editors, noting that most London evening papers and a number of provincial papers had published it in part or full. It was also copied by the American press. Gouraud to TAE, 14 July 1888, DF (*TAED* D8850ABZ); Picker 2003, 186 n. 19; "Edison Talks in England," *New York World,* 28 June 1888, Clippings (*TAED* SC88020B).

With recordings of Docs. 3210 and 3212 in hand, as well as an unspecified number of instrumental cylinders sent at the same time (pianoforte, cornet, and violin, some of which had already been played "several hundred times"), Gouraud promptly invited a correspondent of the London *Times* to listen to them. While finding the reproduction of Edison's voice "feeble," the writer noted that it was readily differentiated from Gouraud's, marking a distinct improvement over tinfoil recordings. The reporter also remarked that "It would be difficult, at first sight, to exhaust in imagination the possible applications of such an apparatus. The power of fixing and reproducing human speech will form an era in the history of civilization." "Mr. Edison's Phonograph," *Times* (London), 27 June 1888, 12; "Mr. Edison's Phonograph," ibid., 30 June 1888, 5.

5. Married since April 1870, Florence Willis Gouraud (1846?–1907) was a native New Yorker whose maternal ancestors included Col. Giles Jackson of the first Continental Congress. Her father, George Snow, was financial editor at the *New York Tribune* before his death. Willis Snow, perhaps her brother, conducted some business on behalf of Edison's Indian and Colonial Electric Co. "Married," *NYT,* 23 Apr. 1870, 5; U.S. Census Bureau 1967? (1860), roll M653_819, p. 1153, image: 562 (New York Ward 21, N.Y., N.Y.); E. Hall 1893–1894, s.v. "Gouraud, George Fauvel"; "Fate of George N. Snow," *New York Tribune,* 28 Sept. 1866, 4; Willis Snow to TAE, 11 Aug. 1882, DF (*TAED* D8240ZAF); "Col. George Gouraud's family tree," (trees.ancestry.com/tree/84927518/family) curated on Ancestry.com by Chris Goddard (webrarian 2009) and accessed 21 Oct. 2016.

6. The two oldest sons of Gouraud and his wife, George Fauvel Gouraud (1872–1915) and Jackson Gouraud (1874–1910), may have boarded at the Harrow School around this time; by 1895 the eldest was associated the Edison United Phonograph Co. Two younger sons, Powers Gouraud (1881–1954) and Bayard L. Gouraud (1879–1912), were likely the boys shown in the illustration of the phonograph's arrival at the Gouraud home in late June, with Powers being the child mentioned

in Gouraud's congratulatory cable to Edison (see notes 2–3). Florence Theodora Gouraud (1879–1943) was the couple's sole surviving daughter, their first-born, Clemence Gouraud (d. 1871), having died in infancy. The youngest child was a son, Manfred Gouraud (1885–1965). "Col. George Gouraud family tree" (see note 5) esp. "Florence Willis Snow" profile, accessed 21 Oct. 2016; Picker 2003, 185 n. 14; Stedman 1900, 795; Welch and Dauglish 1901, 597; William Gilmore to TAE, 4 March 1895; TAE to Jackson Gouraud, 12 Dec. 1898; both DF (*TAED* D9523AAL, LB063293).

–3219–

Patent Application: Phonograph

[New York,] June 30, 1888[1a]

To all whom it may concern:

Be it known that I, Thomas A. Edison, a citizen of the United States residing at Llewellyn Park, in the County of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs (Case No. 783), of which the following is a specification.[2]

The object I have in view is to enable the transmission of phonograph records from place to place and the reproduction of the sounds upon different machines. This necessitates the construction of a phonograph and a phonogram blank which will enable the phonogram blank to be removed from the machine upon which the record is produced and to be adapted to be again placed upon the same machine or another machine and have the sounds reproduced from the record.[3] I have constructed removable phonogram blanks in various shapes, as flat plates with the record formed in a volute line, and as cylinders with the record describing a spiral line upon their external surface.

I prefer to use cylindrical phonogram blanks made entirely or having a recording surface made of wax or a wax composition. These blanks have cylindrical outer or recording surfaces and are preferably provided with tapering bores which fit upon phonogram cylinders having a corresponding taper. The blanks hold themselves in position by the friction of the tapering surfaces.

My invention, however, is not limited to any particular form of the blank or of the blank carrier or any special form of the phonograph apparatus, since the feature of the removable phonogram blank can be embodied in a great variety of forms of blank and constructions of apparatus and has been so embodied by myself.

In the accompanying drawing forming a part hereof, an apparatus is shown for illustration embodying my invention.[4]

Figure 1, is a top view of the phonograph. Figure 2, is an elevation of the same, with the rocking holding arm thrown back, and the phonogram blank in section. Figures 3 and 4 are sectional views of the recorder and reproducer; and Figure 5 is an elevation of the cylindrical phonogram blank having a sound record thereon.

Fig. 1[b]

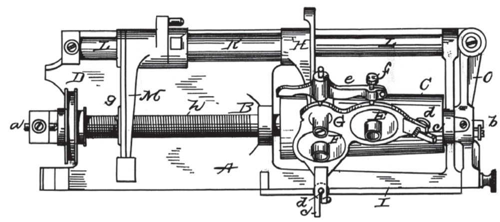


Fig. 2.[b]

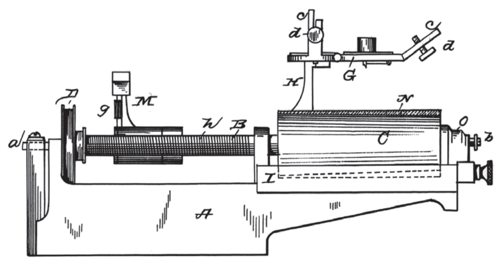


Fig. 3.[b]

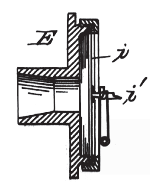


Fig. 4.[b]

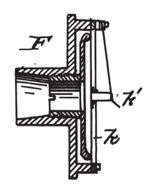
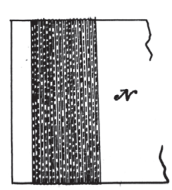


Fig. 5.[b]



A is the frame of the machine upon which is mounted in centers a b, a shaft B, carrying on one end, the smooth surface tapering phonogram cylinder C. The other end of the shaft is provided with a wheel D by which the shaft is connected with any suitable source of power for giving it a uniform movement of revolution; the power may be an electric, a spring or other form of motor, a hand wheel or a treadle. E and F are the recorder and reproducer, which are mounted in the eyes of a spectacle frame G pivoted upon the head of the rocking holding arm H. The spectacle frame G is swung laterally to bring either the recorder or reproducer into operative relation with the phonogram cylinder. Each eye on the spectacle frame has a finger c, provided with a set screw d; these set screws rest alternatively on a guide rest I, which is secured to the frame of the machine in front of the phonogram cylinder and parallel with the axis thereof. The head of the rocking holding arm H is provided with a laterally extending arm e having a set screw f. When the reproducer is swung into position for operation the eye of the spectacle frame that carries it strikes against the set screw f, and by adjusting this set screw the point of the reproducer is adjusted laterally across the track of record so that it can be given the proper adjustment with respect to the record for the efficient reproduction of the sounds. The rocking holding arm H is secured to the sleeve K, which is mounted upon a stationary rod L secured to the frame of the machine in rear of the shaft B and phonogram cylinder C and parallel therewith; the other end of the sleeve is provided with a guide arm M carrying on its free end a toothed block g, which engages with a fine screw thread h cut on the shaft B between the cylinder C and wheel D. The recorder E is provided with a diaphragm i and a recording point i′. The reproducer F is provided with a diaphragm k and a reproducing point k'. The reproducing point is approximately about half as wide as the recording point, so that the reproducer will be given a margin of adjustment in adjusting it to the track of the record made by the recorder of the same or a different machine.[5] N is a phonogram blank, which is a cylinder of wax having a tapering bore and adapted to be slipped on the phonogram cylinder C and to be readily removed therefrom, the friction of the surfaces being sufficient to retain the blank in position. The center b is mounted on a swinging arm O to permit the phonogram blank to be placed upon or removed from the phonogram cylinder or blank carrier.

A phonogram blank being placed upon the cylinder the shaft and cylinder are revolved and the spectacle frame is swung so as to bring the recorder into position for operation; then by adjusting the screw d, the recording point will be lowered until it touches the surface of the phonogram blank. As the machine is illustrated the record is started at the left hand end of the blank and is finished at the right hand end. A proper speaking tube is attached to the recorder and the matter to be recorded is spoken into it, the revolution of the phonogram cylinder being continued and the recorder being fed forward by the feed screw h. When the record is completed the rocking holding arm is thrown back into the position shown in figure 2, and the cylinder may be stopped revolving or it may continue to revolve. The phonogram blank is slipped off of the cylinder and a new blank put in its place when an additional record can be made. These blanks having the records thereon may be transmitted to a distance and placed upon other machines or they may be placed upon the same machine. When it is desired to reproduce the sound one of the blanks with a record upon it is placed upon the phonogram cylinder and the spectacle frame is swung to bring the reproducer into operative relation with the record; the screw d is then adjusted until the reproducing point touches the surface, when by adjusting the screw f the lateral position of the reproducing point is varied until it is determined by listening that the best adjustment has been obtained; by elevating the rocking holding arm by the finger c the reproducer can be set to any part of the record or set back to repeat any portion of the record which has not been understood.

What I claim is:

First: In phonographs, a removable phonogram blank, substantially as set forth.

Second: In phonographs, a phonogram carrier adapted to receive a removable phonogram blank, substantially as set forth.

Third: In phonographs, the combination with a phonogram blank carrier, of a removable phonogram blank, substantially as set forth.

Fourth: In phonographs, the combination of a phonogram blank carrier adapted to receive a removable phonogram blank, with separate recording and reproducing instruments, substantially as set forth.

Fifth: In phonographs, the combination with a phonogram blank carrier adapted to receive a removable phonogram blank, of a reproducer and means for adjusting the reproducer laterally across the track of a record, substantially as set forth.

This specification signed and witnessed this 30th[c] day of June[c] 1888.

Thos. A. Edison[d] Witnesses: William Pelzer[6d]
A W Kiddle[7d]

TD (carbon copy), NjWOE, PS (*TAED* PT032ABB). Document multiply witnessed. [a]Date from document; form altered. [b]Figure designations written by hand, probably by Edward Rowland. [c]Written by hand, probably by William Pelzer. [d]Signatories' names written by hand, probably by William Pelzer.

1. This application was prepared by patent attorneys Richard Dyer and Henry Seely, whose office was at 40 Wall St. in New York; the editors have not found a draft version. Edison signed three other applications on this day that resulted in patents. See App. 5.

The phonograph described and illustrated below has some basic similarities to the one exhibited in May and the redesigned one completed in June (see Doc. 3209 [headnote]) but lacks a major feature common to both: a coarse screw thread for returning the spectacle to the start or any previous position on the cylinder. Such a provision would be especially useful for typing from dictation.

2. This application was filed on 7 July. The Patent Office examiner promptly declared that it would have to be divided because the first claim covered a phonogram blank whereas the others pertained to the phonograph machine itself. In any case, he advised that all claims would be rejected on the basis of prior phonograph patents to Edison (U.S. Pat. 382,416) and Charles Tainter (U.S. Pat. 380,535). After Edison modified the claims and swore an affidavit that his invention predated Tainter's patent, the application was again rejected on the basis of the Edison patent, another to Tainter (U.S. Pat. 341,288) and one to Christopher Reynolds (U.S. Pat. 287,166) from 1883. Edison swore another affidavit to push the date of his invention back to 1883 but the examiner issued a final rejection on the basis of the Edison patent already cited and another (U.S. Pat. 386,974) that had issued in the meantime, on 31 July. Edison swiftly appealed to the Board of Examiners. When that effort failed, he appealed in September 1890 to the Commissioner of Patents, who upheld the rejection in January 1891. Patent Office to TAE, 25 Aug., 10 Oct., 5 Nov. 1888, 18 Feb. 1889, and 7 Jan. 1891; TAE to Patent Office, 3 and 23 Oct. 1888, 6 Feb. 1889, and 2 Sept. 1890; all Patent Case File, PS (*TAED* PT032ABB).

3. As Edison makes clear in the text below, the adaptation or adjustment was on the part of the phonograph machine (by means of set screws), not the cylinder itself. The level of standardization required of phonographs touched on broader questions of large-scale precision manufacturing. Interchangeability of parts, both in assembly and for repair, bedeviled makers of machines such as bicycles, sewing machines, and farm equipment, and it was a problem that Edison had encountered in the design and manufacture of his stock printer in 1871 (Doc. 195 [headnote]). The accepted solution, and the one that Edison adopted in this application, was to allow tolerances for some adjustment

at the last minute. The phonograph was a particularly complex case, in that Edison anticipated an ongoing interchange of unique recordings with a series of different machines, each of which had to be adjustable to accommodate the next record placed on it. On the characteristics and challenges of the so-called "American system" of manufacture using interchangeable parts, see Hounshell 1984 (introduction) and Hoke 1990.

4. Draftsman Edward Rowland traced all five figures onto a separate page on 28 June under the case number heading "783." He and William Pelzer signed that page as witnesses.

5. Recording so as to leave a "margin" for the reproducing point was an element in one of the other patent applications that Edison signed on the same day. That case issued in April 1889 as U.S. Patent 400,647.

6. William Pelzer (1870?–1955) worked as a clerk or assistant for Dyer & Seely, with whom he later practiced. With former Edison assistant Harry Ward Leonard, Pelzer helped to organize an electrical manufacturing and sales firm, the Ward Leonard Electric Co., in 1896. In the twentieth century, he was connected with the National Phonograph Co. and other Edison-related firms. Doc. 3098 n. 7; "General News," *Electrical World* 27 (16 May 1896): 584.

7. Alfred Watts Kiddle (1865–1935), an assistant to Dyer & Seely since at least 1884, had recently graduated from the law school of Columbia College and been admitted to the New York bar. He went on to work as an attorney for the Edison Electric Light Co. and in his own practice. Doc. 2673 n. 4.

–3– July–September 1888

The phonograph, which Edison had "perfected" in June, was becoming one of the more difficult ventures in his long experience of bringing inventions to market. He spent much of the summer improving vital ancillary items, especially the cylinders on which the sound was recorded. In July, he adopted the idea of making cylinders out of metallic "soaps," wax-like compounds with the right properties of elasticity, hardness, and temperature stability to receive and retain the microscopic marks made by sound waves.[1] The new materials entailed further changes to the mechanism.[2] In tandem with George Gouraud, his ever-optimistic agent in Britain, he tested methods of sending cylinders through the transatlantic mails.[3] He also continued to toy with the idea of recording on flat discs.[4] Much of the laboratory's summertime work on the phonograph was encapsulated in an extraordinarily long caveat. Edison's draft, dated 21 September, filled more than fifty looseleaf pages with handwritten text, and there were more than 220 figures. Many of the individual ideas were details of the phonograph's construction and mechanical operation, particularly the diaphragms and related fine mechanisms for registering and reproducing sound waves on wax cylinders. Other ideas included apparatus to screen out noise created by the cylinder's surface, governing devices, and an arrangement for the telephonic transmission of recordings.[5]

The multiplicity of mechanisms aside, much of what Edison needed to bring the phonograph to market required not the laboratory but his office. There, with the help of secretary Alfred Tate, he tried to manage the legal, organizational, and administrative aspects of the phonograph and its manufacture. Tasks included taking out new patents, formalizing the sale of his patents to Jesse Lippincott, monitoring a complex web of foreign patents, mediating the transfer of Gouraud's rights in Mexico, and creating a factory from the ground up. Sales of stock in the new Edison Phonograph Works covered only about sixty percent of the factory's costs—well on their way to about $240,000—with Edison loaning almost $20,000 before the end of the year, an arrangement complicated by having to count on Lippincott to make large payments to him.[6] Lippincott's ultimate failure to do so was because he, in turn, was beholden both to Edison's erstwhile partners in the old Edison Speaking Phonograph Company, who had their own claims on the patents, and to the American Graphophone Company.[7] Edison had assigned to Lippincott the rights to sell phonographs in the United States and Canada, but the rest of the world remained in George Gouraud's hands. Gouraud was eager to exhibit the machine but found Edison unable to supply him with the manufactured products that would make real trade possible.[8] Edison strove to adapt the phonograph for use in business, to replace stenography, and in entertainment, for its musical abilities, but neither he nor his surrogates could yet say which offered the best commercial opportunities. In any case, Edison's investment bought him a factory that was largely complete by early September.[9]

Edison's insistence on the highest manufacturing standards likely created other problems. Assembly of the phonograph, he said, would be "very like that of a gun or a sewing machine. The parts are interchangeable, so that any part of the machine may be supplied at any time."[10] This pledge pushed the state of the art in 1888 because the phonograph was more complex and its adjustments probably finer than either firearms or sewing machines. But interchangeability would enable customers to get repairs without sending the whole machine back for a custom fit and would save Edison from deploying a network of technical experts. These benefits, so important for putting instruments in unskilled hands across the continent, doubtless also complicated both the design and the assembly process.

Even while still engrossed with the phonograph, Edison began to consider a wholly different venture: iron mining. He had worked fitfully for years on magnetic processes for recovering iron from low-grade ore, but the Edison Ore Milling Company had never been able to generate much enthusiasm among mine operators. Now, however, the nation's voracious demand for iron and steel changed the cost calculations for the low-grade ores left in New Jersey, Pennsylvania, and New

York. Like so many of Edison's business ventures, this one would depend on a few key personal relationships. He arranged with Walter Mallory, a Chicago-based friend of his wife's family, for a new company to show the economic soundness of his machines by putting them to work in a Michigan mine. And he hired John Birkinbine, an internationally known mining expert, as a consulting engineer.[11] Having returned to the iron ore problem, Edison had these arrangements in place by the end of July. He also turned again to Henry Villard for help in licensing his separator equipment in Europe.[12]

Though nothing came of the European venture, Villard remained open to leading what would develop into a much more consequential project. That was the reorganization and recapitalization of the domestic Edison electric lighting interests in the face of stiffening competition from companies that had embraced alternating current (AC) instead of the Edison system's direct current (DC).[13] Though disparaging of AC technology, Edison was paying attention to that field. He quickly spotted reports in the trade press about an AC meter patented in August by Oliver Shallenberger, though in delegating follow-up inquiries to Alfred Tate he seems not to have appreciated fully the device's revolutionary possibilities.[14]

At the invitation of the *New York World,* Edison had agreed to develop some empirical understanding of how New York State could carry out death sentences by electrocution, as the legislature had recently stipulated it should. Starting in June, he permitted several sets of gruesome animal experiments at his laboratory, conducted primarily by Arthur Kennelly. After the first fatal trials did not provide enough data, Kennelly resumed them in July. As July stretched to August and then September, circumstances changed and outside parties—notably the anti-AC agitator Harold Brown—became involved. Edison seems to have personally attended only a few of the tests, but as most were carried out at his laboratory or with equipment supplied by him, and sometimes in view of reporters and other witnesses, he became inextricably linked to these events. As time went on, he sought to turn the animal killings to competitive advantage, adding fuel to an incendiary campaign against AC utilities generally and George Westinghouse in particular.[15]

Edison remained a favorite of newspaper writers and editors.[16] He was good for a quote, even a made-up one; the phonograph, especially its exhibitions in London and the recorded cylinders mailed across the Atlantic, were the basis of numerous stories published and reprinted through the summer. After a writer for the *New York Post* met some resistance at the laboratory, Alfred Tate assured the paper that in accord with Edison's "wishes in the matter of accommodating any newspaper representatives who might come to the Laboratory we detailed one of our Phonograph Experts for the duty of exhibiting the phonograph, relieving him of all other work so as to ensure proper attention."[17] Not all visitors were welcome, however. Amid concerns about industrial espionage, a directive over Edison's signature went in every employee's pay envelope in September: "Under no circumstances will employees be allowed to take their friends through this Laboratory No special privileges will be given hereafter to anyone."[18] Following the publication (and reprinting) of a *New York Sun* report about his work on "aerial navigation"—powered flight—Edison was, according to Tate, "flooded with ideas from all parts of the world. In fact, he has received so many letters on this subject that it is impossible for him to read one-quarter of them."[19] During deadly yellow fever outbreaks in the South in late September, the press jumped on Edison's announcement of a possible means of preventing the disease.[20] That startling declaration was the result of a brief burst of research, mainly by Arthur Kennelly, that demonstrated the flexibility of the laboratory's equipment and staff to pivot from Edison's stock-in-trade work to unique microscopical experiments. It also showed the corporate nature of the laboratory, in which Edison took public credit for its collective work. And the wide (though not universal) respect given his announcement amid a public health crisis showed the authority of his words in the public sphere.[21]

Edison's movements and activities can be hard to pin down even amid the wide paper trail created at his laboratory and office. That degree of elusiveness is likely due in part to the greater authority taken by Alfred Tate, now coming fully into his own as private secretary, to conduct correspondence either in Edison's name or his own. With the laboratory organization having reached maturity as well, Edison delegated important ongoing projects to assistants like Arthur Kennelly, William K. L. Dickson, and Jonas Aylsworth.

Several events of personal significance do appear in the records. For one, Edison left on 9 August for Chautauqua, N.Y., (where his wife's family often summered) reportedly suffering from dyspepsia caused by overwork.[22] There he joined Mina and their baby (not yet baptized and still called

"Grace"), and likely at least two of his three older children, William and Tom, Jr.[23] Mina had been ill as well; her sister, traveling in Europe, presumably commenting on Edison's work habits, commiserated that "Thomas is a very bad husband to desert you just at the time you need the most sympathy and husbandly love. If I were there and got to see him (which would be doubtful) I should give him a piece of my mind. . . ."[24] Mina still harbored doubts about her role as a stepmother, doubts that her father again tried to erase.[25]

Edison and Mina skipped a planned stop in Akron, Ohio, and came directly home late on 25 August.[26] However Edison felt physically on his return, his mood was soon dyspeptic. He accused Edward Johnson, one of his closest friends and business allies, of disloyalty in the long dispute over phonograph patent rights. He drafted a bitingly personal letter that rehearsed not only the difficulties over the phonograph but also Johnson's past actions in electric lighting affairs, now thrown into relief by ongoing efforts to consolidate that business. At odds with the youthful Wizard of Menlo Park, who had inspired his staff with charisma and largesse, a distraught Edison now reflected that "Experience has caused me to change hereafter I am going to be a hog myself and look out for myself."[27]

Edison was caught off guard a few weeks later by what he took as betrayals by old friend Ezra Gilliland and personal attorney John Tomlinson. He learned in mid-September the lucrative details of a side agreement Gilliland had made with Jesse Lippincott, an "underhanded" arrangement that he suspected had diminished what Lippincott could pay him. Furious, he summarily disavowed Gilliland and Tomlinson.[28] The friendships were never restored, and it would be years before Edison would return to the Florida property he shared with Gilliland.

1. See Docs. 3223 and 3243.
2. See, e.g., Doc. 3236; cf. Doc. 3259.
3. See, e.g., Docs. 3221 n. 5 and 3252.
4. See Doc. 3253.
5. Edison applied only the 21 September date to his draft, and it is unclear how long he worked on it. Likely his attorneys needed quite some time to put it in shape for the Patent Office, and it was not filed there until 26 October. The Patent Office refused to accept it until Edison narrowed its scope to a single invention. Edison Caveat 111, PS (*TAED* PT031AAB).
6. According to a year-end summary, the Phonograph Works had received a loan of $19,450 from Edison (the date or terms of which were

not recorded) and raised $144,000 from the sale of stock; Edison was by far the largest shareholder. Edison Phonograph Works statement, 1 Jan. 1889, DF (*TAED* D8957AAA); Edison Phonograph Works list of stockholders, 14 Jan. 1890, Lbk. 36:47 (*TAED* LB036047).

7. See Docs. 3247 and 3261.

8. See Docs. 3225, 3236 (esp. n. 9), and 3244.

9. See Doc. 3241 n. 3.

10. "Science and Art," *Worcester (Mass.) Daily Spy,* 3 Sept. 1888.

11. See Docs. 3228 (and headnote) and 3229.

12. Doc. 3232.

13. See Docs. 3232, 3242, and 3263.

14. See Doc. 3250.

15. See Doc. 3224 (headnote).

16. See, e.g., Docs. 3221 and 3233.

17. Tate to *New York Post,* 17 July 1888, DF (*TAED* D8818API).

18. John Randolph to Tate, 15 Sept. 1888, DF (*TAED* D8820AAU). Regarding the threat of espionage, see A. E. Cousens to TAE, 10 Sept. 1888 (DF [*TAED* D8847ACC]) and cf. Doc. 3304 n. 2.

19. Evidence of actual work on a "flying machine" (as the project was named on time sheets of a group of experimenters, draftsmen, and machinists; e.g., O. S. Hussey, B. F. Millington, F. P. Bergh, and S. D. Foulkes; Time Sheets, WOL) ends in the latter part of June. The *Sun* interview appeared prior to 13 June, when it was reprinted by the *Kansas City (Mo.) Star* ("Will Tackle A Flying Machine [p. 2]), but responses evidently flowed in throughout the summer (see, e.g., Tate to I. N. Osborn, 19 Sept. 1888, DF [*TAED* D8818ATK]).

20. See Doc. 3265.

21. One critical voice, an unnamed Detroit physician, challenged Edison's proposed prevention for entailing a microbial explanation of yellow fever, a hypothesis he said had never been accepted by the medical profession as "even a tenable theory." "Edison is No Doctor," *Columbus (Ga.) Enquirer,* 1 Oct. 1888, [1].

22. The dyspepsia diagnosis was Tate's and embellished in the press as a result of overwork (Tate to Villard, 9 Aug. 1888, DF [*TAED* D8818AQY]; *Boston Traveler,* 25 Aug. 1888, Clippings [*TAED* SC88044E]). For some reason, a Schenectady, N.Y., paper thought fit to print (or reprint) Edison's hearty dinner menu a few days before he left (*Schenectady Union,* 7 Aug. 1888, Clippings [*TAED* SC88044D]).

23. TAE to Villard, 4 Aug. 1888, DF (*TAED* D8818AQU); Mary Valinda Miller to Mina Edison, 30 Aug. 1888; Mary Emily Miller to Mina Edison, 26 Aug. 1888; both MFP (*TAED* X018D1AI, X018C9AI).

24. Mary Emily Miller to Mina Edison, 26 Aug. 1888, MFP (*TAED* X018C9AI).

25. See Doc. 3249; also cf. Doc. 3036.

26. Tate to TAE, 21 Aug. 1888, Lbk. 25:126 (*TAED* LB025126); Samuel Insull to Tate, n.d. [18 Aug. 1888]; Ira Miller to Tate, 24 Aug. 1888; Tate to Villard, 25 Aug. 1888; all DF (*TAED* D8835AEF, D8816AAP, D8818ARZ); "How the Phonograph Works," *Orange (N.J.) Herald,* 1 Sept. 1888, Clippings (*TAED* SC88097C).

27. TAE to Johnson, 4 Sept. 1888, DF (*TAED* D8805AGF). The other draft to Johnson is Doc. 3248; also cf. Doc. 3245.

28. See Doc. 3255.

–3220–

Arthur Kennelly to John Vail

Orange, N.J., 4th July *1888*[a]

<Copy Posted 4.7.88>[1b]
Zinc Sulphate Solution[c]
Sir

We are now ~~shipping~~ sending by express[d] our first carboy of pure neutral zinc sulphate solution 1.054 @ 60° F to the Fall River Station in accordance with the order contained in your letter to Mr Edison of the 29th ult;.[2]

Mr Edison has placed the preparation of this solution (in conjunction with his chemical assistants) in my charge. If you will therefore be so good as to address orders to me here and to let me know in advance of any coming unusual[e] demand I will see under Mr Edison's direction that these orders are promptly dealt with. We have now quite[e] a large plant in position for the supply of the solution and can furnish it in considerable quantities if necessary.[3] Mr Edison has instructed me to have accounts made out by his clerks for it at the rate of 20 cents per gallon,[4] and this is I believe[f] decidedly cheaper than ~~the price of~~ the same quality of solution at any of the prominent New York firms.

In as much as Mr Edison has to prepare pure zinc first in order to obtain the pure zinc sulphate I should be glad to know whether you anticipate any demand on the part of the stations for chemically pure zinc. If so we must make arrangements here for casting the plates in the different sizes that are needed for meter work. I am Sir Yours very truly

A. E. Kennelly[5]

ALS (copy), NjWOE, DF (*TAED* D8830ABI). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" and "*188*" preprinted. [b]Marginalia written by Kennelly. [c]Heading typed in preprinted subject line. [d]"sending by express" interlined above. [e]Interlined above. [f]"I believe" interlined above.

1. Although it would be unusual for Kennelly to make a copy on letterhead and sign it as if it were the original, it seems even less likely that he would have made this docket notation on the letter he put in the mail. Vail, in his reply, made no mention of returning the original to Kennelly. Vail to Kennelly, 18 July 1888, DF (*TAED* D8830ABH).

2. Edison's electric consumption meter used the action of electrolytic decomposition (like that in a battery) to determine how much electricity had passed through a circuit. The standard design used amalgamated zinc plates in a solution of sulphate of zinc (Doc. 2163 [headnote]). A new instruction book issued in the spring by the Edison Electric Light Co.'s Engineering Dept. indicated that

> Mr. Edison proposes to prepare at his Laboratory, in Orange, N.J., pure zinc sulphate solution in quantities sufficient to supply

any and all stations desiring to avail themselves of the opportunity of obtaining in carboys chemically pure and properly standardized solution.

The zinc sulphate salt and the four testing reagents should be obtained from Mr. Edison's Laboratory. [Edison Electric Light Co. 1888, p. 44]

This announcement created considerable confusion. William Jenks wrote to Edison on 7 June about an order for meter solution submitted to the laboratory on 25 May by the Edison Electric Illuminating Co. of Fall River. The laboratory, he explained, had referred it to the company's Standardizing Bureau, which sent it to Bergmann & Co., which supplied meters but, knowing nothing of the laboratory's intentions, returned it to the Standardizing Bureau. Jenks quoted John Vail's complaint that this case was "the second instance in 48 hours" of an order that could not be filled. Vail himself wrote Edison to bring the backlog to his "personal attention." Edison replied on 22 June that the laboratory had made a small quantity of solution for testing and would have enough on hand within a week to supply orders from the local companies. Kennelly referred to Vail's 29 June re-order of solution for Fall River, in response to which he prepared an eight-and-a-half gallon carboy on 3 July (Jenks to TAE, 7 June 1888; Vail to TAE, 16 and 29 June 1888; TAE to Vail, 22 June 1888; all DF [*TAED* D8830AAW, D8830AAZ, D8830ABB, D8818ANJ]; N-88-06-06:59, Lab. [*TAED* NB044059]).

The laboratory, under Kennelly's supervision, supplied the zinc sulphate solution for Edison central stations until the Edison Manufacturing Co. took over production in 1890 following the development of an improved meter. In 1889, it also began to produce chemically pure zinc plates amalgamated with mercury for the commercial meters made by Begmann & Co. Jenks to West Orange Laboratory, 22 Aug. and 16 Mar. 1889; Jenks to TAE, 19 Feb. 1889; Bergmann & Co. to Kennelly, 16 Apr., 6 May, and 24 July 1889; all DF (*TAED* D8935ABL, D8935AAO, D8935AAJ, D8902AAE, D8902AAG, D8902AAM); Alfred Tate to Jenks, 23 Aug. 1889, Lbk. 32:137 (*TAED* LB032137); Edison General Electric 1890b, 20; Kennelly to Bergmann & Co., 18 Apr. 1889; Kennelly to Jenks, 15 May 1889; both Kennelly Letterbook LM-1:380, 400, WOL (*TAED* LM111380, LM111400).

3. The editors have learned nothing further about this plant for producing zinc sulphate.

4. The previous day, Kennelly calculated the net cost of producing zinc sulphate solution at 23.8 cents per gallon but noted that it was to be charged at the rate of 20 cents per gallon. N-88-06-06:59, Lab. (*TAED* NB044059).

5. Kennelly had begun testing and experimenting with the electrolytic meters at the end of March and continued to do so through the end of the year, in addition to having charge of producing zinc sulphate for the consumption meter. His work took on new urgency in August when Charles Wirt, an assistant to Jenks at the Standardizing Bureau, advised Jenks about Kennelly's tests and suggested a number of other issues to investigate. Jenks forwarded Wirt's letter to Edward Johnson, who sent it to Edison (with his own summary) and asked him to "please have

such experiments made as may settle these vexed questions as far as possible." In a marginal note on the cover letter from Jenks to Johnson, Edison instructed Alfred Tate to "Say its important to Light Co—that I will have Mr K do as required & I spose foot the bills." Wirt assisted Kennelly with some of the resulting experiments. Jenks to Johnson, enclosing Wirt to Jenks, both 18 Aug. 1888; Johnson to TAE, 20 Aug. 1888; all DF (*TAED* D8830ABU, D8830ABV, D8830ABT); Kennelly to Jenks, 15 Sept. 1888, Kennelly Letterbook LM-1:120, WOL (*TAED* LM111120); for Kennelly's record of meter tests and experiments see the following notebooks, most of which have subject indexes at the beginning: N-88-01-19, N-88-04-18, N-88-06-06, N-88-06-10, N-88-08-28, N-88-09-28, and Kennelly Notebook #1, all Lab. (*TAED* NB019, NB035, NB044, NB045, NB051, NB056, NM023).

On 10 December, Kennelly and Wirt decided on new design features of the meter subject, which the Standardizing Bureau accepted a week later. At a meeting of the American Institute of Electrical Engineers in New York City on 18 December, Jenks presented a paper on "Six Years' Practical Experience with the Edison Chemical Meter" (Jenks 1888) in which he briefly discussed Kennelly's experiments and the changes just approved by the Bureau. Kennelly submitted a detailed report on his experiments to Johnson by the end of December; Edison also received a copy, which Jenks asked to see on 22 January. A few days afterward, Jenks asked Kennelly to prepare a paper about his experiments and improvements for the February meeting of the Association of Edison Illuminating Companies in Kansas City. Kennelly in addition took out U.S. Patent 419,264 (filed on 25 February 1889 and later assigned to Edison) on his method for preventing oxidation of the zinc plates (which altered their resistance) by heating them and the solution to drive off oxygen before putting the meter into use. Kennelly Notebook #1:54, Lab. (*TAED* NM023001); Jenks to TAE, 22 Jan., 1889, DF (*TAED* D8935AAD); Jenks 1888; Kennelly report to Johnson, n.d, Kennelly Letterbook LM-1:230–69, WOL (*TAED* LM111230); Jenks to Kennelly, 28 Jan. and 13 Mar. 1889, DF (*TAED* D8935AAF, D8935AAN); Kennelly to Jenks, enclosing paper, 4 Feb. 1889; Kennelly to Henry Seely, enclosing notes for draft meter patent, 30 Jan. 1889; Kennelly to Jenks, 13 Mar. 1889; all Kennelly Letterbook LM-1:331–42, 357, WOL (*TAED* LM111342, LM111335, LM111331; LM111332, LM111357); Dyer & Seely to TAE, 9 Dec. 1889, DF (*TAED* D8954AEH).

In early 1889, plans were laid to show the new meter at the upcoming Exposition in Paris. Kennelly reviewed and offered minor changes to the printed manual so that 3,000 copies could be sent to William Hammer, concluding with the remark "that if the directions be followed out the meter is more accurate than any other in existence." In April, the City of Paris announced a competition of consumption meters for the first central station to be built by the local authorities. Edison decided to submit the new meter but, because he did not wish to concede manufacturing rights as required by the rules, he had Hammer enter it only unofficially. Kennelly tested six meters at the laboratory and shipped them to Hammer in June with a set of instructions. The judging commission accepted the instruments as unofficial entries but did not include them in their published reports. Jenks to Kennelly, 12 Mar. 1889; Bergmann & Co. to Kennelly, 15 May 1889; both DF (*TAED* D8935AAN, D8902AAH); Kennelly to Jenks, 13 Mar. 1889; Kennelly to Hammer, 10 Apr. and 14 June 1889 enclosing instructions; all Kennelly Letterbook LM-1:357, 378, 431, 429, WOL (*TAED* LM111357, LM111378, LM111431, LM111429); TAE to Standardizing Bureau, 10 May 1889; TAE to Hammer, 6 June 1889; Lbk. 29:365, 30:239 (*TAED* LB029365, LB030239); Kennelly Notebook #1:128, Lab. (*TAED* NM023128); "The Paris Meter Competition," *Teleg. J. and Elec. Rev.,* 25 (1 Nov. 1889): 510; "Electrical Energy Meters Competition," ibid., 26 (28 Mar. 1890): 357.

–3221–

From Edwin Fox

New York, July 6th 1888[a]

Dear Mr Edison;

A large part of the ground embraced in my article having been covered by Mr Meeker's[1] recent 3 column article in the HERALD[2] Mr Chambers[3] the managing Editor suggests that I hold it until later especially as he wants me to write up the receipt of the phonograms that are expected from Europe on the Servia[4] which will be more newsy.[5] He has appointed me special "Edisonian" critic at $15 per column for Edison matter which isn't bad for a struggling lawyer, as the regular rates on the paper are only $8 per column.

Brother Joe Clarke[6] who was out to the laboratory recently and who you know is the Managing Editor of The Morning Journal,[7] which is one of our leading dailies has requested me to write a special three column illustrated article for the Sunday Journal of July 14th. I have (with your permission) concluded to adopt as my theme the efforts that always have been and doubtless always will be made by the Goths and Vandals of so-called inventors to inroad upon your great works by alleged priority. History shows that the minute you perfect something great, scores of "scientists" loom up with convenient affidavits to show 1st that it can't be done and 2nd if it can be done they did it. I purpose showing that when you have the incandescent light perfect—so far as primordial principle was concerned—the whole world was proclaiming that practical incandescent electric lighting was a physical impossibility etc etc and then when your method of doing it became known the world of invention literally bristled with adverse claimants. I shall also go into the matter of the inadequacy of the protection afforded by the patent laws as at present existing, to original inventors and discoverers. I shall handle without gloves the future would be Scientists who when you send the perfected phonograph to the world may endeavor to infringe by their alleged "improvements." Mr.[b] Clarke agrees with me that this will be a good line of article.[8]

If you will direct your secretary to send me word at any time something new transpires I will immediately go out to the Laboratory and write it up. As the Courts are all adjourned until next October I have abundant time on my hands for[b] science, and literature. With my sincerest wishes for success, I am Truly Yours

Edwin M Fox[9]

P.S. I have shown the "cylinder" you so kindly gave me on the occasion of my late visit, to nearly all the Editorial Staff of the Herald[c] and it is regarded as a rare curiosity. E.M.F.

TLS, NjWOE, DF (*TAED* D8807ABJ). Letterhead of Edwin M. Fox. [a]"*New York,*" preprinted. [b]Interlined above by hand. [c]Multiply underlined.

1. A lifelong journalist, Ralph Meeker (1845–1921) was an established *New York Herald* writer famous for his investigations of corruption in the administration of Indian lands under President Ulysses Grant. Meeker had served as the *Herald* correspondent in Washington, D.C., (1875–1877) and in London (1885–1886). *NCAB* 19:93–94; Knight 1993, 196–97.

2. Republished elsewhere, the long *New York Herald* article described Edison's satisfaction with the remodeled phonograph, as well as Gouraud's plans for the machine in England ("Edison's 'Mail Phonograph,'" *Chicago Inter-Ocean,* 21 June 1888, 9). The *Herald,* one of the city's most widely read papers, was as sensational as its owner; James Gordon Bennett, who inherited the successful paper from his father in 1867, reputedly said that he did not so much report the news as make it himself. Aided by spectacles such as the hunt for explorer David Livingstone, the *Herald* reach a peak circulation above 190,000 readers in 1885, but it had recently been surpassed in both advertising revenue and circulation by Joseph Pulitzer's meteoric *New York World* (Mott 1962, 229–33, 415–21; *ANB,* s.v. "Bennett, James Gordon, Jr.").

3. James Julius Chambers (1850–1920), an Ohio native, became a reporter for the *New York Tribune* soon after graduating from Cornell University in 1870. After a sensational exposé of abuses at the Bloomingdale Asylum, Chambers in 1873 joined the *New York Herald,* for which he covered several foreign cities and served as city editor (1876–1877). During his tenure in New York, he managed to read law in Philadelphia. Dispatched to Paris in 1886 by publisher James Gordon Bennett to start the *Herald* edition there, he returned to New York as managing editor. Chambers took a similar position at the *New York World* in 1889. *DAB,* s.v. "Chambers, James Julius"; *NCAB* 14:444–45; cf. Mott 1962, 424.

4. The *Servia* left Liverpool on 30 June and was due in New York on 9 July. When it entered revenue service at the end of 1881, the ship was the Cunard Line's largest vessel and first steel steamer. "Incoming

Steamships," *NYT,* 9 July 1888, 3; "A New Cunarder: Some Account of the Mammoth Servia," *NYT,* 18 Mar. 1881, 8; "The New Cunard Steamer Servia," *NYT,* 30 Nov. 1881, 5; "The Steam-Ship Servia. Her Arrival after a Remarkably Short Voyage," *NYT,* 9 Dec. 1881, 8; Hyde 1975, 124.

5. According to a spate of press accounts, Edison was anticipating recordings by singer Adelina Patti and statesmen William Gladstone and Arthur Balfour. As the *Herald* and other papers would note, however, as of 16 July he had received only several by George Gouraud, including the one transcribed as Doc. 3218 that Gouraud mailed on 30 June, when the *Servia* sailed from Liverpool (see note 4). These were detained and the packages opened by postal authorities in New York who suspected them of containing taxable items or, according to one report, dynamite. After the cylinders reached Edison on the sixteenth in badly damaged condition, he concluded that there was no phonogram forthcoming from Gladstone, at least. "A Phonograph's contents," *NYT,* 10 July 1888, 4; "Transatlantic Voices. What the Phonograms Bring over the Sea—How Can They be Mailed?," *New York Herald,* 17 July 1888, 8; "No Phonograph from Gladstone," *NYT,* 17 July 1888, 8; "By Phonograph," unidentified clipping, 7 July 1888; "Edison's Phonograms Broken," *N.Y. Star,* 17 July 1888; "Not the Right Phonograms," *N.Y. World,* 17 July 1888; all Clippings (*TAED* SC88040B, SC88040C, SC88040D).

6. Joseph Ignatius Constantine Clarke (1846–1925) became managing editor of the *New York Morning Journal* in 1883 and held the post for a dozen years. Clarke was born near Dublin, Ireland, and was working for the Queen's Printer in London when he was drawn to the Irish republican cause as an organizer and writer. Forced into exile, Clarke made his way to New York in 1868. After a brief stint as a traveling speechmaker for the 1868 presidential campaign of Ulysses Grant, Clarke joined the *New York Herald,* where he held a variety of editorial jobs until leaving for the *Morning Journal* in 1883. *ANB,* s.v. "Clarke, Joseph Ignatius Constantine"; *DAB,* s.v. "Clarke, Joseph Ignatius Constantine."

7. The *New York Morning Journal* was started in 1882 by Albert Pulitzer, the younger brother and rival of Joseph Pulitzer. Under Joseph Clarke's editorship, it was, according to one historian, a "bright and lively" penny paper. Within five years, the *Morning Journal* had attained the enviable circulation of 225,000. Mott 1962, 433, 520.

8. Joseph Clarke suggested to Edison that Fox had at least an outline for an article "showing the relation of inventors to patents—on the line of our recent conversation." Fox hoped to have Edison make "comments and suggestions…[which] would receive marked consideration by both public and officials and might lead to results beneficial to yourself." If Edison would do that, Fox promised to "fill up the frame work and do the necessary elaborating," and Clarke hoped that Edison would sign his name to it. Edison was apparently willing enough until Fox consulted with John Tomlinson, who warned that Edison's close association with such a project might prejudice judges and Patent Office officials against him. Edison then instructed his secretary to "Say perhaps after all he better not write the article" and that he would "give em hell when I stop inventing." Fox to TAE, 13 July 1888, enclosing Clarke to TAE, 12 July

1888; Fox to TAE (with TAE marginalia), 17 July 1888; all DF (*TAED* D8807ABK, D8807ABL, D8807ABO).

9. Edwin Marshall Fox (1850–1919?), originally from Boston, became friends with Edison when they both worked as young telegraphers. Fox went on to a varied career as a journalist (his output included a number of sympathetic articles about Edison's inventions, including the first full description of the carbon incandescent lamp; see Doc. 1868 n. 3), a lawyer, and eventually a business agent in London and New York (Docs. 1266 [headnote], 1668 n. 3; 2264 n. 4; U.S. Census Bureau 1970 [1880], roll T9_853, p. 396B, image 14 [enumeration district 184, Brooklyn, Kings, N.Y.]; U.S. Immigration and Naturalization Service 1987, roll M1834_45, Fox passport, issued 1 Nov. 1898; *England & Wales, National Probate Calendar (Index of Wills and Administrations), 1858–1966,* p. 295, online database accessed through Ancestry.com, 1 July 2016). He evidently attended the University of the City of New York with the class of 1876 but was not listed among the school's graduates. After a misunderstanding in 1881, Fox left the Edison orbit but seems to have returned to good graces by about 1887 (Fox's testimony, *Edison Electric Light Co. v. Electric Manufacturing Co.,* 12 July 1893; Thomas Connery to TAE, 21 May 1887; both DF [*TAED* D9323AAF, D8748AAH]; *Catalogue of the University* 1875, 9; cf. *General Alumni Catalogue* 1916, 791.

–3222–

Alfred Tate to Carr & Dickinson[1]

[Orange,] July 11, 88.

Dear Sirs:—

I send you by express to-day a package of tobacco leaves which Mr. Edison has prepared from the second box which you sent him. The first box forwarded contained four different samples of tobacco. The second box was all the same kind, and it was from the latter the leaves we are now forwarding were taken.[2]

Mr. Edison says that this experiment has proved a very difficult one and he would like to have your opinion as to the result so far as shewn in the package we are sending.[3] Yours truly,

A[lfred]. O. T[ate] Private Sec'y. M[aguire].

TL (carbon copy), NjWOE, DF (*TAED* D8818AOV). Initialed for Tate by Thomas Maguire.

1. Carr & Dickinson were (according to their letterhead) "Commission Merchants for the Sale of Leaf Tobacco and Grain" in Richmond, Va. The partnership was formed in 1878 by Samuel P. Carr (1844–1897), a Virginia native and former Confederate cavalryman, and Loren Dickinson (1844–1909?), also a Confederate veteran. Carr was known as "one of the best-posted tobacco men" and an authority on

the cultivation and curing of bright and Burley tobacco. "Mr. S. P. Carr Killed," *Richmond Dispatch,* 18 Nov. 1897, 6; Find A Grave memorial no. 43394067, online database accessed 13 Oct. 2016; Fitz and Ryland 1890, 267.

2. Carr had asked Edison in February to experiment on curing tobacco leaves into the "fine yellow wrappers" known as "bright" for which buyers would "pay very fancy prices." Bright tobacco was a flexible label for a commodity whose traits depended on a complex mix of soil type with techniques of cultivation, harvesting, curing, and marketing; a rising market led to creative efforts to expand bright production beyond the traditional region of the central Virginia-North Carolina border (Carr to TAE, 27 Feb. 1888, DF [*TAED* D8805ABA]; Hahn 2011, esp. introduction and chap. 4; Tilley 1948, chaps. 1, 2, and pp. 369–51). When Edison agreed, Carr shipped him samples and a circular on curing bright tobacco. On 7 April, Edison instructed Alfred Tate to "Send samples upstairs to Gladstone & give him all the letters & tell G to see me about it." James Gladstone (one of two men working on this project in the spring and early summer) spent nearly all his time between 10 April and 20 June on these experiments (Carr to TAE, n.d. [Mar. 1888], 10 and 19 Mar., 7 Apr. [with TAE marginalia], Tate to Carr, 20 July 1888; all DF [*TAED* D8805ABW, D8805ABL, D8805ABP, D8805ACA, D8818APR]; Time Sheets, WOL; regarding Gladstone's experimental records, see his loose note of 27 February and 7 Apr. 1888 in N-88-02-17 and his notes in N-88-03-30 [*TAED* NB025AAL, NB025AAP; NB033AAI–NB033ACM]).

3. Carr replied on 14 July that he thought Edison had "made a grand success as far as color is concerned, but the flavor will militate against it." He planned to approach manufacturers that might be able to use it by disguising the flavor but reported on 20 July, after more tests, that "the flavor <u>hangs to it</u> & as long as that is the case can not make it proffitable to work it." Tate responded on Edison's behalf "that there is hardly anything in chemistry that he has not tried in connection with the tobacco" but that Edison would continue a few months longer if Carr sent additional samples. Carr promised to do so, but the editors have found no evidence of further laboratory work; an account book entry of 31 December 1888 assigned the project to "Dead Exp[e]r[iment]s" (see App. 3). In September 1891, Edison declined Carr's request to resume experiments because "every known method of accomplishing what you desire, including electricity, was tried, and they all resulted in giving to the tobacco a foreign taste." Carr to TAE, 14, 20, and 27 July 1888; Tate to Carr, 20 and 24 July 1888; all DF (*TAED* D8805AEK, D8805AEQ, D8805AFC, D8818APR, D8818APW); Ledger #5:489, Accts. (*TAED* NL011A1); Tate to Carr, 28 Sept. 1891, Lbk 52:420 (*TAED* LB052420).

–3223–

Draft Patent Application: Phonograph

[Orange, c. July 12, 1888][1]

~~<Case>~~[a]

The object of this invention is to produce phonogram blanks the material of which shall have superior qualities for recording & reproducing sounds—

The invention consists of the use of a Metallic Soap[2] or mixtures of the same, or a metallic soap mixed with other modifying materials like Waxes Resins & gums—[3]

The oleates stearates [~~Laureates~~?][a] of[b] Lead Magnesium[b] Alumina are the preferable material for forming the cylinders as these soaps are more amorphous than the other salts of the fatty acids

The preferable mixture is Equal quantities of Oleate & stearate of Lead—melted & poured into moulds

The usual methods described in chemical works are[b] used to make the soaps—[4]

Claim. as a recording material for phonographs metallic Soaps of the fatty acids.[5]

~~2nd~~ ~~Ole~~

AD, NjWOE, PS (*TAED* PT032ABC1). [a]Canceled. [b]Obscured overwritten text.

1. Patent attorney Henry Seely marked this draft as received in his New York office on 13 July.

2. As the name suggests, a metallic soap is formed by combining (such as by boiling) the oxide of a metal with oils or fats commonly used in soaps (Watts 1885, 8; see also note 3). As historian Ray Wile notes, the metallic soaps, though chemically unrelated to natural waxes, were often called waxes because of their texture and moldability (Wile 1995, 164).

3. This draft application arose from the ongoing painstaking experiments of Jonas Aylsworth. The shift to metallic salts began with experimental compound No. 739 on 27 May, following a period of research that focused on the use of lead chloride (see Chap. 1 introduction). As Aylsworth later recalled, No. 739

> marked the starting of experiments in an entirely new line. Heretofore experiments had been limited chiefly to natural waxes and materials of a wax-like nature. This experiment opened up a new field, whereby artificial wax-like materials were made. The success of this experiment was instrumental in making a whole series of similar compounds. It was reasoned that if a solid wax-like material could be made from oleic acid combined with lead, materials of any desired properties might result by similar combination of a fatty acid with lead and other metallic bases. [Ayslworth's testimony, p. 15, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046, image 90)]

On 25 July, Edison moved Aylsworth from the chemistry laboratory to Room 14 in the main building. There Aylsworth could work more closely with Arthur Payne, who molded cylinders from the new compositions developed by Aylsworth (Ayslworth's testimony, p. 19, *American Graphophone Co. v. National Phonograph Co.,* Lit. [*TAED* QP003046, image 92]; N-87-07-01:115, 144, Lab. [*TAED* NB001115, NB001144]).

4. See Doc. 3238 esp. nn. 8 and 10.

5. The application created from this draft was one of at least eight related to the phonograph that Edison signed on 14 July. (This draft became mixed in Edison's files with one of the others, Case 795 pertaining to wax hardeners, that was involved in a parallel procedural dispute at the Patent Office and was ultimately rejected and abandoned; see Case 795 file, esp. Petitioner's Statement, Oct. 1889, PS [*TAED* PT032ABC, esp. images 31–35].) It was filed as Edison's Case 793 on 30 July, but the claims were promptly rejected. After Edison made several appeals, excised two of the original five claims, and slightly modifed the descriptive text, it issued as a patent in June 1890. The specification, less than a page with no drawings, became the fundamental patent for the metallic soaps used in Edison recording materials. It clearly expressed Edison's preferences:

> Insoluble soap may be formed of any metal or sometimes of an early oxide, like lime, in combination with any fatty acid. For my purpose, however, it is best to use lead, magnesium, or aluminium, combined with oleic or stearic acid, forming an oleate or stearate of the metal used. These compounds are preferred because of their superior amorphous quality. Of the metals named I especially prefer to employ lead, and especially to use a mixture of equal quantities of oleate and stearate of lead. [Pat. App. 430,274]

PHYSIOLOGICAL EXPERIMENTS Docs. 3224, 3240, and 3292

Outside circumstances prompted Edison to permit his laboratory to take part in a grisly series of animal experiments starting in June 1888. Intended to demonstrate the fatal effects of electric shock on dogs and to find the lethal threshold, the summertime trials were repeated in December on several larger animals in hope of providing useful extrapolations to human beings. The backdrop for these actions was the decision by New York State, early in the year, to substitute electrocution for hanging as a means of capital punishment, a proposal to which Edison had reluctantly given his limited endorsement (see Doc. 3125 n. 2). The issue again came to the fore in June, when the *New York World* questioned the state's adoption of electrocution without "an exact understanding of the application as a taker of life."[1] At the paper's request, Edison agreed to try to create such an understanding. He had already given some thought to the subject, having recently advised the American Society for the Prevention of Cruelty to Animals (ASPCA) about using electrocution to euthanize unwanted animals (see Doc. 3184). But that was on a theoretical basis only; intentional electrocution was a wholly new matter.[2]

The gruesome experiments that followed did not necessarily provide the clarity sought by the *World*. They did, on the other hand, serve to inflame long-running disputes about the public safety of electric utility wires generally, and specifically those of Edison's direct current (DC) light and power system compared with rival alternating current (AC) systems. Edison had obvious interests in these questions, as did the Edison Electric Light Company, which reimbursed the cost of most of the animal experiments.[3] But Edison is known to have personally participated in only two, though others were carried out at his instruction, in his laboratory, by members of his staff.[4] He also permitted (and perhaps encouraged) the participation of outside parties. Their involvement entwined their interests with his, enlarged the scope of the experiments, and ultimately helped fuel a vitriolic campaign against AC generally and George Westinghouse in particular.

The first experiment, made at the request of the *New York World* and supervised by Edison, took place at the laboratory on 21 June. It was conducted by Charles Batchelor and Arthur Kennelly, Edison's chief electrical assistant. Power was supplied by an AC machine capable of producing 1,500 to 2,000 volts; its poles were wired separately to a metal plate and a metal dish filled with water. The dog, one of several taken from the streets of Orange, was to be induced to drink from the dish while standing on the plate. The animal could not be persuaded to do this, but while struggling to get free, it stepped simultaneously on the plate and in the dish and completed the circuit through its body. *World* correspondent Vincent Cooke reported that the dog was killed within two seconds and that blood soon gushed from its nose and ears. He argued prophetically that the experiment proved two things: "that an execution by electricity can become a more hideous spectacle than an execution by hanging, and…that there is a greater possibility of a blunder than where the hangman's noose is the agent of legal revenge." Such mistakes had occurred when water from the dish splashed on rubber strips underneath and compromised the insulation and when one of the wires burned out and interrupted the current. The first prolonged the dog's suffering. The second happened immediately after death but otherwise would also have led to greater suffering. Cooke reported that when asked how quickly electricity would kill a man, Edison replied, "in an incalculable space of time.… An electric light current will kill a regiment in the ten thousandth part of a second."[5]

Cooke's *World* article also took the state to task for failing to specify how or by what devices the fatal current should be applied. Edison, who believed strongly in the inherent lethality of alternating current (see, e.g., Docs. 3002 [headnote] and 3008), suggested that manacles should be placed on the prisoner and connected by chains to the poles of an AC machine. When the circuit is closed, he said, "it is over"; death would be instantaneous. "One thousand volts would be enough," Cooke quoted him as saying, "but 2,000 volts would be sure beyond any question." Kennelly added that the prisoner should be bound in an "electric chair"; otherwise, he or she might be able to resist and prevent completion of the circuit.[6]

Without any evident further prodding by the *World,* Kennelly began a series of new tests on dogs—labeled "Physiological Experiments" in his notebooks—at the laboratory in early July. These experiments were diverse, complex, and complicated by many variables, not the least of which were the wide disparities in the characteristics of the dogs, making direct comparisons among test cases difficult or impossible. Nonetheless, Kennelly recorded the results, as he would throughout the summer across nearly two dozen closely written pages (interspersed with notes of unrelated work), some of which he summarized in late July in a tabular "Epitome of Physiological Experiments."[7] In these tests, with one exception, the electrodes were bound with wet cotton bandages to the right front leg and left hind leg of each animal. Kennelly first tried a 1,200-volt direct-current dynamo on a fox terrier on 6 July and a small black mongrel and another dog of "greyhound extraction" on 9 July.[8] He then deliberately shocked himself and recorded the experience in his 11 July notebook entry:

> Hands wiped dry and brought in contact with two terminals in connection with the municipal dynamo whose potential diff was observed to be 1200 by voltmeter. Strong shock felt with muscular contractions in elbows and principally on breast. Dizzy sensation allied to syncope for the moment. Contact with terminals only momentary. Temporary

debility lasting for a few minutes and headache followed. Two small angular scars about 1⁄16 in diam: at points of contact the + point on the fleshy part of the thumb right hand, – point on the outer edge of the palm, latter is the deeper. [N-88-06-06:72, Lab. (*TAED* NB044072)]

When Kennelly resumed animal experiments on 12 July, it was with the participation of two outsiders. One was Harold Brown, a self-proclaimed consulting electrical engineer from New York City;[9] the other was physician and neurologist Frederick Peterson. Brown was a provocateur and vocal critic of alternating current who had published an incendiary letter in the 5 June edition of the *New York Evening Post,* likening the danger of AC wires to "a burning candle in a powder factory." But it was only after the account of the 21 June demonstration at the Edison laboratory appeared in the *New York World* that Brown contacted Edison (whom he later said he had not previously met) to borrow equipment for experimentation. Edison responded by inviting him to the laboratory to join the tests there. Peterson, whom Kennelly identified as a neurologist at the Vanderbilt Clinical Hospital, may have been on hand as a representative of the New York Medico-Legal Society, which the *World* had also roundly criticized for endorsing electrocution in capital cases without fully understanding it. Kennelly now kept more detailed notes of these new experiments, and Peterson examined some of the corpses and recorded the effects of different voltages of AC and DC. Twelve different dogs were used. The first was not weighed and was not included in the chart Kennelly made at the conclusion of the July experiments, but the others ranged in weight from 13½ to 59 pounds.[10] This series of trials also necessitated a supply of animal subjects, and Edison appealed in Doc. 3224 for help in obtaining them.

Each participant in the animal experiments had his own—sometimes overlapping—reasons for his involvement. In his August letter to the *World* (Doc. 3224), Kennelly narrowly defined the project's purpose, suggesting that the aim was merely to determine "by exact measurement the amount of electricity which requires to be passed through a dog in order to kill it."[11] This gave the impression that the intent was to discover the least painful and quickest method for euthanizing dogs, as the ASPCA had requested (see Doc. 3184), even though Kennelly clearly had human physiology in mind as well.[12] Brown's interest was to establish the lethality of AC so as to convince the New York Board of Electrical Control to require new safety standards, including limiting alternating current to 300 volts, an interest coincident with Edison's. (Brown also hoped that the experiments might suggest ways to make DC safer.)[13] Peterson's object seems to have been to determine the most efficacious and painless method of executing criminals in accordance with New York's new law, scheduled to take effect on 1 January 1889.

The records of the July experiments suggest that they were designed to determine not just the best practices for killing animals but also for executing criminals under the new law. This purpose is apparent in Kennelly's measurements of the resistance of human bodies (his own and Brown's), and by the shocks he gave himself.[14] In this regard, the tests on the first eight dogs included in Kennelly's chart (beginning with the small black mongrel on 9 July) were unsatisfactory because the shocks did not always cause death and never did so instantaneously. Several dogs suffered, sometimes severely.[15] On the first eight dogs, Kennelly employed an Edison municipal dynamo. Four dogs were subjected to DC at different voltages—800, 1,000, 1,000, and 500. Three of them died, with the "Time elapsing between contact and death" ranging from one to several minutes. In one case, where 1,000 volts direct current were administered to a 39-pound half-breed shepherd, the dog survived and was not much hurt. (This dog had also survived six previous tests with a short circuit.) For the other four tests in this series, rather than using an AC machine, Kennelly alternated the dynamo's current by means of a hand-driven commutator. As he explained, "the contact was made twice during every revolution, and at each successive contact the current was alternated in direction" between 26.7 and 68.3 times per second. The voltages employed were 800, 800, 570, 300, and 1,200. The last two shocks were administered to the same dog, a 47-pound bull terrier, through the head instead of the body as in the other tests. After receiving 300 volts, the dog was alive but "badly hurt," and Kennelly immediately administered the full force of the machine to end its misery. In none of the cases in which hand-alternated current was employed did death follow instantly, with elapsed times ranging from 15 to 90 seconds.[16]

For experiments on the last three dogs listed in his chart, Kennelly used a Siemens AC machine producing a high rate of alternation (288 per second) and a transformer to control the voltage. He administered fatal shocks at voltages ranging from 158 to 250, reporting that each animal died "at once" and was silent and motionless as the current was applied. On the last and largest dog, a 59-pound red setter, Kennelly first tried 99, 114, 146, and 176 volts in turn. The dog, though not killed at these voltages, was increasingly hurt and exhausted. A final shock at 188 volts caused instant death. These tests suggested that even at relatively low voltages, regular AC current at a high rate of alternation was instantly fatal.[17] Taken in toto, the experiments in July convinced Kennelly that alternating or pulsating current (such as the unsmoothed DC waveform often used in high-voltage arc lighting systems) was more lethal than low-voltage DC (such as in Edison's incandescent system) in proportion to the number of its reversals or pulsations. This was similar to what Brown had hypothesized in his June letter to the *Post,* and Kennelly was sufficiently confident of his own proof to draft a letter to the *World* (Doc. 3240). But Kennelly's experimental records, usually so exacting in other contexts, appear to have left out some information critical to making such a determination. He had not consistently measured amperes for each test; indeed, he omitted this statistic altogether for the final three tests with the Siemens AC generator. This failure, and a general inconsistency in the conditions of the experiments, left the conclusions open to challenge.[18]

Brown, meanwhile, prepared to use animal experiments to his own ends. In early June, the New York Board of Electrical Control had published his letter to the *Post* in its minutes and circulated it for comment to the electric lighting companies. The board then invited Brown and his opponents to debate the relative safety of AC and DC at its 16 June meeting. Although Brown was out of town at the time, the meeting went forward without him and was dominated by his opponents. Brown later claimed that in his absence, his detractors from the lighting companies subjected him to "bitter, personal attacks." To rebut them, he planned a public demonstration for 30 July at the School of Mines at Columbia College.[19]

On the appointed day, the lecture room at Columbia was packed with about seventy-five witnesses, including electricians, reporters, members of the Board of Electrical Control, and representatives of various electric lighting companies (John Howell of the Edison Lamp Co. and E. T. Birdsall of the Edison Electric Light Co. among them). Edison was not there, though Brown had sent him a printed invitation. With the assistance of Kennelly and Peterson, Brown conducted the demonstration in the same fashion as the tests at the laboratory. But the subject of the first experiment was much larger, a 76-pound part Newfoundland dog. The DC Edison dynamo was fitted with a relay to prevent a surge, caused by the discharge of the field magnets, from reaching the unfortunate animal. Under this arrangement, the dog survived shocks of 300, 400, 500, 700, and 1,000 volts, though it yelped and struggled to free itself. The *New York Times* reported that at 1,000 volts, the dog's "body contorted with pain and the experiment became brutal," so that some in the crowd demanded that the animal be put out of its misery. Brown did so using 330 volts from a Siemens AC dynamo, which killed the dog within thirty seconds. At this point, an SPCA representative halted the proceedings on grounds of cruelty, even though Brown proposed to continue with a series of dogs he had on hand. Some of the spectators reportedly interpreted the event as part of a larger contest between "rival inventors" (unsurprisingly, given Brown's involvement in experiments at the Edison lab), and this awareness increased the revulsion expressed by spectators and editorialists alike.[20]

Electricians in the audience objected that Brown had neither used a relay on the AC machine nor measured the strength of its current, and that the repeated shocks had lowered the dog's resistance from 15,300 ohms to about 2,100 ohms just prior to receiving the fatal current. Under these circumstances, the *New York World* concluded, "The test was useless for purposes of comparison between the two currents."[21]

Brown conducted further experiments with alternating current on three dogs at Columbia on 3 August. With neither Kennelly nor Edison present, he was assisted by Schuyler Wheeler, the electrician of the Board of Electrical Control. Peterson once again performed dissections along with Drs. C. F. Roberts and Cyrus Edson of the Board of Health. These trials, owing to the variations in the dogs' weight and resistance and the currents' voltage and duration, do not seem to have been conclusive. Nevertheless, Brown claimed to the press that the physicians present believed that the "deaths were painless, as the nerves were probably destroyed in less time than that required to transmit the impression to the brain of the subject."[22] He also boasted to Kennelly that "We made a fine exhibit yesterday, as you will see from all the papers, and I had the report of the proceedings signed by all present and sent to the associated press throughout the country." He thought that this time the demonstration would have the desired effect: "Whatever action the Board of Electrical Control may take, it is certain that yesterday's work will get a law passed by the legislature in the fall, limiting the Voltage of alternating currents to 300 Volts."[23] However, neither the Board of Electrical Control nor the state legislature took any immediate effective action.[24]

After the Columbia interlude, Kennelly resumed physiological tests at Edison's laboratory. By the end of August, he had experimented on eleven more dogs using a Siemens AC dynamo (with and without a converter) and a DC municipal lighting dynamo. He also made one (non-fatal) experiment using Edison's three-wire system.[25] As with the July experiments, the varying weight and resistance of the dogs and the differing voltages and durations of shock made comparisons difficult. The AC current, however, generally proved fatal with less time of contact and at lower voltages than DC.[26]

The Medico-Legal Society produced another quasi-public demonstration at the laboratory in early December. The Society's committee on capital punishment, aiming to show decisively the efficacy of AC to electrocute animals as large as a man, arranged for Brown and Kennelly to dispatch two calves and a horse. Edison attended and addressed members of the committee, probably reiterating his confidence that AC would swiftly and painlessly kill a human being for the State of New York. Further animal trials took place at the laboratory in March 1889, at the instigation of the state superintendent of prisons, to determine the specific machinery and methods best suited to that grim task.[27]

1. "As Revolting as Hanging: An Electrical Execution Covers its Victim in Blood," *New York World,* 24 June 1888, 18.

2. Historians have tended to see the animal experiments principally in light of what became known as the "Battle of the Currents" between the Edison and Westinghouse lighting systems, in the process reducing the experiments' original purposes to the polemical purposes for which they were ultimately used. See, e.g., Hughes 1958, Moran 2002 (78–104), Essig 2003 (134–56, 197–99), and Jonnes 2003 (chap. 7).

3. The expense payments for the 1888 physiological experiments do not show up in the bill books of the Edison Electric Light Co. until 1889. Expenses include materials, such as copper wire, screws, wood, and insulating tape, as well as "catching dogs" and laboratory payroll, with payroll by far the largest cost. In all, according to the bill books, the Light Co. paid $46.10 for the July experiments, $58.57 for September, and $35.97 for December. The latter expense is exclusive of obtaining, transporting, and disposing of the body of the horse, which is listed in Kennelly's letter to Charles Wirt. The total expense listed in the bill

books from August 1888 to April 1889 amounted to $200.29. Ledger #5, which includes expenses through 1 June 1890, records the total cost of the physiological experiments at $315.46. Edison Electric Light Co. Bill Book #3:390–394, NjWOE; Ledger #5:111 (*TAED* NL011A1 [image 80]); Kennelly to Wirt, 7 Dec. 1888, Kennelly Letterbook LM-1:198, WOL (*TAED* LM111198).

4. In Doc. 3240, Arthur Kennelly ascribed his work to Edison's "instruction." Harold Brown later estimated there were between thirty and fifty animal experiments from June to December, though with some subjects receiving multiple shocks the number of animals would have been lower. Edison subsequently testified in the William Kemmler murder case that he personally witnessed only "one or two" of the tests. Brown's testimony, p. 33, and Edison's testimony, p. 636; both *Kemmler v. Durston,* Lit. (*TAED* QE003002, QE003A0623).

5. "As Revolting as Hanging," *New York World,* 24 June 1888, 18. A laboratory assistant, Arthur Colgate, later testified that the dynamo was an Edison machine producing 1,000 to 1,400 volts. Colgate's testimony, pp. 463–66, *Kemmler v. Durston,* Lit. (*TAED* QE003463).

6. "As Revolting as Hanging," *New York World,* 24 June 1888, 18.

7. N-88-06-10:37, Lab. (*TAED* NB045036).

8. N-88-06-06:61, 71, 84–88, Lab. (*TAED* NB044061B, NB044071, NB044084); Kennelly's testimony, pp. 668–71, *Kemmler v. Durston,* Lit. (*TAED* QE003A0655).

9. By 1889, Brown would have a symbiotic working relationship with Edison and his lighting interests (cf. Docs. 3330, 3337, 3379, and 3442). It is not clear how that relationship developed, but there is some suggestion (among private letters published by the *New York Sun* to embarrass Brown) that it may have begun by September 1888 (letter II, 16 Sept. 1888, in "For Shame, Brown!," *New York Sun,* 25 Aug. 1889, 6; cf. Essig 2003, chap. 15).

10. N-88-06-06:74, Lab. (*TAED* NB044072); "Death in the Wires," *New York Evening Post,* 5 June 1888, 7; Harold Brown circular letter, n.d. [Dec. 1888], DF (*TAED* D8828AEA); Peterson's testimony, pp. 248–51, *Kemmler v. Durston,* Lit. (*TAED* QE003240).

11. See Doc. 3240; Kennelly used a similar phrase in Doc. 3224.

12. See Doc. 3240.

13. "Death in the Wires," *New York Evening Post,* 5 June 1888, 7; "Physiological Tests with Electric Currents," *Electrical World* 12 (11 Aug. 1888): 69; Brown's testimony, pp. 24–25, *Kemmler v. Durston,* Lit. (*TAED* QE003002); Doc. 3224; Brown 1889a, 586.

14. N-88-06-06:72, N-88-06-06:75, both Lab. (*TAED* NB044072, NB044069).

15. Although Kennelly made extensive notes on these experiments, wrote about them to the newspapers, and testified about them in the Kemmler case, it is difficult to gauge his personal feeling about inflicting pain on these animals. He made careful note of the reaction of the dogs to the shocks (including the extent of apparent suffering), quickly administered a fatal shock to put one pitiable creature out of its misery, and recommended that the test for the Medico-Legal Society take place at night to discourage the curious—all of which show awareness of the brutal nature of these experiments. But nowhere did he express misgivings or revulsion, nor did he comment, amid rather clinical

descriptions, on the moral aspects of what he was doing.

16. N-88-06-10:31–32, 36, 39; N-88-06-06:71, 72–75, 78–80, 85–88; all Lab. (*TAED* NB045031, NB045036, NB045039, NB044071, NB044072, NB044078, NB044084); Kennelly's testimony, pp. 668–73, *Kemmler v. Durston,* Lit. (QE003A0655); "Surer than the Rope," *NYT,* 6 Dec. 1888, 5.

In addition to testing the effect of a short circuit, Kennelly shocked one dog with different induction coils, increasing the size of the coil in each of three experiments. Though the 41½-pound dog "struggled" all three times, it had no obvious signs of injury and Kennelly omitted these experiments from the summary chart he made at the end of July. N-88-06-10:31, Lab. (*TAED* NB045031); Kennelly's testimony, pp. 672–73, *Kemmler v. Durston,* Lit. (*TAED* QE003A0655).

17. N-88-06-10:32, 36–37, Lab. (*TAED* NB045031, NB045036); Brown's testimony, pp. 33–34, and Kennelly's testimony, pp. 670–73; both *Kemmler v. Durston,* Lit. (*TAED* QE003002, QE003A0655).

18. N-88-06-10:31–32, 36–37, Lab. (*TAED* NB045031, NB045036).

19. "Physiological Tests with the Electric Currents," *Electrical World* 12 (11 Aug. 1888): 69. Brown ordered the equipment for the demonstration, including a municipal dynamo, from the Edison Electric Light Co. on or before 20 July, and the firm in turn borrowed it from the laboratory. In his note to Charles Batchelor (de facto manager of the laboratory), Frank Hastings, the Light Co. secretary and treasurer, explained that he and company president Edward Johnson were "very much interested in these experiments and are very anxious that everything should be there in time." Naturally, if the experiments convinced the Board of Electrical Control either to require additional safety measures for alternating-current systems or place limits on the voltage of electrical wires in the city, the company would benefit at the expense of its competitors. Hastings also emphasized to the laboratory that it was "understood that these materials are to be loaned to Mr. Brown in our [the Light Co.'s] interests and at as little expense to us as possible, and we will see that they are returned in good order." Hastings to Batchelor, both 20 July 1888, both DF (*TAED* D8830ABJ, D8830ABK).

20. "Mr. Brown's Rejoinder," *Electrical Engineer,* 7 (Aug. 1888): 369; "Dogs Must Not Be Tortured," *New York World,* 31 July 1888, 5; "Died for Science's Sake," *NYT,* 31 July 1888, 8; "Physiological Tests with the Electric Currents," *Electrical World* 12 (11 Aug. 1888): 69; Brown to TAE, 30 July 1888, DF (*TAED* D8828ACO2).

21. "Died for Science's Sake," *NYT,* 31 July 1888, 8; "Dogs Must Not Be Tortured," *New York World,* 31 July 1888, 5.

22. "More Experiments on Dogs," *NYT,* 4 Aug. 1888, 8; "In Defense of the Brown Experiments," *Electrical World* 12 (22 Sept. 1888): 160; Brown's testimony, p. 30, and Kennelly's testimony, pp. 682–83; both *Kemmler v. Durston,* Lit. (*TAED* QE003002, QE003A0655).

23. Brown to Kennelly, 4 Aug. 1888, DF (*TAED* D8828ACS).

24. Sullivan 1995, 150–69.

25. The physiological experiments were hardly Kennelly's exclusive focus in August. They were interspersed among other projects, including tests on converters, transformers, Grenet batteries, electrometers, dynamos, photometers, ameroids, inductometers,

watches, lamp resistances, wires, and phonograph motors. Kennelly also investigated the electrical charges of lightning and raindrops and visited the Westinghouse AC power plant in Staten Island during this period. N-88-06-10, N-88-08-28, both Lab. (*TAED*NB045, NB051).

26. Research conducted in the 1970s appeared to bear out the outsized physiological effects of alternating currents in comparison to direct, though some evidence from the late nineteenth and early twentieth centuries suggests otherwise; see Reynolds and Bernstein 1989, 26; cf. Bernstein 1975.

27. See Doc. 3292 esp. n. 3.

–3224–

To Henry Bergh, Jr.

[Orange,] 13th July [188]8

Dear Sir

I have lately been trying various experiments on dogs with a view to finding how great a pressure and quantity[a] of electricity it takes to kill them, with the view not only of determining the physiological data the question involves but also to[a] arrive at the best means of safeguard to the lives of men engaged in electric lighting business.[1] I already know how much current is required to produce instant death within certain rough limits that I am desirous of narrowing. Can you therefore aid me to obtain some goodsized animals for the purpose of completing these experiments as early as possible.[2]

If so you will greatly oblige Yours very truly.

Thos A Edison

LS (letterpress copy), NjWOE, Lbk. 26:273 (*TAED* LB026273). Written by Arthur Kennelly. [a]Obscured overwritten text.

1. See headnote above.

2. Bergh responded on behalf of the American Society for the Prevention of Cruelty to Animals that "the nature of the experiments you propose is so antagonistic to the principles which govern this Institution, that I can not consistently lend myself to them." While in favor of electrocution "to produce instantaneous and merciful death," he opposed the experiments as "calculated to inflict great suffering upon the animal" in the pursuit of data which, he contended, would not have any clear bearing on human life. In a note written in the margin, Edison referred obliquely to his earlier correspondence with Bergh (see Doc. 3184) and instructed his secretary to "Write & say I understood that the Society wanted to change from drowning to Killing dogs by E as a more Humane method. I simply wanted a few dogs which were to be drowned so I could ascertain the proper method Excuse me if I misunderstood." Alfred Tate prepared such a letter in Edison's name. After receiving it, Bergh replied that New York City mayor Abram Hewitt had decided against electrocution to euthanize animals at the city pound and that the ASPCA now favored the use of carbonic oxide gas (Bergh to TAE, 14 July [with TAE marginalia] and 28 July 1888;

both DF [*TAED* D8828ACI, D8828ACO1]; TAE to Bergh, 21 July 1888, Lbk. 10:22 [*TAED* LB010022]). Hewitt, though, may still have been considering alternatives as late as mid-September, when Edward Johnson asked Edison to loan an alternating current machine "to demonstrate to the Mayor the practicability of Substituting Electrical Killing for Drowning of Dogs." According to Johnson, Hewitt had said he would arrange for an appropriation to purchase "a Westinghouse plant for this purpose" before he left office (Johnson to TAE, 17 Sept. 1888, DF [*TAED* D8828ACZ]).

–3225–

From George Gouraud

Little Menlo. [London,] July 14th. [1888]

Copy of Phonogram[1a]

Dear Edison:—

Yesterday I received the following cable.[2]

"Remarkable improvements, absolutely perfect. Will express Monday next necessary devices. Edison."[3a]

I sent you the following reply. "I was about inviting leading scientists. Shall I wait? Send grams, your voice, every body wants to hear it, those we have everybody can't understand, being too muffled."[4]

I have had no phonograms from you since I arrived here, the two phonograms I have, one the first phonogram & the other the dialogue between yourself & myself are not sufficiently distinct for the ordinary hearer. I understand everything, but you spoke very loud & I spoke a little loud too. Naturally everybody wants to hear your voice, & of course I am anxious to gratify that desire. Indeed my cards of invitation make it absolutely necessary that I should produce your voice, as they read "To meet Mr. Edison, non presentem sed alloquantem," meaning, in the voice, ere! er!—meaning, not present but speaking to you.[5]

I am of course delighted to receive your cable & shall look for something very substantial. I have had no reply to my question in my cable to you of yesterday but hope to receive one today.[6] Yours ever—

Gouraud—

L (transcribed phonogram), NjWOE, DF (*TAED* D8850ABY). Written by Hugh de Coursey Hamilton. [a]Followed by dividing mark.

1. This transcription was made by Hugh de C. Hamilton at Gouraud's London home and mailed to Edison the same day. Though not explicitly stating that the cylinder was also going in the mail, Hamilton remarked that it was recorded at 112 rpm, which suggests that he expected Edison to play it back. Hamilton to TAE, 14 July 1888, DF (*TAED* D8850ABX).

2. The following cables (and one other) were typed and sent to Gouraud as confirmation a few days later. TAE to Gouraud, 17 July 1888, DF (*TAED* D8818APK).

3. Alfred Tate's handwritten version of the cable to London is undated. The date on the typed version (see note 2) did not transfer to the carbon copy in Edison's file. TAE to Gouraud, n.d. [c. 13 July 1888], DF (*TAED* D8850AES).

4. According to the typed confirmation (see note 2), the final words of Gouraud's 13 July cable were "so muffled." Edison replied swiftly: "Better wait arrival new apparatus; very fine."

5. Gouraud used this phrasing in his publicity designs of the previous November, when he translated it as "Not present but in the voice." See Doc 3236 n. 3; Gouraud to TAE, 30 Nov. 1887; TAE to Gouraud, 17 July 1888; both DF (*TAED* D8751AAJ, D8818APK).

6. See note 4 and, regarding the demonstration for scientists, Doc. 3231.

–3226–

George Parsons Lathrop to Alfred Tate

New London, Conn. July 19/88.

My Dear Tate:

Your two notes, about 2 weeks ago, found me here on my return, July 5th. I was sorry that the severe attack of illness, which kept me for a week in New York, prevented my coming out to see Edison before my return to this place.[1]

I wish to inquire whether the transfer of the Phonograph to the new North American Co.,[2] or Lipincott's syndicate, extinguishes my chance of doing anything in the line I was contemplating.

The last time I was at the Laboratory, speaking with Edison about a possible sale of the whole Phono. interest, I said: "In that case, it seems to me that I shall get left." He replied quite earnestly: "No; you won't get left." I have no doubt he will recall this brief conversation; for my notion is that he remembers pretty nearly everything.[3]

My contract with Edison for the use of the "amusement phonograph" was what he called "the best kind of contract," viz. "his mouth." I was ready, all along, to carry out my end of it; & was prevented, not by any fault of mine but, as you are aware & as I explained to Edison, by the delay of Gilliland & Tomlinson, who suddenly put down the brakes on the incorporation of the Amusement Phono. Co., & could not even be induced to consult any further about it.

I haven't any idea that Edison meant, or means, to drop me out unceremoniously; especially after what he said about my not getting "left." So what I am desirous of finding out is, what sort of loophole has been left for me; or whether I have been to any extent included in the new deal, and how.

I write to you, instead of to Edison directly, because I don't want to risk bothering him by sending a letter which might reach him at a busy moment.

Will you kindly bring this matter to his attention soon, at a convenient time for him, & give me his reply?[4] Perhaps you will find it the shortest & best way to just show him this note, & talk it over.

With regards to your wife,[5] and best wishes for you all, Sincerely yours

G P Lathrop.

ALS, NjWOE, DF (*TAED* D8848ACW).

1. Tate's letter to Lathrop of 28 June concerning Samuel Clemens is the most recent one known to the editors. Lathrop was recovering from an unspecified gastric illness. "George Parsons Lathrop Getting Better," *Hazleton (Pa.) Plain Speaker,* 12 July 1888, 1; Doc. 3217 n. 5.

2. The North American Phonograph Co. was incorporated in Jersey City, N.J., on 14 July by Jesse Lippincott and four associates. Certificate of incorporation, 14 July 1888, North American Phonograph Co. minute book (p. 1), CR (*TAED* CK201001).

3. Lathrop later recalled having talked with Edison about the phonograph in the course of two visits to the Orange laboratory: one that occurred sometime between 6 and 13 June, the other on 22 or 23 June. After some later confusion, he specifically ascribed the conversation about "getting left" to the second visit. Lathrop to Tate, 18 and 25 Nov. 1888, both DF (*TAED* D8848AES, D8848AEW).

4. Tate replied a few days later that he had no fresh information about either the proposed Amusement Co. or the effect of Edison's sale of phonograph rights to Jesse Lippincott. Lathrop then wrote back to have Tate press his case to Edison. Supposing his hopes for the Amusement Co. to have been thwarted, Lathrop "thought it not unlikely that Mr. Edison, if retaining an interest in the new phonograph company, had arranged or would arrange to transfer to me some small share in that as compensation." The editors have found no evidence of such an arrangement. Tate to Lathrop, 23 July 1888; Lathrop to Tate, 3 Aug. 1888; both DF (*TAED* D8818APV, D8805AFK).

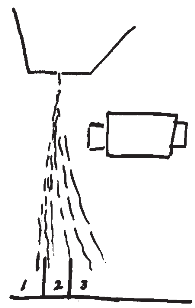
5. Tate married the former Bessie H. Dean (b. 1864?), the daughter of a Canadian judge. Because he made his will in her favor a few weeks later, their marriage may have been a recent one. U.S. Census Bureau 1992 (1920), roll T625_1203, p. 1B, image 582 (enumeration district 745, New York , New York, N.Y.); *Canadian Passenger Lists, 1865–1935,* online database record of 3 Oct. 1913 for Alfred Tate accessed through Ancestry.com, 5 Apr. 2016; Tate 1938, 210–11; Tate's Last Will and Testament, 25 July 1888, Miller (*TAED* HM88AAH).

–3227– [Orange,] July 20 1888

Memorandum to Richard Dyer: Ore Milling

Dyer—

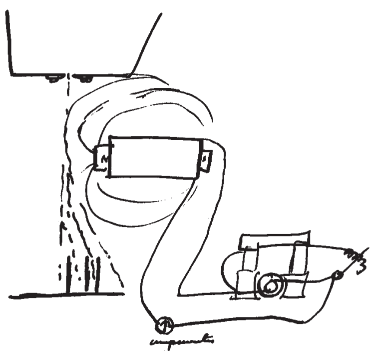
Please give me the state of my ore milling patents in Countries outside of US I may want to take some more out.[1] Do I in any US patent mention several partitions to make several grades.[2]



2 is what I call a Mugwump[3] & it seems to be essential in seperating iron ores as its in No 2 that the Titaniferous iron falls which is but slightly magnetic & also where the[a] phosphate of ~~Ca~~Lime & other non ferrous matter falls which has some iron attached= This mugwump stuff can be used for foundry iron[4] not being free enough of phosphorous Sulphur etc for Bessemer—[5]

If I hadnt this prepare a patent.

Also in same patent you might put the following[6]



Amperemeter—Dynamos with regulatable field—so magnet can be discharged slowly otherwise sudden bkg ckt pieces insulation— also you might mention breaking the Resistance

Edison

ADS, NjWOE, DF (*TAED* D8846ABB). [a]"over" next to drawing indicates page turn.

1. Edison had at least one prior foreign ore milling patent (Brit. Pat. 4,276 [1880]). When drafting a specification in October 1888, Edison

instructed his attorneys that "all ore milling patents are to be taken out in Canada for Long period"; one was filed there on 18 December. His attorneys were also preparing cases to file in France and Germany before the end of the year. TAE marginalia on draft application, 1 Oct. 1888, PS (*TAED* PT032ABM1); Henry Seely to Alfred Tate, 23 Nov. 1888, DF (*TAED* D8846ACJ1); Canadian patent 35,740, box 317, Patents, NjWOE; Tate to Dyer & Seely, 19 Nov. and 7 Dec. 1888, Lbk. 27:96A, 27:327 (*TAED* LB027096A, LB027327).

2. The graduated flow described here was not part of any ore separation patent that Edison had yet received in the United States. Edison later embellished the idea in an application that he filed in September 1888. That specification was intended to address "certain iron ores which contain light particles of phosphorus and silicon ores… [which] are affected by currents of air, and so may float or be carried into the receptacle for the magnetic particles, whereby the product is rendered impure and unavailable for the Bessemer process" (see note 5). Edison proposed to subject the ore to a steady current of air, causing a greater spread in the flow than that made by the magnet alone, so that it would sort itself among four spaces defined by three partitions. U.S. Pat. 430,275.

3. Although "mugwump" had been adapted decades earlier from a native tribal word into American English as a humorous term for a political leader, it gained wide currency in the 1884 presidential campaign when a faction of Republicans chose to remain aloof from their party's nominee, James Blaine. The word was thereafter applied to persons or groups acting independently of party orthodoxy. Edison and John Birkinbine used it in their February 1889 paper to the American Institute of Mining Engineers for a material that resists easy sorting into binary categories. *OED,* s.v. "Mugwump"; *Notes and Queries* 2 (28 Aug. 1886): 177–78; "Our One Hundred Questions. XII," *Lippincott's Monthly Magazine* (July 1889): 121–22; Birkinbine and Edison 1889a, 743.

4. That is, iron suitable for casting. "Foundry iron" was a relative qualitative term, but it generally implied metal with sufficient carbon to make it hard enough for casting but without the degree of purity or specialized chemical composition of steel. Helpfully for Edison's purpose here, a high concentration of magnetic ores would tend to produce an inferior casting metal. *OED,* s.v. "foundry. C.2"; "Production of Pig Iron," *Journal of the Iron and Steel Institute* 1 (1889): 300–303.

5. The English engineer Henry Bessemer announced in 1856 his discovery of a new way of making steel by using blasts of air to purify molten pig iron. Bessemer's process was far cheaper and faster than previous methods, and its rapid adoption by furnaces in Britain, Europe, and the United States transformed steel-making. Atmospheric oxygen blown into the Bessemer converter reacted with carbon, silicon, and other non-ferrous materials, largely removing them from the iron and releasing large amounts of heat. The oxidation process did not affect sulfur and phosphorous, however, two especially detrimental elements, so Bessemer steel required ores largely free of those contaminants. The use of basic (non-acidic) linings in converters since 1878 somewhat ameliorated the problem, but the Bessemer process remained dependent on ores with low phosphorous (especially) and sulfur content. *Ency*

Brit. 14, s.vv. "Bessemer, Sir Henry," "Bessemer steel"; *KAMD,* s.v. "Bessemer Process."

6. Figure label is "ampermeter." This suggestion appears not to have been incorporated into a patent.

MICHIGAN IRON ORE-MILLING PLANT Doc. 3228

Having so far failed to entice established iron mine operators to lease his ore concentrating machinery from the Edison Ore Milling Company, Edison tried a different approach.[1] He looked to the formation of a new company, created specifically for concentrating iron ore and controlled by family and close associates, in the hope that its successful use of his system would encourage wider licensing and sales. Walter Mallory, a Chicago-based friend of Mina Edison's family, agreed in Doc. 3228 to organize the Edison Iron Concentrating Company for that purpose.[2]

The new company erected only a single pilot plant at Humboldt, on Michigan's Upper Peninsula, despite having the right to operate, lease, and sell Edison equipment in Michigan, Wisconsin, and Minnesota. Mallory ordered the machinery in October 1888; it was being installed at Humboldt by December and began operating in late January 1889.[3] The plant consisted of a large Gates rock crusher, shaking screens to sort the ore by size, a pair of 16×30-inch Cornish rolls to further crush the ore so that it passed through a 20-mesh screen, and the Edison magnetic separator. Edison and Mallory hoped to refine magnetite ores containing 40 to 45 percent iron to a concentrate of about 65 percent iron as required by the Bessemer steel process.[4]

The agreement with Mallory assumed that the Michigan company would return a profit from the sale of ore, and Edison also stood to gain indirectly from royalty payments to Edison Ore Milling and the purchase of equipment from the Edison Machine Works. He surely hoped that the small but coordinated network of "Edison" manufacturing and licensing outlined in Doc. 3228 would grow to include established mine operators in the United States and Europe. But even though he was a stockholder and the company's first president, Edison never visited the Humboldt plant. He instead chose to work out its "bugs" at his laboratory, much as he had managed the introduction of the phonoplex telegraph in Canada,[5] but was less than successful in doing so. The Michigan plant was beset by problems and, even as it began to operate, Edison was already planning a new one in Pennsylvania, about a hundred miles from the laboratory, to which he could more easily give his personal attention.[6]

1. Edison had reorganized the Edison Ore Milling Co. in the latter part of 1887 in hopes of improving its prospects (see Doc. 3061). Witherbees, Sherman & Co. had not yet acted on his June lease offer, and Henry Villard had made no evident progress toward commercial arrangements in Europe (see Docs. 3207 and 3232).

2. Edison Iron Concentrating Co. incorporation papers, 3 Jan. 1889, Misc. Legal (*TAED* HX89039).

3. Mallory to TAE, 24 Jan. 1889; Edison Iron Concentrating Co. report, n.d. [Mar. 1889]; both DF (*TAED* D8950AAB, D8950AAG); Israel 1998, 344; May and Lemmer 1969, 117–22; Alfred Tate to William Dickson, 2 Feb. 1889, Lbk. 20:81 (*TAED* LB028081).

4. Birkinbine and Edison 1889a, 743. The plant's total cost was $16,559.48, including $6,743.48 for machinery, $1,109.05 for changes to correct mistakes, $1,597.92 for building materials, and $1,910.07 for labor and freight. Edison Iron Concentrating Co. report, n.d. [Mar. 1889], DF (*TAED* D8950AAG).

5. Edison planned to visit Humboldt in June or July 1890 but continued to delay his trip despite Mallory's repeated requests. He eventually canceled plans to go to Michigan in order to remain with his wife as she entered the later stages of pregnancy (Charles Edison was born on 3 August 1890). Tate to Mallory, 21 Mar., 2 May, and 12 July 1890; Lbk. 38:474, 40:329, 42:322 (*TAED* LB038474, LB040329, LB042322); Mallory to TAE, 21 June, 11 July (with TAE marginalia), and 14 July 1890; all DF (*TAED* D9045AAX, D9045AAZ, D9045ABA); cf. Doc. 2800 (headnote).

6. See Doc. 3309 (and headnote). Problems at the Humboldt plant led Edison to order its temporary shut down in April 1889 (see Doc. 3344).

–3228–

Edison Ore Milling Co. Agreement with Walter Mallory[1]

Orange, N.J. July 25, 1888.

(Copy)[2]

Preliminary Agreement between "The Edison Ore Milling Company of New York and Walter S. Mallory[3] of Chicago, Illinois." Brief of term of a final contract.[4]

First, Mallory to form a Company with a capital of $200.000.00,—Stock assessable,—to be called "The Edison Iron Concentrating Co."[5] with General Office at Chicago, Illinois.

Second, The Edison Ore Milling Company to license under its patents the said Company to use all its patents, devices and appliances in the States of Michigan, Wisconsin and Minnesota on the following terms:—The Edison Ore Milling Co. to receive a royalty of 15 (15) cents on each ton of 2240 lbs. of saleable ore concentrated by its magnetic seperator in such states, whether the Company be formed by Mallory operate the machine themselves or lease or sell the machine, and any contract for lease or sale must be submitted to the Edison Ore Milling Company for and must receive its approval to the end that it may see that such contract for sale or lease sufficiently secures its said royalty of Fifteen (15) cents per ton.

The Mallory Company are not to operate in any other than the States mentioned or sell or lease machines to be used in any other states than those mentioned.

Such Mallory Company agrees to put up within six (6) months from date one complete plant capable of crushing and concentrating one hundred and fifty tons (150) daily of twenty four (24) hours of crude ore and to diligently prosecute the business of installing other plants and operating or causing the same to be operated.[6]

Royalties are to be payable quarterly ten days after being due, and sworn statements of the number of tons concentrated are to be made and access given to the books of said Mallory Company, to any officer or agent of the Edison Ore Milling Co.

The license is to be exclusive only on the following conditions, the failure of such conditions at any time destroys the exclusiveness.

That the output of saleable ore in the last month of the first six months (i.e) January 1889, shall not be less than Seventy eight Hundred (7800) tons of saleable ore, and for the last month of the second six months, the month of July, 1889, shall not be less than Twenty thousand eight hundred (20 800) tons of saleable ore, and ~~for~~ the total output for the next year (i.e) from July 1889 to July 1890 shall not be less than Four hundred and sixty eight thousand (468 000) tons of saleable ore, and for the next year (i.e) from July 1890 to July 1891 shall not be less than Six hundred and twenty four thousand (624 000) tons of saleable ore, if these conditions are fulfilled at this date the license is continued thereafter exclusive provided the output does not diminish below Six hundred thousand[a] (600.000) tons saleable ore annually, unless such output will not net the Mallory Company a profit.

The Edison Ore Milling Co. agree to furnish an expert for sixty days, the Mallory Company only paying travelling expenses and board.[7]

The machinery is only to be used for concentrating iron ore and for no other purpose.

(Seal) Thos. A. Edison, for the Edison Ore Milling Co.

(Seal) Walter S. Mallory.

TD (copy), NjWOE, DF (*TAED* D9046AAH). [a]"Six hundred thousand" interlined above.

1. See headnote above.

2. A handwritten copy of this agreement, with only minor discrepancies from the typed version, is in Mallory (*TAED* MD001AAA).

3. Walter Seeley Mallory (1861–1944), the son of Eliada B. and Charlotte (née Bradley) Mallory and a native of New Haven, Conn., was educated in Baltimore and attended Baltimore City College. After working with his father in a Baltimore packing business, Mallory became a bookkeeper in 1881 at Carmichael & Emmens, Chicago commission agents for a Pennsylvania iron works. He subsequently became a partner and, when Carmichael & Emmens failed in 1884, he bought out the other partners and formed W. S. Mallory & Co. By the early 1880s, Mallory had become closely associated with the Miller family through his friendship with Mina Edison's brother Ira. Though only recently acquainted with Edison when Edison and Mina married in February 1886, Mallory served as an usher at the wedding. After the concentrating plant in Humboldt, Mich., burned in 1890, Mallory sold his interest in his eponymous company and moved to Orange to work with Edison there. He became a stockholder in the New Jersey and Pennsylvania Concentrating Works (NJPCW) and later its superintendent. Mallory also served the Edison Portland Cement Co. as vice president and president before retiring in 1918. "Mallory, Walter S.," Pioneers Bio.; "Coatesville Iron Co. Assignment," *Pittsburgh Post-Gazette,* 24 July 1884, 1; "Mr. Davenport Retires," *Boilermaker and Sheet Metal Worker* 9 (May 1901): 24; Mary Valinda Miller to Mina Miller, 16 Dec. 1883, CEFC (*TAED* X018D1AA01); May and Lemmer 1969, 116; *Iron Age* 17 (11 June 1891): 1132; Israel 1998, 344.

4. These terms were agreed upon about three weeks after Mallory reported from Ishpeming, on Michigan's Upper Peninsula, that he had been visiting mines in that state and Wisconsin. Having collected samples of magnetite, he planned to bring them to the laboratory for analysis after finishing his tour in a few days. The editors have not found a final version of the contract. Mallory to TAE, 2 July 1888, DF (*TAED* D8845ABZ).

5. With partners Justin B. Staley and Jeremiah Leaming of Chicago, Mallory incorporated the Edison Iron Concentrating Co. on 3 January 1889 with an initial capital of $115,000. The original stockholders and directors were Edison, Mallory, Mallory's father, Lewis Miller, and Ira Miller. Edison Iron Concentrating Co. incorporation papers, 3 Jan. 1889, Misc. Legal (*TAED* HX89039); *Iron Age* 43 (7 Feb. 1889): 207.

6. Under a separate agreement, the Edison Machine Works supplied equipment to the Edison Iron Concentrating Co. (at a 20 percent profit) under license from the Edison Ore Milling Co. TAE to Mallory, 25 July 1888, Mallory (*TAED* MD001AAA1).

7. Edison sent Oren S. Hussey (1865–1931), who had earned a B.S. in mechanical engineering from the Massachusetts Institute of Technology in 1887 and been employed at the laboratory since September of that year. Hussey was credited with designing the plant at Humboldt. Costs associated with his services included $118.05 for travel and $169 for board. "Hussey, Oren S.," Pioneers Bio.; Edison Iron Concentrating Co. report, n.d. [Mar. 1889], DF (*TAED* D8950AAG).

–3229–

From John Birkinbine

PHILADELPHIA. July 30th 1888[a]

Personal

My dear Mr Edison

I think the enclosure covers the ground of our conversation—if not please advise me as to any omission.[1] I thought it advisable to put in the 5th proviso—so that neither your motive or my own could be capable of misinterpretation. I intended sending you a suggestion for altering position of the magnet to suit different ores. I will make a drawing of it   Yours Truly,

Jno Birkinbine

ENCLOSURE[b]

Philadelphia, July 30th, 1888

Dear Sir:

Confirmatory of our conversation at your laboratory on Thursday the 26th, I agree to act with you in the matter of magnetic separation of iron ores, or metallic iron from waste, cinder, etc[2] for one year from the 1st of August 1888 on the following basis.[3]

1st   I am to be recognized as your consulting engineer, and am to be given advantage of whatever information is obtained in the treatment of ores and metals by magnetic separation in your laboratory.

2nd. I am to make such visits to your laboratory as will be necessary to obtain this information, and am to collect whatever data I can which I believe will be of service to you in this speciality and communicate it to you.

3rd. Whenever in the prosecution of my professional work I am called upon to visit iron ore mines, where your method of separation can be applied I will direct attention to the matter, and also give you such information concerning the mine as may be of service to you.

4th. If desired I will prepare descriptions of the apparatus ~~in~~ or[c] its operation for the technical press or engineering societies, and will do all in my power and in the capacity of consulting engineer to advance the interests of your method of concentration, and increase its application.[4]

5th. It is understood that my association in the capacity of consulting engineer with you is not in any way to interfere with my connection in the same capacity with Messers Witherbees Sherman & Co, nor in any way influence my action concerning their proposed concentrating plant.[5]

6th. For my services I am to receive a compensation of twenty five hundred dollars [$2500] per annum, payable in monthly instalments. Yours Respectfully,

Jno Birkinbine

<Tate— write & accept the proposition which is to Continue from one year from Aug 1888 I will sign it E[dison]>[6]

ALS, NjWOE, DF (*TAED* D8845ACJ, D8845ACK). Letterhead of John Birkinbine. [a]"Philadelphia." preprinted. [b]Enclosure is a TDS on letterhead of John Birkinbine. [c]Interlined above by hand.

1. Although he had quite a bit of experience with ore-milling technology and a background in chemistry, Edison was still something of a neophyte when it came to the complexities of iron ores and their markets. Ores were variegated in ways that directly affected how they could be processed and used, and they differed not just from one region to another but often from one mine to the next. Birkinbine 1889c, 721–23; Smock 1889; Birkinbine and Edison 1889a, 735–40.

2. Edison's broad goal was to create concentrating technology that could be adjusted to concentrate an assortment of lean ores until the iron content was high enough (at least 65 percent iron with a low phosphorous content) to be used in the Bessemer process, still the principal means of producing steel in the United States (Misa 1995, xviii, 5, 31; cf. Doc. 3389). Such lean ores were still abundant in Eastern states, but after decades of operation, mines in New York, New Jersey, and Pennsylvania were becoming depleted of the richer ores and faced increased competition from richer deposits in the West and abroad. Birkinbine attributed the decline of New Jersey mines specifically to three causes: the availability near eastern ports of foreign ores "which average higher percentages of iron than the New Jersey ores, to the expense of mining and high royalties, and to the necessity of roasting many of them to reduce or eliminate the sulphur" (Birkinbine 1889c, 722).

3. The meeting occurred after Birkinbine offered to visit Orange; afterward, he promised to send a formal acceptance of the terms discussed. He also suggested that Edward Landis, an unemployed Philadelphia chemist who was experienced with iron ore, could be helpful for Edison's work. Landis visited the laboratory with Birkinbine in August, but Edison was away and later decided that while he did not "doubt a good chemist is worth the amount asked," he declined to

pay it. Birkinbine to TAE, 21 and 28 July 1888; Landis to TAE, 7, 18 [with TAE marginalia], and 29 Aug. 1888; Alfred Tate to Birkinbine, 8 Aug. 1888; all DF (*TAED* D8845ACH, D8845ACI, D8814ADH, D8814ADL, D8814ADP, D8815ABV).

4. In an effort to promote Edison's magnetic ore separator, Birkinbine and Edison co-authored a paper, "The Concentration of Iron-Ore" (Birkinbine and Edison 1889a), for the 20 February 1889 meeting of the American Institute of Mining Engineers, convened in the library of the Edison laboratory. The paper favorably compared Edison's apparatus, which had no moving parts, to the Buchanan, Wenström, and Conkling separators, and emphasized particularly its greater capacity and simplified design.

5. Witherbees, Sherman & Co. already had long experience concentrating ores from their properties in and around Mineville, N.Y. The editors have not learned the particulars of the project to which Birkinbine referred, but in 1889 the company reportedly planned to test several types of magnetic separators, including Edison's. "Witherbees, Sherman & Co.," *Iron Age* 43 (14 Mar. 1889): 414.

6. Alfred Tate drafted a formal letter of acceptance in Edison's name. TAE to Birkinbine, 2 Aug. 1888, DF (*TAED* D8818AQL).

–3230–

From Francis Upton

Harrison, N.J. August, 1st, *188*8.[a]

My dear Mr. Edison:—

With this is attached the expenses to date of the Fibre Expedition.[1] You will note that the bill of expenses to date is $11,129.29.

In addition to this there will be a probable expense of another $5000.00

It will require, as you see, a million and a half Fibres at one cent a piece to pay for this expense. It strikes me that Hannington[2] is a terrible expensive man to send. We have a letter to-day which calls upon us to send $600.00 more to Hannington.[3]

I think it would be a fair estimate to consider that our Samples of Fibres, cost about $150.00 a piece.[4] Very truly yours,

Francis R. Upton

TLS, NjWOE, DF (*TAED* D8828ACQ1). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.*" and "*188*" preprinted.

1. Upton enclosed a list of monthly "Amounts advanced on Acct of Fibre Expeditions" for each of five men who made extended trips between late 1886 and the present in search of plant fibers suitable for carbonizing as lamp filaments (Edison Lamp Co. report, 1 Aug. 1888, DF [*TAED* D8828ACQ2]). In addition to Charles Hanington (see note 2), the travelers included Arthur Coyle Payne, who made two or three expeditions (at least one to Mexico, between late 1886 and early

1888; see Doc. 3122); Hugh de Coursey Hamilton (whose itinerary in late 1886 and early 1887 is not known); James Ricalton (who traveled to Ceylon before writing to Alfred Tate from Bangalore, India, on 26 July 1888 [*TAED* D8828ACN1]; and Frank McGowan (in South America—he posted a letter to Edison from Cali, Colombia, on 18 July 1888 [*TAED* D8828ACJ]). The men's surviving letters give some idea of the arduous nature of their sea and land travels, as does a lengthy account McGowan gave to a newspaper after his return (correspondence from and about these expeditions is in "Electric Light—General," DF [*TAED* D8828]; "Frank McGowan's Journey Through South American Wilds," [*New York Sun*?], 2 May 1889, Cat. 1341:2457, Batchelor [*TAED* MBSB62457]). Two months into his Brazilian journey, for example, Hanington projected he would reach his destination having covered 9,310 miles from New York in eighty days, a trip "costly…both in money and time." Related correspondence suggests something of how the home offices assessed the risks of the expeditions. Before Ricalton left, Francis Upton forwarded his request that some provision be made for his family in case of his death, to which Edison responded, "I think we could stand $1500. if he died by reason of the climate." In contrast to the reliability of Edison's postal and cable correspondence to Britain and Europe, communicating with South American travelers involved some guesswork. Alfred Tate reported in early March 1888 that he had just received a letter from McGowan "written on 25th November last. He is somewhere away from civilization with a couple of Indians and will probably reach Quito in a couple of weeks." Shipping material back could also be difficult: bamboo sent by McGowan that had not been "seasoned" by fire arrived with "dry rot and is consequently useless." Ricalton (like Hanington) dealt in large quantities, promising in April "50 or 100 tons" of bamboo, some of it as much as a foot in diameter (Hanington to TAE, 24 Apr. 1888; Upton to TAE [with TAE marginalia], 20 Feb. 1888; Tate to Hanington, 4 Mar. 1888; Tate to McGowan, 2 July 1888; Ricalton to Tate, both 24 Apr. 1888; all DF [*TAED* D8828ABH, D8828AAK1, D8828AAS, D8818AOH, D8828ABH4, D8828ABH1]). Regarding a fiber expedition in 1880 and 1881 by John Branner, see Doc. 2191.

2. Charles F. Hanington (b. 1842) had filled a variety of roles in Edison's and related businesses since 1881, principally having to do with wiring, before Edison dispatched him to South America in the latter part of 1887. According to Upton's accounting (see note 1), that was Hanington's second fiber expedition, the first having been sometime between late 1886 and early 1887 to an unspecified destination. Hanington was back in New York in early 1888 but left again on 20 February and reached Cuyaba, deep in Brazil's interior, on 8 June. He contracted at the end of June for large quantities of bamboo from that region, agreeing to pay $300 for each lot of 5,000 canes cut to his specifications. Docs. 2450 n. 4, 3065 n. 4; Hanington to TAE, 24 Apr. and 8 June 1888; Hanington agreement with Pedro Antonson, 26 June 1888; all DF (*TAED* D8828ABH, D8828ACQ, D8828ABY).

3. Hanington wrote from Cuyaba, Brazil, on 8 June asking for money to be wired through Drexel, Morgan & Co. to Buenos Aires, Argentina, in advance of his arrival there. Edison instructed Alfred Tate to advance him $600. Expedition-related expenses ultimately fell to the Edison

Lamp Co. Hanington to TAE (with TAE marginalia), 8 June 1888, DF (*TAED* D8828ACQ).

4. The editors have not found a reply from Edison, but he presumably agreed with winding down the expeditions. Payne had returned to the laboratory in the spring; Hanington was in New York by February 1889; and Ricalton, after closing out the year in Burma and Singapore, was home by the end of February 1889. At about that time, Tate cabled "Come home" to McGowan at Cali, Colombia. McGowan reached New York about the first of May 1889, reportedly in ill health, and recounted his travels to a newspaper writer. He later submitted a bill of $320 for medical treatment and four months of recuperation, which Edison paid. Tate to TAE, 18 Aug. 1888; Hanington to Upton, 26 Feb. 1889; Ricalton to Tate, 8 Nov. and 4 Dec. 1888; Upton to Tate, 1 Mar. 1889; Tate to McGowan, 21 Feb. 1889; McGowan to Charles Batchelor, 30 Aug. 1889; all DF (*TAED* D8818ARU, D8939AAP, D8828ADG1, D8828ADO1, D8939AAQ, D8933AAO, D8933ABJ); McGowan to Tate, 28 Oct. 1889; Vouchers—Lab. no. 1189 (1889); both Vouchers, (*TAED* VC89030A, VC89030); see note 1 regarding McGowan's interview.

–3231–

To George Gouraud

[Orange,] August 3, 88.

Dear Sir:—

I beg to confirm the following cablegrams sent by us and received from you:—[1]

Gouraud, Norwood.[2] "Henry Edmunds[3] leaves here Saturday with Graphophone to exhibit before Societies.[4] Have sent apparatus to fix your two old instruments which will give you three good ones.[5] I send by Gilliland, who also sails Saturday,[6] several dozen loud phonograms music and voices which can be heard small audience. Better arrange quick several exhibits before Societies to come off soon as Gilliland arrives. Answer if you can do so." (Signed) "Thos. A. Edison."

Edison, Orange. "Letters mailed to-day all Societies proposing earliest dates also at homes to most distinguished Scientists everything now depends on you only support me with machines quickly and amply and all honor and profit will be ours glad you realize importance first appearance equally so everywhere cable number and dates I can rely on for other countries so can make similar pro-posals all European capitals Grapho already working press.[7a]

Edison Orange.[8] "Your letter 24 implies we have three new motors; have only two; send other by Gilliland, also pulleys complete for one machine."

Gouraud, Norwood.[9] "Did not state was sending number of machines as your cable implies. You will have three good ones when extras arrive. Hope to send six new machines within thirty days, after which large factory will supply quantities.[10] Edison."

Yours truly,

T.A.E M[aguire].

TL (carbon copy), NjWOE, DF (*TAED* D8818AQT). Initialed for Edison by Thomas Maguire. [a]"posals...press" handwritten, possibly by Maguire.

1. The first cable transcribed below was sent by Edison on 1 August. The original message has not been found but Gouraud acknowledged its receipt the next day and confirmed the text of his reply (quoted back to him below). Gouraud also responded on 4 August in a recorded phonogram that was transcribed onto four small handwritten pages. Gouraud to TAE, 2 and 4 Aug. 1888, both DF (*TAED* D8850ACF, D8850ACK).

2. The London suburb of Norwood was the location of Gouraud's home, Little Menlo.

3. Henry Edmunds, Jr. (1853–1927) was a British engineer, entrepreneur, and electric light promoter. He met Edison at Menlo Park in 1877 and sought to become the British agent for the phonograph; Edison did not agree but encouraged Edmunds to demonstrate and lecture with it (Docs. 1205 n. 3, 1212, 1249, 2142 n. 6; "Obituary. Henry Edmunds," *Engineer* 144 [25 Nov. 1927]: 602). While visiting the U.S. again in mid-1887, Edmunds met Charles Tainter and discussed the graphophone with him. About that time, Tainter and his associates approached George Gouraud to represent their graphophone patent rights in Great Britain. Gouraud sought approval to do so (according to biographer Matthew Josephson's quotations from documents no longer found in the archival collection), but Edison curtly instructed him on 1 August 1887 to "Have nothing to do with them. They are bunch pirates.... Have started improving phonograph." Edmunds was back in Washington, D.C., in July 1888, when he secured from the graphophone parties the right to negotiate the sale of their patents in Great Britain through 31 October 1888. Once back in Britain, Edmunds quickly set up a graphophone agency business with a partner and began securing colonial patents (Andrews 1982, 97; Tritton 1993, 94–97; "The Graphophone," *Teleg. J. and Elec. Rev.* 23 [3 Aug. 1888]: 128; Tainter [1931?], 99–100; Josephson 1959, 317–18; cf. Doc. 3071 n. 2). The patent rights outside of the U.S. would later be invested in the International Graphophone Co., formed in 1889 (Welch and Burt 1994, 107; Graphophone Syndicate, Ltd., n.d. [Feb. 1889], PPC [*TAED* CA033]; Doc. 3071 n. 4).

4. The editors have not identified such occasions other than the presentation Edmunds made to the British Association meeting in early September (cf. Doc. 3244 n. 7). In August, however, one of his associates showed the graphophone to Queen Victoria and recorded her voice at Balmoral Castle. Tritton 1993, 98–100; cf. Picker 2003, 186 n. 27.

5. The promise of material to create three upgraded machines was part of a chain of messages including a 24 July letter from Edison to

Gouraud (not found) and Gouraud's 2 August cable response, copied below. Gouraud to TAE, 2 Aug. 1888, DF (*TAED* D8850ACH).

6. Ezra Gilliland sailed for England on 4 August, intending to be gone several weeks. Henry Villard provided a letter of introduction, stating his wish that Gilliland should present a phonograph to Werner von Siemens, Otto von Bismarck, and other dignitaries in Berlin. Gilliland was abroad for several months; he initially "saw a great deal of Gouraud" in London but did not reach Berlin. Charles Bruch to S. N. Johnson, 4 Aug. 1888; Gilliland to Armin Tenner, 7 Dec. 1888; both LM 22:10, 244 (*TAED* LM022010, LM022244); Villard to Siemens & Halske, 6 Aug. 1888, DF (*TAED* D8849AAU).

7. Gouraud amplified his cable reply in a phonogram dated 4 August. Having already addressed a letter to the principal newspapers, he assured Edison that it "has been generally published & consequently will take the rise out of Mr. [Edmunds]," (a name not discernible to Edison's transcriber but evident from the context). He had also proffered the phonograph to the major scientific societies, most of which he expected would plan meetings around demonstrations in September or October (Gouraud to TAE, 4 Aug. 1888, DF [*TAED* D8850ACK]). The graphophone appeared in a spate of British newspaper articles in the latter part of July in connection with the sale of Edison's phonograph rights to Jesse Lippincott, but the instrument does not seem to have received much press attention in its own right until late August and then partly in connection with the demonstration to Queen Victoria (see, e.g.,"Court Circular," *London Evening Standard,* 30 Aug. 1888, 5).

8. Gouraud sent this cable on 2 August (DF [*TAED* D8850ACH]). The editors have not found Edison's 24 July letter.

9. Edison sent this cable on 2 August. DF (*TAED* D8850ACI).

10. Though Edison promised to send the six new phonographs on 1 September, they were not shipped until the thirteenth. On receiving them, Gouraud pronounced them "fine." TAE to Gouraud, 9 Aug. 1888, Miller (*TAED* HM88AAI); TAE to Gilliland, 13 Sept. 1888; Gouraud to TAE, 28 Sept. 1888; both DF (*TAED* D8818ATD, D8849ABU).

–3232–

From Henry Villard

New York, Aug. 3 1888[a]

Friend Edison:

You are no doubt aware of my return on Saturday last.[1]

I have been so much absorbed by all sorts of business matters this week that I could not think of coming out to see you, as I intended to do at the earliest possible moment. But I intend to pay you a visit, with your leave, sometime in the course of next week, and I will thank you to inform me in reply on what days I shall be sure to find you at home.[2]

I will only add that I am fully prepared to carry out the new Company scheme[3] and to negotiate definitely with you regarding the license for the use of the ore-mill in Europe.[4]

I hope I am not too late in congratulating you on the addition to your family which I understand has recently come.[5] Sincerely yours,

H. Villard S[pofford].[6]

L, NjWOE, DF (*TAED* D8832AAA). Letterhead of Mills Building; written by Charles Spofford. [a]"New York," and "188" preprinted.

1. Charles Spofford had told Edison of Villard's intent to sail from Bremen on 18 July. Villard reached New York on 28 July and spent a few days at his summer home in Dobbs Ferry, N.Y., before returning to work at his Manhattan office. Spofford to TAE, 16 July, DF (*TAED* D8845ACG); "Henry Villard's Return," *Louisville Courier-Journal,* 30 July 1888, 1.

2. Edison suggested getting together on 7 August but Villard could not to commit to that date, and no meeting took place before Edison left for Chautauqua two days later. TAE to Villard, 4 Aug. 1888; Villard to TAE, 6 Aug. 1888; Alfred Tate to Villard, 9 Aug. 1888, all DF (*TAED* D8818AQU, D8832AAB, D8818AQY).

3. That is, the proposed consolidation of Edison lighting companies into what would become the Edison General Electric Co.

4. The Edison Ore Milling Co. had designated Villard as its exclusive European licensee in April, for a period of four months (John Tomlinson to Villard, 3 Apr. 1888, Villard). Villard seems not to have made any arrangements on the company's behalf in that time, and in July Spofford advised Edison that Villard would be "prepared to deal with the ore mill business after his return" from Europe. Having discussed the matter with William Perry, Villard on 6 August asked Edison to "please get ready to run the machine, and have plenty of iron on hand" for a demonstration. At the end of August, Perry prompted Tate to "remind Edison to send in to Villard the papers he wanted about seperating Iron ore." During the fall, Villard provided ore samples for testing and expressed enthusiasm over the results. He also promised to keep his European contacts apprised of favorable news and tried to arrange demonstrations of the separation process for prospective investors (Spofford to TAE, 16 July 1888; Villard to TAE, 6 Aug. 1888, 26 Oct. 1888, and 13 Nov. 1888; Perry to Tate, 31 Aug. 1888; all DF [*TAED* D8845ACG, D8845ACM, D8845AFA, D8845AFR, D8845ADF]; Villard to TAE, 23 Oct. 1888, letterbook 60:84, Villard; Buss 1978 [1977], 207).

5. Edison thanked Villard and added, "The baby is quite well and at present enjoying an outing with its mother at Chautauqua." TAE to Villard, 4 Aug. 1888, DF (*TAED* D8818AQU).

6. Charles Ainsworth Spofford (1853–1921), an attorney, was Villard's private secretary and business associate. Docs. 2685 n. 3, 2965 n. 5.

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George Parsons Lathrop to Alfred Tate

New London, Conn. Aug. 3d. 1888.

My Dear Tate:

Thanks for your note of July 23d.[1] I am very well now; have gained wonderfully in the last three weeks & feel almost as good as new.

In my last, I wrote so fully about my understanding with Edison concerning the Amusement Co., that I don't think I can throw any further light upon it. But it seems to me important that the subject should be brought to his attention promptly, so that if he has in mind any method of adjustment to obviate my "getting left" it may be known, & I may have an understanding of it. I suppose the carrying out of the Amusement project to be frustrated, but have thought it not unlikely that Mr. Edison, if retaining an interest in the new phonograph company, had arranged or would arrange to transfer to me some small share in that as compensation.

If you prefer, I can write to him directly. But I thought it would save time to state the circumstances clearly (as in my last letter to you) so that you could place them before him at a glance &, in a few minutes' conversation, ascertain his views. I shall be glad if you can do this.

It is uncertain when I shall be in New York again.

Clemens (Mark Twain) responded very favorably to my suggestion about the book, but seemed to think it important to have it put in autobiographical form.[2] If Edison has insuperable objections to this, & Clemens makes it a <u>sine quâ non</u>, it is probable that favorable arrangements could be made in some other quarter. Will you ask Edison in a[a] general way what he thinks of the idea of the book?

Meanwhile Thorndike Rice is in a hurry to have the first of the articles about Edison—"Memoirs of an Inventor"—of which I spoke to Edison. They are to be in the interview form, signed by me, but submitted to Edison's scrutiny & revision. To this plan Edison has given me his consent.[3] It would be desirable to shape these articles with reference to use, later, in the book. Hence I would like to have you get Edison's ideas about the contemplated book & learn whether he will approve it if suitable arrangements be made.

Rice would like the first article this month, if possible, or next month. The subject, I should say, might be: How Edison began inventing. It might give a few points of his early career, & then describe the circumstances & nature of some of the first among his inventions. Preparations will be necessary, in beginning a list of his more important inventions, & in reviewing such biographical material as exists concerning boyhood & the earlier years of his manhood. If I cannot come down to do this preliminary work during the present month, in the Laboratory library, would it be possible, & satisfactory to Edison, for me to send some one—say Horace Townsend[4]—to break ground & collect that much material?[5]

Please let me know as soon as possible, since I must write to Rice in a few days at latest, & also wish to be in a position to form definite conclusions & arrangements about the proposed book. Yours very truly

G P Lathrop.

ALS, NjWOE, DF (*TAED* D8805AFK). [a]Interlined above.

1. Tate's letter was in reply to Doc. 3226, probably Lathrop's most recent letter. Tate to Lathrop, 23 July 1888, DF (*TAED* D8818APV).

2. See Doc. 3217 esp. n. 7.

3. Thorndike Rice, editor of the *North American Review,* wanted the article (evidently the first of a series on Edison) by 20 September. The conditions for Edison's participation were later the subject of some confusion. In November, after Lathrop had drafted the first article, Rice asked Edison to sign it. Edison refused (according to Tate) "on the ground that it would appear egotistical." Lathrop blamed Rice for the misunderstanding but inquired if Edison would give the article his public approval in lieu of allowing himself to be named as author. The matter seemingly could not be arranged to everyone's satisfaction and, in early 1889, Lathrop offered his draft to *Scribner's Magazine,* evidently without success. Tate to Lathrop, 16 Nov. 1888, Lbk. 27:70 (*TAED* LB027070); Horace Townsend to Tate, 11 Sept. 1888; Lathrop to Tate, 17 Nov. 1888 and 2 Mar. 1889; all DF (*TAED* D8807ACB, D8807ACX, D8907AAO).

4. Horace Townsend (b. 1859?) was identified in various Federal, New York State, and English census lists as a writer, author, and journalist originally from Cheshire, England. He entered the United States about 1881 but maintained his British citizenship and, at least intermittently, a London residence. U.S. Census Bureau 1980 (1910), roll T624_1025, p. 11B (Manhattan Ward 12, enumeration district 665, N.Y., N.Y.); New York State Census 1905 (Manhattan, Assembly district 23, election district, 27, p. 11), accessed through Ancestry.com, 3 May 2016; 1891 England Census, folio 126, p. 3 (Kew, Surrey), online database accessed through Ancestry.com, 3 May 2016.

5. Townsend was evidently working as a freelance writer in New York when he was commissioned in July to write an article in Edison's name for *The Epoch,* a weekly magazine. Though nothing seems to have come of that project, he went through scrapbooks at the laboratory on Lathrop's behalf on 15 September and again in early October. At the end of 1888, Townsend was working on a different Edison article for Samuel McClure's writers' syndicate and, in early 1889, another for *Cosmopolitan* magazine. Thomas Maguire to Lathrop, 18 Sept. 1888; Townsend to Tate, 26 July, 4 Oct., 29 Dec. 1888, and 7 Jan. 1889; all DF (*TAED* D8818ATJ, D8807ABR, D8807ACK, D8807ADJ, D8907AAA).

From Franck Maguire[1]

PHILADELPHIA August 4th, 1888.[a]

My Dear Sir:

Your favor of 3d inst., just to hand.[2] I will take up the Phonograph for Japan and China with pleasure if you will give me reasonable option; and I think I can carry it through to your satisfaction.[3] How soon could Count Mitkiewitz[4] and some members of the Chinese legation see the Phonograph at your laboratory? I would say that the Count has a hold on these Chinese which no other foreigner can secure. He is no fraud. I suppose there have been fifty attempts to secure the concession which he received.

There is another thing which I intended to mention in my last letter I overlooked.[5] Some months ago I had a conversation with Mr. Gilliland in regard to the Phonograph figure business:[6] that is, a nickle dropping attachment for a Phonograph. I know of course that you have sold this along with your other improvements, but I wish to tell you that I had a talk with Mr. Erastus Wyman[7] and Hon. Benj. Butterworth[8] upon this subject, they were very much taken ~~up~~ with the idea, and Wyman agreed to go in with us and form a company. The Automatic Weighing Co.[9] of which he is in control [-][b] to handle the Phonograph figures. As this matter is so far on the way, could not possibly be in better hands, and as Mr. Wyman is of the opinion that he will get a chance at it, would it not be judicious to present the matter to the New Company[10] and see if they will agree to the organization of a sub-company simply for the purpose of handling these figures, with Mr. Wyman as President on what terms ~~they~~ you[c] see fit.

I would be much indebted if agreeable to you if you would send the letter of introduction to Mr. Lippincott that I spoke of in my last letter.[11]

You have probably read the article of Mr. Sumner Tainter[12] in the Electrical World of recent date upon the Graphophone.[13] Tainter is a good fellow, but his article is away off. I notice he quotes largely from my article on the Graphophone written in 1886 in Harpers Weekly,[14] and reproduces the cuts &ct. I may say that in the first part of the article (which he did not quote) I gave you full credit for the invention of the Phonograph and then dilated upon Mr. Tainter's invention of the wax cylinder. If I had seen your patents I would not have spread on the subject so much.[15] In writing that article I was guided by the information I received around the Bell Laboratory.[16] I was thoroughly convinced as soon as I saw your patents that you owned the Graphophone from a to izzard.[17] Very truly yours,[18] TL, NjWOE, DF (*TAED* D8847ABM). Letterhead of Edison's phonograph and mimeograph; F. Z. Maguire, general agent for Pennsylvania. [a]"PHILADELPHIA" preprinted. [b]Canceled. [c]Interlined above by hand.

1. Franck Zevely Maguire (1859–1910) was from Washington, D.C., where as a young man he worked for the government printing office (U.S. Census Bureau 1970 [1880], roll T9_124, p. 9B, image 0020 [Washington, District of Columbia]; Maguire passport application, 13 May 1901, *U.S. Passport Applications, 1795–1925,* online database accessed through Ancestry.com, 15 Mar. 2017; "Obituary," *Electrical Review and Western Electrician* 57 [19 Nov. 1910]: 1066). He was still in Washington in early 1888, by which time he had been "great friends" with Charles Tainter and formed a low opinion of Uriah Painter. He had corresponded with Ezra Gilliland about the phonograph and graphophone business. Gilliland warned at an unspecified date that Edison should have nothing to do with Maguire in regards to the phonograph, perhaps on suspicion of loyalty to Tainter, a sympathy that Maguire explicitly disavowed. Maguire moved to Philadelphia by June 1888 and was connected with the Edison phonograph and mimeograph agency there by the end of July (Maguire to Gilliland, 10 and 28 Mar. and 19 June 1888; Gilliland to Tate, n.d. [spring 1888?]; Maguire circular letter, n.d. [spring 1888?]; Maguire to TAE, 30 July 1888; all DF [*TAED* D8848AAN, D8848AAS, D8805ADS, D8848AFP, D8847AEJ, D8847ABJ]).

2. The brief typed letter sent in Edison's name was a truncated version of the reply he drafted on a 30 July inquiry from Maguire about securing agency privileges for some of Edison's inventions in Pennsylvania and beyond. Specifically, Maguire requested the "opportunity to place the Phonograph in South America or Mexico," about which he claimed to have been in contact with George Gouraud; he also asked for a letter of introduction to Jesse Lippincott. Edison instructed his secretary to "Write that Gouraud has everything— but I am ready to talk Japaneese & Chineese with a proviso I never saw Lippincott but once & dont feel well enough acquainted to give better." The formal reply made no mention of Lippincott but see note 11. Maguire to TAE (with TAE marginalia), 30 July 1888; TAE to Maguire, 3 Aug. 1888, both DF (*TAED* D8847ABJ, D8818AQS).

3. The question of Maguire's agency in Japan and China went back and forth throughout the fall, during which time he also expressed interest in the talking doll trade for those countries. Although Edison expressed skepticism to Gouraud that Maguire was the "right man" for the job, a contract (not found) was apparently drafted and submitted to Sherburne Eaton for legal review and to Everett Frazar for his consideration. Frazar approved, with some suggestions regarding the possible inclusion of his firm in the business. By November, however, Maguire was in Chicago, where he helped to organize the Illinois and Indiana Phonograph Co., and he relinquished all claims to the Japan and China trade early in the new year. He became involved with Edison kinetoscope businesses in the 1890s. Maguire to Tate, 10 and 24 Oct. 1888; TAE to Gouraud, 8 Oct. 1888; Gouraud to TAE, 10 Oct. 1888; Eaton to Tate, 18 Oct. 1888; Frazar to TAE, 3 Nov. 1888; Maguire to TAE, 29 Nov. and 13 Dec. 1888; all DF (*TAED* D8849ACB, D8849ACF,

D8849ACA, D8820AAW, D8849ACI, D8847ADK, D8847ADV); Tate to Frazar, 16 Nov. 1888, Lbk. 27:68 (*TAED* LB027068); Maguire to TAE, 9 Jan. 1889, Miller (*TAED* HM89AAB); "Chicago," *Electrical Engineer* 8 (Jan. 1889): 29; Musser 1994, 82.

4. Count Eugène Stanislaus de Mitkiewitz (d. 1901), described variously as a Polish or Russian noble, was the son of a Warsaw tradesman. Mitkiewitz reportedly assumed his new identity about the time he arrived in New York in 1868. He became involved with business affairs in China in the mid-1880s and secured powerful political patrons there. From 1887 to 1888 he led syndicates of American investors seeking concessions from Chinese authorities to set up telephone exchanges, railroad companies, and banks. Mitkiewitz's schemes and motives came under attack in the American press, however, and by late 1887 reports were circulating about his checkered past, including five years spent in an English prison. Mitkiewitz filed a well-publicized lawsuit against a group of disgruntled Philadelphia investors in June 1888. Young 1968, 44–50; "'Count' Mitkiewicz Dies at Asbury Park," *NYT,* 15 May 1901, 9; "Mitkiewicz Strikes Back," *NYT,* 9 June 1888, 1.

5. Maguire's 30 July letter; see note 2.

6. Maguire may have used "figure" in a general colloquial sense, as the cost of something or a sum to be paid (*DSUE,* s.v. "Figure"). More likely, however, he had in mind a particular episode related in an interview of Edison late in the year. Asked how he came up with the idea of a talking doll, Edison reportedly told this story:

> Last summer I had a couple of small phonographs made and put inside of two figures. Then I proceeded to have fun with my friends. Whenever they would come in I would twist this crank and the figures would say in unison:
>
> "Put a nickle in my mouth and I'll tell you who will be the next President."
>
> One was a Harrison and one a Cleveland figure, but you couldn't find out which was which until you dropped the nickle in the mouth.
>
> The nickle would set the phonograph in motion. If it went into one the man looking for information would be told that the next President would be Benjamin Harrison and if into the other then Grover Cleveland would be named. It was all a matter of luck. ["Talks with Wise Dolls," *New York Press,* 30 Nov. 1888, Clippings (*TAED* SC88132A)]

7. Maguire had some involvement with Erastus Wiman concerning the phonograph as early as March, when he told Ezra Gilliland: "I wish you could arrange to have the Phonograph figure matter run through at as early a date as possible because I do not want to have Wiman lose interest. I think we are going to make some money out of the scheme." Maguire to Gilliland, 1 Mar. 1888, DF (*TAED* D8848AAK).

8. Benjamin Butterworth (1837–1896) was a member of the U.S. House from Ohio and a former Commissioner of Patents. Doc. 2695 n. 4.

9. Erastus Wiman acquired American patent rights to a coin-operated scale in 1886 or soon thereafter, and he subsequently organized the American Automatic Weighing Machine Co. in New York City. The

firm started with a thousand penny-operated scales; by 1893, according to Wiman, 17 million people each year weighed themselves on the 7,000 scales it had in use. Wiman 1893, 29–30, 191; Carleton 1903, 1:380.

10. That is, the North American Phonograph Co.

11. Edison's unwillingness to provide an introduction to Lippincott having been omitted from his earlier reply to Maguire (see note 2), Tate explained on 8 August that Edison did not know Lippincott well enough to do so. He urged Maguire to ask Ezra Gilliland at the Edison Phonograph Co. office in New York for such a letter. Tate to Maguire, 8 Aug. 1888, DF (*TAED* D8818AQW).

12. Charles Sumner Tainter (1854–1940) honed his skills as a machinist and instrument maker in the shops of Charles Williams (telegraphic and electrical equipment) and Alvan Clark & Sons (optical instruments) in the Boston area. Having helped build equipment for observing the transit of Venus in 1874, he joined the government expedition for that event. Tainter afterward set up his own shop making scientific instruments in Cambridge, Mass. Among his clients was Alexander Graham Bell, who hired him in 1879 to help set up the latter's new laboratory in Washington, D.C. There Tainter helped Bell with the photophone and took the lead in developing an improved phonograph (the graphophone) and wax recording cylinders. Tainter remained connected with the graphophone enterprise off and on until 1903, when he moved to California for health reasons. *NCAB* 29:98–99; "C. S. Tainter Dead; Associate of Bell," *NYT,* 22 Apr. 1940, 14.

13. Publisher and editor W. J. Johnston expanded the editorial purview of *The Operator,* a well-established New York journal of the telegraphic trade, into *The Operator and Electrical World* in 1883. Called simply *Electrical World* by this time, it was "a weekly review of current progress in electricity and its practical applications" ("Another Step Forward," *Electrical World* 1 [6 Jan. 1883]: 4). Maguire referred to Tainter's illustrated article in the 14 July issue (Tainter 1888), a response to the inflated claims made by Ezra Gilliland on Edison's behalf at the May phonograph exhibition at the Electrical Club in New York.

14. As Maguire suggested below, his illustrated article (Maguire 1886) credited Edison with the invention of recorded sound and Tainter with mechanical improvements on the phonograph. It appeared in *Harper's Weekly: A Journal of Civilization,* a magazine (founded 1857) famed for its coverage of the Civil War and political aftermath and for its editorial and cartoon campaign against New York politician William "Boss" Tweed." By the mid 1880s, having lost some of its stature as a maker of political opinion, *Harper's* sought a wider compass of American life, notably on issues related to new technologies and industrialization. Prettyman 2001, 27–33.

15. In September, Maguire received and forwarded to Edison a long letter from Charles Stolpe, a former assistant at Bell's Volta Laboratory, who claimed to be the true inventor of the wax-covered paper cylinder patented by Tainter. Stolpe to Maguire, 3 Sept. 1888; Maguire to TAE, 5 Sept. 1888; both DF (*TAED* D8847ACA, D8847ABZ); see Doc. 3252 n. 2.

16. Alexander Graham Bell had recently moved to Washington, D.C., and set up a laboratory on Connecticut Ave. with Charles Tainter, when, in late 1880, he received the Volta Prize from the French government.

Bell used the prize money (roughly $10,000) in early 1881 to endow the Volta Laboratory Association, consisting of himself, Tainter, and his British cousin, Chichester Bell. The group initially focused on telephone research but quickly took up the challenge of improving the phonograph. Tainter continued working on recorded sound at the lab after the dissolution of the Association in 1885. Wile 1990, 210–12, 216–17; Tainter [1931?], 2–11, 14–15; *NCAB* 29:98.

17. That is, "from A to Z," or "beginning to end." The word "izzard" was a colloquial American variant of "zed," a British name for the letter "Z." J. Wright 2001, s.v. "from A to Izzard."

18. The letter was typed nearly off the bottom of the page, leaving little room for a signature.

–3235–

From James Gordon Bennett, Jr.[1]

New York, August 7th, 1888.

Dear Mr. Edison:

Enclosed please find a letter pertaining to the supply of electricity.[2] Would you be good enough to write a short reply to this for the Herald, and oblige, Very truly,

James Gordon Bennett.

<Tate write something like this Let me see it—[3]

This gentleman asks where all the Electric[a] power comes from that runs our modern electric Lights. The Herald can easily ascertain this by sending a reporter down stairs in their Electric light department to interview the Coal pile. The Sun shining several thousand years ago on rank vegetation stored up the Energy which lights the N York Herald.[4] The Reading RR owns most of the Electric Resources—[5] Edison>

TL, NjWOE, DF (*TAED* D8805AFL). [a]Interlined above.

1. James Gordon Bennett, Jr. (1841–1918) took over from his father as editor and publisher of the *New York Herald* in 1867. Under his stewardship, the paper expanded its circulation and became known for its extravagant pursuit of sensational stories, most famously Henry Stanley's African rendezvous with explorer David Livingstone. In 1879, Bennett and the *Herald* sponsored the polar expedition of the USS *Jeannette,* for which Edison supplied one of his first generators, arc lights, and related equipment. Bennett lived largely in self-imposed exile in Paris since 1877 but continued to exercise direct daily control over the newspaper. *ANB,* s.v. "Bennett, James Gordon, Jr."; see Doc. 1706.

2. Enclosure not found.

3. Alfred Tate incorporated Edison's marginalia into a reply over Edison's signature. The reply was dated 29 August, though a notation on Bennett's letter indicates it was sent two days later. The editors have not found Edison's response published in the *Herald* or other papers. TAE to Bennett, 29 Aug. 1888, Lbk. 25:145 (*TAED* LB025145).

4. The *Herald* purchased a large Edison isolated lighting plant (some 600 lights) in 1882. Plans to connect its offices to the Pearl St. cental

station in 1883 were apparently not carried out (see Doc. 2338). Edison's specification, however off-handed, of "several thousand years" for the creation of coal brought him to the edge of disputes over the age of the Earth that had for decades roiled geology, physics, evolutionary theory, and theology. By this time, however, there was a broad consensus in the English-speaking scientific world that the proper scale for measuring the Earth's age was on the order of a hundred million—not thousands—of years (Burchfield 1990, introduction; cf. Doc. 2940 n. 2).

5. The Philadelphia and Reading Railroad (widely known simply as the Reading) began operating in the anthracite coal fields of Pennsylvania in 1839. Through a subsidiary (the Philadelphia and Reading Coal and Iron Co.), the company acquired and began to operate the mines themselves in the 1860s. In recent years, the railroad also took virtual control of rival lines so that by about this time it exercised a "virtual stranglehold" on the region's mineral wealth, according to recent historians of the area (Dublin and Licht 2005, 14–19). According to Edison's formal response (see note 3), the remark about the Reading was in response to a direct question by Bennett's correspondent about ownership of the greatest coal reserves.

–3236–

From George Gouraud

Little Menlo—Beulah Hill—Norwood— Aug 11th 1888.

My dear Edison:—

I telegraphed you of the due arrival of the new Spectacles[1] & how pleased I am at the results. You were quite[a] right in saying ~~that~~ I had never[b] heard the Phonograph speak. Hamilton & I were truly astonished at the accuracy of the re-productions. The distinctness with which all the hisses are heard is really astonishing. The loudness is also very remarkable & will be very useful for all purposes of exhibition, lectures &c. These improvements arrived just in time. For the first time I felt myself ready in all respects to show the Phonograph. I had my invitations all ready printed[2] & ready for the mail & immediately posted them to the representatives of all the London newspapers—inviting them here to meet you—"non presentem at aloquentem"—that is to say—speaking but not present, or rather—not present but speaking.[3] Gilliland should be here by that time with the several dozen of loud records of music & voices which you mentioned in your cable.[4]

I sent you a cable immediately[5] explaining to you that you are wrong in supposing that deter[6] you. You have last said,[7] we should have the necessary means of making three complete machines. We have really but one complete machine fit for exhibition & in order to have two more we shall, as I explained to you require one silent motor & two new style governors.[8] That would enable us to utilize two of the old style of Phonograph frames, which with the new spectacles sent for them, makes two additional good instruments, that is, good enough for exhibition purposes.

I shall answer your last[b] long cable regarding the number of Phonographs I shall require as soon as I have had the opportunity of talking with Gilliland.[9]

We are curious as well as interested to know what the new material for Phonograms is. That they are not effected by temperature & are cheap, is most important.[10] Good-bye—
Yours Ever

Gouraud

L, NjWOE, DF (*TAED* D8850ACN). [a]Interlined above. [b]Obscured overwritten text.

1. Gouraud may have been referring to a cable sent on 9 August exclaiming "Improvements truly remarkable" and also complaining about the lack of a motor and governors for retrofitting older phonographs. He and Hugh Hamilton had been looking forward to the "new spectacle with perfected knife" since mid-July. Edison shipped the updated spectacle, along with various phonograph parts and supplies (including diaphragms and mailing boxes), on 23 July. There seem to have been at least two ways of attaching the trimming knife to the spectacle. One was to mount it on a short arm that placed it next to the recording point. The other, possibly adopted at this time, was to have it screwed directly to the spectacle frame. Gouraud to TAE, 9 Aug. 1888; TAE to Gouraud, 9 July 1888; Hamilton to TAE, 14 July 1888; Arthur Payne memorandum, 23 July 1888; George Evans to TAE, 17 Sept. 1888; all DF (*TAED* D8850ACM, D8818AOR, D8850ABX, D8850ACE, D8848ADV); see Doc. 3209 (headnote).

2. Gouraud enclosed an invitation in a different letter to Edison (n.d. [Aug. 1888], DF [*TAED* D8850ACW]).

3. Gouraud had considered issuing an invitation with some version of this phrase since at least November. He sent Edison a printed copy of such an invitation about this time, and the phrase was picked up in some press accounts of his phonographic receptions. Gouraud to TAE, 30 Nov. 1887 and n.d. [Aug. 1888?]; both DF (*TAED* D8751AAJ, D8850ACW); "To Meet Edison. Eloquentem Sed Non Preasentem," *Pall Mall Gazette* (London), 15 Aug. 1888, 6.

4. According to a typed confirmation, Edison wired that Ezra Gilliland would sail on 3 August with "several dozen loud phonograms music and voices which can be heard small audience." TAE to Gouraud, 3 Aug. 1888, DF (*TAED* D8818AQT).

5. Possibly Gouraud referred to a cable he sent on 2 August (in response to a 24 July letter from Edison) requesting a new motor and pulleys to retrofit an earlier phonograph. Gouraud to TAE, 2 Aug. 1888, DF (*TAED* D8850ACH).

6. Gouraud's amanuensis inserted a wavy line between "that" and "deter" and marked the latter word with a wavy underline. He also inserted small question marks over the wavy line and "deter." His apparent uncertainty about the intended text (as well as the form of

the dateline and closing) suggest that this letter was dictated on a phonograph.

7. As in the text above, here the amanuensis marked "last said" with a wavy underline and interlined a small question mark above the phrase.

8. Gouraud complained in early September that "the Governors of both the machines I have are admittedly all round imperfect, that is they are not regular in governing, the consequence of which—even with Messrs. Gilliland & Hamiltons manipulation in playing music—it gets constantly out of adjustment." Gouraud to TAE, 8 Sept. 1888, DF (*TAED* D8850ADC).

9. Edison's 8 August cable ran more than 120 words and read, in part: "Will ship you six hand made new perfect machines on first September. We start factory on that date turning out thirty daily for American Company. How many shall we add for you. You will be compelled to take the daily output you decided on for six months from September first.... See Gilliland and decide on maximum and cable quickly. The larger the output the cheaper they will be" (TAE to Gouraud, 8 Aug. 1888, Miller [*TAED* HM88AAI]). Gouraud cabled on or about 20 August that he wanted to know the machine's cost before committing himself to a standing order. Having evidently received no definitive answer as to cost, Gouraud delegated Ezra Gilliland to cable on his behalf that he would take as many phonographs as the American company, provided they lived up to Edison's promises and cost no more than twenty-five dollars (Tate to TAE, 14 Aug. 1888; Gilliland to TAE, 3 Sept. 1888; both DF [*TAED* D8818ARO, D8850ACY]; Tate to TAE, 21 Aug. 1888, Lbk. 25:126 [*TAED* LB025126]). Learning that Edison refused to accept the order on anyone else's authority, Gouraud explained that he had asked Gilliland to send it so as to avoid publicity. In reiterating Gilliland's directive, however, he also appeared to amend it, telling Edison: "You can best judge what number present perfection justifies making. I give you absolute discretion to fix and make that number for my account. I can handle double ordered by American Company if machines equal Gillilands representations of what they will be" (Gouraud to TAE, 8 Sept. 1888, DF [*TAED* D8850ADC]). Edison replied that he would allot Gouraud five instruments daily from the factory, increasing to twenty after two months. The latest machines, he promised, were "very perfect, louder, clearer any you yet heard; governor and adjustments perfect; single small cell runs twelve hours. Factory machines will be more perfect" than those yet made by hand (TAE to Gouraud, 10 Sept. 1888, Miller [*TAED* HM88AAP]).

10. Edison cabled a few days earlier, presumably in reference to metallic soap compounds: "Since Gilliland left have discarded wax and have a substance that is perfect, also independent of temperature and cheap" (TAE to Gouraud, 8 Aug. 1888, Miller [*TAED* HM88AAI]). With only the prior wax cylinders to work with, Gilliland identified some of their faults in a memorandum to Edison a short while later:

> Wax bothers us a great deal, gets all over the machine and the floor. The wax Hamilton has seems harder, it is much whiter and may be a different mixture. I thought it well to mention this as this difference may be due to seasoning....
>
> When the phonograms are used at a different temperature than

when they are made the pitch of the thread is altered in the wax. It makes it necessary to alter the adjustment 3 or 4 times in running across the phonograms.

Such distortions would not seriously affect office dictation but would be detrimental to commercial recordings of music, especially given contrasts between the American and British climates. "How would it do," he suggested, "to have music for hot weather and music for Autumn Winter & Spring" (Memorandum enclosed with Gilliland to TAE, 23 Aug. 1888, DF [*TAED* D8850ACS]).

–3237–

From Alfred Tate

[Orange,] August 18, 88.

My Dear Mr. Edison:—

I beg to confirm the following telegrams sent you to-day:—[1]

"Gilliland cables us this morning as follows: Have exhibited the phonograph to eighty leading journalists; great success. Have procured good phonograms from many of them and other prominent persons.[2] Will send phonograms by M. L. Pierce,[3] passenger on 'Etruria'[4] Saturday. Have arranged to exhibit the phonograph to other important parties. Please send at once by quickest route phonograph with good collection of phonograms. Your phonogram and Bushnell's[5] singing and noises[6] made great hit. Enjoying ourselves; all well. Please advise Bushnell at New Haven of his success. Can do nothing Railway Telegraph at present. GILLILAND"

"Find now that no new phonographs can be ready before Saturday twenty-fifth instant. A. O. Tate."[7]

Yours very truly,

TL (carbon copy), NjWOE, DF (*TAED* D8818ARV).

1. The editors have found neither the cable from Ezra Gilliland quoted below nor Tate's retransmittal of it. Edison left for Chautauqua, N.Y., on the morning of 9 August. For the preceding week he had been feeling, according Tate, "somewhat indisposed from an attack of acute dyspepsia, brought about by too close application to his experiments" (an explanation echoed in a least one press report). He planned to be away for a week or ten days but did not return until late on 25 August (Tate to Henry Villard; 9 and 25 Aug. 1888; both DF [*TAED* D8818AQY, D8818ARZ]; untitled clipping, *Boston Traveler,* 25 Aug. 1888, Clippings [*TAED* SC88044D]). Edison's wife Mina and their infant daughter Madeleine had been at Chautauqua (with members of her family) since at least early August (TAE to Henry Villard, 4 Aug. 1888; Ira Miller to TAE, 24 Aug. 1888; both DF [D8818AQU, D8816AAP]).

2. George Gouraud cabled Edison more effusively about this event: "Press reception immense success, hundred papers present,

unprecedented unanimity, unqualified praise. You will hear their cheers on arrival of 'Etruria.'" Tate to TAE, 20 Aug. 1888, DF (*TAED* D8850ACQ).

3. The passenger manifest for this journey listed Martin L. Pearce as an elderly banker from Liverpool; the editors have not further identified him. Pearce delivered a box of phonograms "in good condition" to the Edison Phonograph Co. office in New York on 27 August. *Passenger Lists* 1958, microfilm M237_529, line 510, list no. 1172; Charles Bruch to Ezra Gilliland, 28 Aug. 1888, LM22:96 (*TAED* LM022096).

4. The *Etruria* and sister ship *Umbria* were the most powerful single-screw steamships yet constructed when they entered service for the Cunard Line in 1885. *Etruria* sailed the Liverpool–New York route and had recently set the westbound speed record across the open Atlantic from Queenstown, Ireland, to Sandy Hook, N.J., in just over six days. The ship steamed from Liverpool with 700 passengers on Saturday, 18 August, amid speculation that the crew would try to best that time. Hyde 1975, 32; "What Is the Limit of Speed," *New York Tribune,* 10 June 1888, 12; "Still Out Upon the Sea," *Chicago Daily Tribune,* 9 Aug. 1888, 1; "News of the Day Abroad," *NYT,* 21 Aug. 1888, 1; "The Etruria at Anchor," *NYT,* 26 Aug. 1888, 8.

5. This was probably Ericsson Foote Bushnell (1862?–1929), an operatic bass and baritone from New Haven, Conn., who recently had been making his name in New York and reportedly made a number of recordings for Edison in 1888 and 1889. His older brother, Cornelius Judson Bushnell (1855–1922), also sang baritone in New York. One or both of the siblings was acquainted with Gilliland. Herndon 1898, 306–8; Find A Grave memorial nos. 130688285 (Ericsson) and 94955677 (Cornelius), online database accessed through Ancestry.com, 25 Apr. 2016; "Calvary Baptist Church," *New York Amusement Gazette* 13 (17 Mar. 1890): 353; Charles Bruch to Gilliland, 7 Sept. 1888, LM 22:127 (*TAED* LM022127); Gilliland to F. E. Bristol, 22 June 1888; Nathaniel Smith to Tate, 21 Sept. 1889; both DF (*TAED* D8848ACK, D8955ADA).

6. Gilliland probably referred to a recording of noises from Edison's laboratory (including an anvil, sandpaper, and a printing telegraph) that Gouraud had reportedly played for visitors to his home a few days earlier. At some time before the British Association meeting in early September, Gouraud also received a recording of Edison's workmen singing, talking, and imitating barnyard noises. "Mr. Edison's Phonograph," *Times* (London), 15 Aug. 1888, 9; "The British Association," ibid., 7 Sept. 1888, 5.

7. Tate to TAE, 18 Aug. 1888, DF (*TAED* D8847ABR); see Doc. 3238.

–3238–

From Alfred Tate

[Orange,] August 18, 88.

My Dear Mr. Edison,.—

I have received your memoranda.[1]

PRINTER EXPERIMENT.[2] Kenny gave me the enclosed samples of work which he has done so far. He says he does not think the type wheel will have to revolve as rapidly as you at first thought it would. As you will see he has only printed with one letter so far, and says the experiment is coming out all right.

TEST MODEL PHONOGRAPH. As soon as the model phonograph is ready Kennelly will make the test you requested[3] The machine has been delayed, as Fred Ott[4] has been knocked out the last few days. He lost only one afternoon, but is unable to work with that vigor which usually characterizes his movements. I do not think the machine can be ready before Wednesday at the earliest.

PHONOGRAPHS UNDER CONTRACT. The men are working night and day on the twenty phonographs. I wired you this morning[5] that none of these machines can be completed before a week from to-day, 25th instant. Ott found that none of them could be finished by Wednesday, as he first supposed.[6]

BOOKS ON SOAP MAKING & C.[7] Payne had no catalogue of Van Nostrand's[8] so I have written Spiers[9] to send out here all books which treat of the matters you mention. You can select what you want and return those you do not desire to keep.[10] I have started English[11] out collecting the data you asked for, and gave Gladstone the memoranda you enclosed to me.

Bamboo. In my letter of yesterday I added a postscript to the effect that Mac's[12] bamboo had arrived at New York.[13] It is being put through the Customs and will be sent out here just as soon as it is cleared.

Ink Factory.[14] I am going over to this place this afternoon and will write you to-morrow (Sunday) as to the progress they are making.

Batchelor has been away since yesterday at the sea shore with his family. He returns on Monday, when I will deliver your message.

I communicated with the Machine Works in regard to the centrifugal machine which they had at Goerck Street,[15] and also in relation to insulation. I had hoped to have had a reply in time to embody the same in this letter, but nothing has come up to present writing. I will advise you just as soon as I hear from them. I also asked them about the castings for new big dynamo.[16]

ASPHALT EXPERIMENT. Wilmowsky[17] tells me that this experiment was completed to-day. I enclose some data with relation to same which he handed me.[18]

MALLORY'S IRON ANALYSIS. I have received another letter from Mr. Mallory in regard to the analysis which he wants to get of the sample of iron left with you.[19] He says it is very important that he should obtain this at the earliest possible moment and Wilmowsky says that if you wish, he could make this analysis himself now and complete it in one or two days. If you desire the analysis made, immediately, please advise me.

LETTERING ON PHONOGRAPHS. Ott has handed me a sketch and memorandum which you sent to Batchelor in regard to lettering phonographs.[20] This lettering cannot be put on the machines where you indicate, for the reason that there is a rod which runs along the centre of that side of the machine and which would obscure the record. It is like this:[a]

The only place on the phonograph where you could put this record is on top, thus:[b]

I have sent for a full list of phonograph patents to be recorded in the way you indicate.[21]

Lamp Test. I enclose herewith record of lamp test up to nine o'clock this morning.[22]

PHONOGRAPH DATA. I have received from Serrell[23] the data which we asked him for, with relation to the phonograph. I enclose herewith copy of his letter which accompanied the data.[24]

Checks. I received this morning your letter containing the checks which I sent you for signature.[25]

Since writing the above I have been over at the Ink factory, and find that the work which you refer to will be completed by Tuesday. They can then go right ahead, provided the gas coil which they have works all right. If it does not work satisfactorily they will have to do a little experimenting upon it. Yours very truly,

P.S. I have just received the following telegram from the Machine Works, and have repeated to Batchelor that portion which relates to his going to Schenectady:—[26]

"Centrifugal Drying machine shall be shipped Monday. Hope to cast new big dynamo early next week. Have new squirter running and have used up all insulation we have on hand; send more.[27] Can Mr. Batchelor come up and see machine in operation? Important. EDISON MACHINE WORKS."

TL (carbon copy), NjWOE, DF (*TAED* D8818ARU). [a]Followed by a short blank space at the top of the next page, apparently intended for a drawing. [b]Followed by a blank space, apparently intended for a drawing.

1. Not found.

2. This project likely was a form of typewriter, which Edison (and others) sometimes referred to as a printer (see, e.g., Docs. 133, 153, 156, and 234 n. 2). Patrick Kenny had worked with Edison intermittently over several years on various telegraph printing devices, none of them likely to have used the type wheel mentioned below. Rather, laboratory time sheets show Kenny working exclusively on a typewriter throughout August. Both an account record for this project and correspondence from Albert Dick suggest some connection with the mimeograph. In September, when Edison received an unsolicited suggestion to devise an electrically operated typewriter, he instructed Tate to "Say I am working on one" (Time Sheets, WOL; Laboratory Ledger #5:462, WOL [*TAED* NL011A1]; Dick to TAE, 26 May 1888; TAE marginalia on Jonathan Young to TAE, 12 Sept. 1888; both DF [*TAED* D8822ABB]).

3. This machine likely had the "model motor" made by Fred Ott. According to Doc. 3241, it was to be ready in a few days, and Arthur Kennelly tested it on or before 23 August. Kennelly to TAE, 23 Aug. 1888, DF (*TAED* D8855ABL1). This machine probably was the instrument mentioned in Doc. 3241.

4. Frederick Paul Ott (1860–1936), the brother of John Ott, had worked for Edison since 1874. He was a machinist and mechanical assistant at the Orange laboratory. Ott had been putting in long days (and nights) on phonograph experiments in recent weeks. Doc. 3077 n. 7; Time Sheets, WOL.

5. Doc. 3237.

6. The editors have not determined the genesis of this batch of twenty hand-made machines. When finally completed about the tenth of September, Edison proclaimed to George Gouraud that they were "very perfect louder clearer [than] any you yet heard governor and adjustments perfect." Two were promised to Gouraud and four to Gilliland. TAE to Gouraud, 10 Sept. 1888, Lbk. 26:314 (*TAED* LB026314).

7. Cf. Doc. 3223.

8. D. Van Nostrand & Co., one of the nation's most venerable book publishers, importers, and sellers, was founded in 1848 by David Van Nostrand, whose initial focus on military topics rapidly expanded to encompass all manner of engineering, industrial, technical, and scientific subjects. Edison had made innumerable purchases from the firm, which since 1869 had been located in adjacent buildings at 23 Murray and 27 Warren Sts. in lower Manhattan ("The House of Van Nostrand and Speirs Jubilee," *Publishers' Weekly* 97 [1 May 1920]: 1383–84; Derby 1884, 653–55). In an undated note probably written shortly before he left for Chautauqua on 9 August, Edison instructed Tate to "Tell [Arthur] payne to get from Van Nostrand such works as treat of fats, soap making—Candle making" (TAE to Tate, n.d. [Aug. 1888], DF [*TAED* D8855ACN]).

9. Charles E. Speirs (1853–1933?) began working for Van Nostrand & Co. in 1870 and spent his entire career with the firm, eventually becoming managing director; Edison had corresponded directly with him since at least 1878. Speirs was elected to the New York Electrical Society in 1898. U.S. Census Bureau 1982? (1900), roll 1154, p. 8B

(enumeration district 0835, Manhattan, New York, N.Y.); *New York, New York, Death Index, 1862–1948,* online database accessed through Ancestry.com, 17 May 2016; "The House of Van Nostrand and Speirs Jubilee," *Publishers' Weekly* 97 (1 May 1920): 1383–84; "New York Electrical Society," *Electrical Review* 33 (9 Nov. 1898): 295.

10. The first eleven items on a running list of "Additions to the Library" were works about soaps, candles, and oils, all entered on 24 August. A twelfth title, *Practical Treatise on Animal and Vegetable Fats and Oils* by William Brannt (1888), was crossed out but was among the dozen or so chemistry volumes that Payne borrowed from the library on 17 September. N-88-01-30:71, 19; WOL (*TAED* NL003AAA [images 37, 11]).

11. John English.

12. Frank McGowan (1849?–1890?) had filled various administrative duties with Edison and his lighting businesses since 1882, including secretary of the Edison Co. for Isolated Lighting and, most recently, an undetermined position with the Edison Electric Light Co. In late autumn 1887, Edison dispatched him to South America in search of lamp fibers. McGowan signed many of his letters on this journey as "Mac." Docs. 2261 n. 2 and 2797 n. 8; on the fiber expeditions of McGowan and others, see Doc. 3230 n. 1.

13. The editors have not found Tate's prior letter. The bamboo likely was sent from Cali, Colombia, on or shortly after 4 July. Soon afterward, McGowan wrote a long letter (copied onto twenty typed pages) detailing his herculean labors to obtain and prepare the bamboo, including his provision of 150 mules to transport it. C. H. Simmonds to Tate, 4 July 1888; McGowan to TAE, 18 July 1888; both DF (*TAED* D8828ACH, D8828ACJ).

14. Edison had long experience with various inks (recently in connection with the mimeograph), but this "factory" seems to have had nothing to do with writing or printing. Information is sparse, but Edison apparently was using a large building marked "ink factory" on a period map (the Glen Ridge section of Bloomfield near the border of Orange) to apply a secret process to the manufacture of lamp filaments. By early 1889, Tate was tracking the "ink factory" in a "special set of books," which the editors have not found (chap. 1 introduction esp. n. 12; Tate to Francis Upton, 30 Jan. 1889, Lbk. 28:10 [*TAED* LB028010]). The Glen Ridge (N.J.) Historical Society has suggested that Edison formulated waterproof ink at the site but the editors have not substantiated the claim (Glen Ridge Historical Society web page, glenridgehistory.org/the-mills, accessed 9 Dec. 2018; cf. Hill 2007, 168).

15. The Edison Machine Works was located on Goerck St., in Manhattan, from 1881 to 1886 (see Docs. 2060 esp. 1 and 3018). Tate directed a telegram to the shop: "Are you using the Centrifugal drying machine which you had at Goerck street. If not Mr Edison would like to have it shipped to him here. reply" (West Orange Laboratory to Edison Machine Works, 18 May 1888, DF [*TAED* D8835AEC]). He copied the response, also received the same day, into his postscript below (see note 26).

16. In a separate telegram sent the same day in Edison's name, Tate inquired: "How is insulation progressing Is squirter finished yet? Have you made castings yet from Potters new big dynamo? Reply."

Tate copied the reply into the postscript of this document (see note 26). "Potter" may have been a mistaken reference to Charles T. Porter, an erstwhile steam engine builder who had been using the Edison Machine Works to design a new engine. As the cost of his effort to the Machine Works approached $25,000, Edison had recently resolved to end the project promptly but did not do so. TAE to Edison Machine Works, 18 Aug. 1888; Insull to TAE (with TAE marginalia), 26 July 1888; both DF (*TAED* D8835AEB, D8835ADO); Doc. 3004 n. 4.

17. Erwin Freiher von Wilmowsky (1853–1907) became the head of the chemical department when Edison opened his new laboratory at the end of 1887. Sometime after being discharged in 1889, he became associated with Elihu Thomson at the Thomson-Houston Electric Co. in Lynn, Mass., where he became a naturalized citizen in 1894. His prior citizenship was listed as German, though according to one report he was born a Polish baron. Doc. 3109 n. 1; U.S. Immigration and Naturalization Service 1983, roll M1299_114 (V545, 5 Apr. 1894); *New York, New York, Death Index, 1862–1948,* online database accessed through Ancestry.com, 23 May 2016; *New York, Kings County, Probate Records,* online database accessed through Ancestry.com, 23 May 2016; *Western Electrician* 10 (26 Mar. 1892): 196.

18. The enclosures have not been found. Wilmowsky's laboratory time sheets indicate several recent weeks of insulation experiments involving asphalt.

19. Walter Mallory wrote from Chicago on 15 August, anxious to have results of the iron ore analysis before taking options on land or mines in the region. Tate replied that Edison had given the task to an assistant who "failed to conduct it properly—in fact, botched the whole thing." Tate promised to bring the matter up with Edison upon his return. Mallory to Tate, 15 Aug. 1888; Tate to Mallory, 17 Aug. 1888; both DF (*TAED* D8845ACU, D8818ARQ).

20. Not found.

21. That is, a metal plate engraved with Edison's name and his relevant patents.

22. Not found.

23. Lemuel Wright Serrell (1829–1899) was Edison's patent attorney from 1870 to 1880. Docs. 110 (headnote) n. 2 and 2120 n. 5.

24. Serrell supplied information about two phonograph caveats (nos. 77 and 80; Docs. 1227 and 1341) that he had prepared for Edison in 1878, noting the relation of each to foreign patent specifications. He enclosed copies of the specification of the former case and the drawings and specification for the latter one. Serrell to TAE, 17 Aug. 1888, DF (*TAED* D8846ABE).

25. The editors have found neither Edison's letter nor previous correspondence from Tate about these checks.

26. Tate transcribed the message sent by William Gilmore to the Laboratory. Gilmore to West Orange Laboratory, 18 Aug. 1888, DF (*TAED* D8835AED).

27. The new machine for applying insulation to wire had been ready at the Edison Machine Works since about 9 August, when Samuel Insull asked Edison to send the "latest and best specimens of insulation" from the laboratory. Near the end of August, Charles Batchelor reported that samples of insulated wire were "very fine, although the material

itself is not quite tough enough," especially since wire came through the machine faster than it could be wound on spools without damage to the coating. Batchelor thought that residual acid in the material could be part of the problem, though the amount would be small because the acid was washed out with warm water "until there is no more taste." Insull to TAE, 9 Aug. 1888; Batchelor to John Kruesi, 27 Aug. 1888; both DF (*TAED* D8835ADY, D8818ASA).

–3239–

To George Gouraud[1]

[Orange,] Aug 20th [188]8

Dear Sir:

Messrs Dyer and Seely[2] have referred to me your letter under date 7th inst.,[3] in which you state that you fail to understand the object of your not applying for patents in short term countries in connection with phonograph improvements, and stating furthermore that you had made applications for patents in short term countries in the matter of cases 84 and 85.[4]

In reply to this letter I would say that there are several reasons why you should not make such applications, the object of which will appear later on.

The first reason was contained in a letter dated November 23rd 1887[5] written by Mr Dyer in which he told you that I had asked him to say[a] to you that I did not wish you to apply for these short term patents.

The second reason you will find in a letter which is doubtless in your files at the present time, written by Mr. Dyer and reiterating in substance the instructions contained in his letter of the 23rd of November, the former being dated March 22nd 1888.[6]

The third reason is the various conversations which you had with myself and Mr. Dyer on this same subject when you were last in America, and the fourth reason I find embodied in your proposed contract relating to foreign countries, the first provision of which reads as follows:[7]

"And the said Edison further agrees, that if during the existence of this contract, any new or further inventions or improvements[a] are made by him…he will furnish to the said Gouraud such data information and drawings as may be necessary to enable the said Gouraud to apply for and obtain… Letters Patent…in each and every the countries aforesaid.…

<u>Provided however</u>, that the said Edison shall not be called upon to do anything which will prevent either the obtaining of Letters Patent upon such inventions or improvements in the

United States, <u>or shorten the life of any such patents when obtained</u>."

You are sufficiently well versed in patent affairs to know that in the case of short term patents the date which controls is the date of application, and consequently if you apply for a short[a] term patent before my United States patents in the same connection have been issued, you thereby limit the lives of my U.S. patents, and render them valid only so long as the short term patent is in force.

In the matter of Cases 84 and 85 you have displayed an utter and selfish disregard for interests of mine which you must have known were of more value to me than the short grants which you have obtained in obscure countries.

In addition to this you have acted in direct opposition to my expressed wishes, and have furthermore violated the very first provision of a recorded agreement which you proposed entering into with me.

As my instructions to you in this connection were made so repeatedly,[a] not only by letter, but orally by myself and through Mr. Dyer, and as I also considered the matter of sufficient importance to provide for it in my proposed written agreement with you, it is difficult for me to understand just in what way I can place my views before you, or express my wishes to you so as to ensure a proper recognition of them on your part. I cabled you today[9] expressing briefly my feelings as to your action in the matter of cases 84 and 85, and I endeavor to express myself in relation to Cases 86 and 87[10] in a way that would admit of but one interpretation. yours truly,

Thomas A Edison T[ate]

L (letterpress copy), NjWOE, Lbk. 25:117 (*TAED* LB025117). Typed copies in DF (*TAED* D8849ABI, D8818ARW). [a]Repeated as page turn.

1. With Edison vacationing in Chautauqua, Alfred Tate wrote and sent this letter himself as part of a chain of correspondence on this subject. He had a typed version prepared (with a carbon copy) that he sent to Edison with an explanation of the circumstances and the remark that he "considered it necessary that Gouraud should get this letter as quickly as possible; otherwise I would have awaited your return so you could have signed it yourself." Tate to TAE, 20 Aug. 1888, Lbk. 25:112 (*TAED* LB025112); TAE to Gouraud, both 20 Aug. 1888, DF (*TAED* D8849ABI, D8818ARW).

2. Henry W. Seely entered into partnership with Richard Dyer in 1884, with the new firm of Dyer & Seely acting as Edison's principal patent attorneys. Docs. 2346 n. 15, 2429 n. 3, and 2681 n. 1.

3. Gouraud's 7 August letter to patent attorneys Dyer & Seely acknowledged that he "fail[ed] to understand the object" of their instructions, mailed on 27 July (but not found), not to file in countries

offering patent protection for less than fourteen years. Their letter, however, had crossed in the mail with one sent by Gouraud a day earlier, in which he made clear his intention to do just that. On receipt of that information, Dyer & Seely relayed it on 6 August to Orange, where it would have reached Tate but not Edison; they also reiterated that they had instructed Gouraud about short-term patents with each set of documents sent to him. Nothing more seems to have been done for two weeks. Gouraud to Dyer & Seely, 26 July and 7 Aug. 1888; Dyer & Seely to TAE, 6 Aug. 1888; all DF (*TAED* D8849AAT, D8846ABI, D8846ABD).

Having received Gouraud's letter of the 7th from Dyer & Seely, Tate wired Edison in Chautauqua on 20 August, urging him to "cable Gouraud Norwood your views on this subject and mail me copy of your cable." Apparently unwilling to wait, Tate drafted a cable to Gouraud in Edison's name (on letterhead of attorney John Tomlinson) stating that Edison was "surprised and greatly annoyed to learn ~~that~~ you have taken patents on cases Eighty four and Eighty five in short term countries ~~This is a~~ in direct violation of ~~your~~ my instructions to you personally and through Dyer I forbid absolutely a repitition in connection with cases eighty ~~seven~~ six and eighty seven." Later that day, Tate mailed Edison a more complete explanation (enclosing Gouraud's 7 August letter, after having a typed copy made; see note 1) stating that he had already responded to Gouraud by cable and post. Tate to TAE, 20 Aug. 1888; TAE to Gouraud, 20 Aug. 1888; both DF (*TAED* D8849ABF, D8850ACQ1); TAE to Gouraud, 20 Aug. 1888; Tate to TAE, 20 Aug. 1888; Lbk. 25:115, 112 (*TAED* LB025115, LB025112).

4. The editors have found limited information about these patent master cases (or "sets") for groups of foreign countries. The extant record for Case 84 consists of a file wrapper indicating that it corresponded to Edison's U.S. Cases 741 and 742 (see *TAEB* 8 App. 2.A). Specifications and drawings were sent to Gouraud in November 1887, as were powers of attorney for Germany, France, Spain, Belgium, Austria, Italy; documents for South Australia, Queensland, and Tasmania went later. Case 85 corresponded to Edison's U.S. Cases 747, 750, and 755–758 for a phonograph machine, phonogram blanks, and method of making blanks (see *TAEB* 8 App. 2.A and *TAEB* 9 App. 5). Specifications and powers of attorney went to Gouraud on 23 March 1888, and materials for South Australia, Queensland, and Tasmania went in April. Cases 84–85, Foreign Sets, Patents, NjWOE.

5. The editors have not found Dyer's letter of 23 November 1887, but Tate summarized its strictures in his 20 August letter to Edison (see note 1).

6. The editors have not found Dyer's letter, but Tate conveyed its gist to Edison in his 20 August cover letter (see note 1).

7. Though Edison referred to a "proposed" contract, he quoted from the first clause of his 14 October 1887 agreement with Gouraud. Miller (*TAED* HX87010); Doc. 3092 n. 1.

8. Section 4887 of the American patent statutes appeared to limit the length of a U.S. patent, in cases where foreign specifications were also taken out, to that of the shortest foreign patent. The practical effects of this provision, however, were still being litigated. Doc. 3120 nn. 2–3.

9. See note 3. Tate subsequently telegraphed to Edison (in care of

Lewis Miller in Akron, though it is unclear whether Edison went there) the text of a long cable received from Gouraud. It read, in part:

> Complete misunderstanding No recollection personal request but am assured no harm done and certainly no idea deviating from your wishes and best interests No step taken except advised by highest authorities regardless expense who advised no prejudice resulted to long terms when short terms applied for subsequently [Tate to TAE, n.d. (21 Aug. 1888?), Lbk. 25:126 (*TAED* LB025126)]

10. Edison's foreign Case 86, sent to Gouraud on 27 July 1888, corresponded to his U.S. Cases 774–76, 784–86, 787, 789, 791, 793, and 795. Case 87 went to Gouraud a day later and corresponded with U.S. Case 792. Unlike those in foreign Cases 84 and 85, none of the related U.S. patents in this latter group had yet issued. See App. 5; Cases 86–87, Foreign Sets, Patents, NjWOE.

–3240–

Arthur Kennelly to the New York World[1]

[Orange,] 20th August [188]8

Dear Sir

Having read the article in your issue of last Sunday the 19th entitled "To kill by electricity", I beg that you will allow me to correct a misstatement that has found its way there and also to add a few remarks on the subject.[2]

It is mentioned that "Experiments in killing dogs under the supervision of so able an electrician as Thomas A. Edison resulted in the hides of some of the animals being split open"—. Having[a] carried out those experiments under Mr Edison's instruction for the purpose of ascertaining by exact measurement the amount of electricity which requires to be passed through a dog in order to kill it, I am in a position to say that in no case has the hide been so split.

There have been only two cases in which the skin of the animal has suffered any damage and that was a[a] burning or charring effect produced in our first trials before we had learned the best method of passing the current through the body. It may be mentioned that it can always be arranged to kill a dog instantly by electricity without any external sign left on the animal showing how death was inflicted, and without sign moan or struggle. The animal falls motionless.

In all cases where persons have been burned by accidentally coming in contact with electric light wires, the burning is traceable to the ~~bad electrical[b] contact~~ insufficient contact that has existed between the wire and the person of the sufferer[b] [------].[c] Had the contact been more perfect, that is to say had it taken place over a larger and wetter surface of skin there can be no question that the burning would not have resulted, although it is probable that the shock would have thereby been more disastrous in its effect on vitality.

While it must be admitted that the amount of current that will kill a dog is perhaps considerably less than that which is necessary to kill a human being, and also that ~~the shock would have therby been more disatrous in effect upon vitality~~, both human beings and dogs differ very much among[a] themselves in their susceptibility to injury by electricity, still there are in the absence of direct measurement on human beings, [---][c] limits of proportion within which our conclusions may be trusted.

The results of experiments made at Mr. Edison's laboratory point to four conclusions.

1st That in the case of continuous currents or those which flow continuously in the same direction the fatality of the current depends upon its strength and also to some extent upon the time of application. For example a current of one fourth of an ampere might be fatal [--][c] during an application of twenty seconds though not fatal during five. The fatality though it thus [~~depends~~?][c] increases with the time does not seem to do so in anything like direct proportion—.

2nd That with alternating currents or those that vary rapidly in direction to and fro, the fatality of the current depends upon its strength, the time of its application, and also upon the number of alternations per second or rapidity of reversal. The effect in this case seems to be more nearly proportional to the time of application or the number of alternations than is ~~yet~~ to be observed with the continuous current.

3rd That the rapidly[b] alternating current is under otherwise [----][c] similar conditions beyond all doubt more fatal than the continuous current. The exact difference cannot be stated accurately owing to the great range of vitality and susceptibility that different dogs evince, but it would appear on an average that the former is two and a half or three times more fatal than the latter, under the same set of conditions.

4th That the effect of the current when passed between one fore leg and one hindleg is chiefly on the nervous system and not so much on the heart or its only nervous centre. As a rule the heart of a dog killed by the current beats for some time after unconsciousness and death have reached the brain. In one case examined by Dr. Peterson[3] the heart beat for more than thirty ~~seconds~~ minutes after death had been produced.

There seems to be no good ground for the opinion that the resistance of an animal or its variation has any direct bearing upon its vitality or its susceptibility to electrical injury. The matter is generally misunderstood. The resistance of a piece of homogeneous metal is a definite quantity depending upon ~~the~~ its shape and nature, but the resistance of a human being is not capable of similar[b] definite statement.[4] First of all he is composed of heterogeneous material largely fluid, and essentially of variable resistance, ~~the resistance of this heterogeneous mass will soar~~, and secondly he is encased in dead matter, superficially covered with horny epidermis a very bad conductor. If the hands are dry and each grasps a wire the resistance between them may be very large. It would therefore require under those circumstances a large electrical pressure to force a fatal current through him. But when the skin is moistened ~~either~~ by perspiration or wet applications, and the surface of contact with the conductors conveying the electricity are sufficiently enlarged, the resistance of the body can be reduced almost to[b] ~~without~~ any[b] limit. So that when the resistance of a human being or any animal is stated to be so many ohms, the statement simply defines the particular resistance of the animal's body and skin, under the existing conditions of area, moisture and pressure of contact, and that the variation of any of these latter would change the resistance perhaps many times. The fact is generally noticed that the measured resistance of a dog falls when a strong current is passed through his body. That means that either the electricity in traversing his tissues has altered them more favourably to conduction or what is quite as likely that the contact at the surface of the skin has in some way been improved.

The electrical pressure which will kill a dog within thirty seconds, seems to vary for the particular method of contact employed ~~at~~ in the Edison Laboratory experiments, according to the size and nature of the animal between 300 and 700 volts for continuous and between 100 and 250 volts for alternating currents. The pressure which is required to kill instantly say within two seconds is greater and may be roughly taken as three times those amounts.

How much more than this current is required to kill a man we do not at present know but it is probable that sustained electrical pressure of three thousand volts alternating say 500 times per second through good contacts made perhaps by bandages on the wrists moistened with salt water, the contact being even more important than the voltage, will suffice[b] for the purpose of criminal execution. There will be at least under those circumstances no mutilation, and death if not instantaneous would be a question of seconds Yours faithfully,

A. E. Kennelly Electrician Edison Laboratory

ALS (letterpress copy), NjWOE, WOL, Laboratory Letterbook LM-111:43 (*TAED* LM111043). [a]Obscured overwritten text. [b]Interlined above. [c]Canceled.

1. The *New York World,* founded in 1860, became the leading Democratic newspaper in the United States in the 1880s. Jay Gould owned it briefly before selling it in 1883 to Joseph Pulitzer, publisher of the *St. Louis Post-Dispatch.* Pulitzer made the struggling *World* a success within a short time and revolutionized the newspaper industry in the process by increasing illustrations, making crime and sex scandal stories a mainstay of the news, raising the overall standard of writing, and instituting investigative reporting. *Ency. Am. Journ.,* s.v. "New York World."

2. See Doc. 3224 (headnote). The lengthy article in the *World* the previous day discussed uncertainties related to New York State's adoption of electrocution for capital punishment and the animal experiments at Edison's laboratory ("To Kill by Electricity: Nobody Knows Just How Much is Needed to Take Life," *New York World,* 19 Aug. 1888, 3). Kennelly's letter does not appear to have been published in its entirety, but much of it was quoted in a subsequent *World* article ("They Tried it on the Dog," *New York World,* 27 Aug. 1888, 8).

3. Dr. Frederick Peterson (1859–1938), a native of Faribault, Mich., was a nationally renowned neurologist and member of the New York Medico-Legal Society. A graduate of the University of Buffalo Medical School, Peterson later studied nervous and mental diseases and medical electricity at the universities of Vienna, Munich, Zurich, and Strasbourg. In 1888–89, he was a professor of nervous and mental diseases at the University of Vermont, having previously served as professor of pathology at the University of Buffalo. Peterson practiced for five years in Buffalo and three years at the Hudson River State Hospital for the Insane, Poughkeepsie, N.Y., before opening a private practice in New York City about a year prior to the experiments at the Edison laboratory. In September 1888, he was appointed chairman of the New York Medico-Legal Society's newly appointed committee to conduct experiments to determine the best method of electrocuting criminals. "Dr. Peterson Dead; A Neurologist, 79," *NYT,* 11 July 1938, 71; Peterson et al. 1889; Peterson's testimony (pp. 240–41), *Kemmler v. Durston,* Lit. (*TAED* QE003240); "Inebriety and Crime," *NYT,* 13 Sept. 1888, 5.

4. Kennelly had already measured the electrical resistance of himself and Harold Brown under different conditions (see Doc. 3224 [headnote]). Similar measurements were made on more than 200 Edison employees in July 1889 (see Doc. 3379).

–3241–

From Alfred Tate

Orange, N.J., Aug 21/*188*8[a]

My dear Mr Edison:[1]

I enclose record of Lamp Test for today:—[2]

At the Phonograph Works they have the first full line (No 1) of Shafting belted and running and 25 toolmakers at work.[3]

They are delayed on the other lines for want of pulleys, hangers and bench legs from the Machine Works. All the other work is going ahead in good shape.[b]

The model phonograph will be put together tonight and ready for test tomorrow. (Wednesday)

Ott[4] says the men on the 20 phonographs will begin assembling on Friday. It looks as though they ~~won~~ will finish just outside their time limit.

I find that the total labor on these 20 machines is going to amount to about $900.—or $45.00 for each instrument.

Fully half this time has been spent on tools in addition to which ~~they~~ the workmen are all high priced men— The cost in the Phonograph Works, when we commence there, will be away below these figures— I should say material and Labor will come somewhere in the neighborhood of $15—within a dollar one way or the other.[b]

I have received today two phonograms from Gouraud—chiefly gush—the only reference to business as follows under date 11th inst:—[5]

"I shall answer your last long cable regarding the number of Phonographs I shall require as soon as I have had the opportunity of talking with Gilliland."[b]

M Edwin M Fox asked me to send you the copy of his letter 18th inst. attached. He[c] has written you under separate cover.[6]

Yours faithfully

Tate

ALS, NjWOE, DF (*TAED* D8805AFQ). Letterhead of Edison laboratory. [a]"*Orange, N.J.*," and "*188*" preprinted. [b]Followed by dividing mark. [c]Obscured overwritten text.

1. This letter was one of three (plus a telegram) that Tate addressed to Edison on this date. Lbk. 25:122, 124, 126 (*TAED* LB025122, LB025124, LB025126).

2. Not found.

3. After some delays in construction, the Edison Phonograph Works began moving in equipment from the laboratory in early July. At the beginning of September, a reporter from the *Orange (N.J.) Herald* described the new complex. It consisted of two large buildings between which stood three smaller structures. The building nearer the laboratory contained offices, the phonograph assembly room, a testing room, a jappanning room, a room for manufacturing record blanks, a room for

nickel plating the instruments, an area for packing and finishing, and a room for putting together batteries. A foundry was located at the north end of this building. The other large main building was the machine shop. Just off the machine shop was a brick building housing the 150 horsepower steam boiler that drove the steam engine, which Arthur Kennelly tested on 1 September. The purpose of the two small wood buildings was not described. The two large buildings were electrified so that the plant could run day and night with two shifts of workers. An 1895 Sanborn fire map shows the layout of the two main buildings, though by then wax manufacture had been moved to the Silver Lake complex (see Doc. 3372 n. 10) and one room devoted to the assembly of kinetoscopes. Joseph Taft to Tate, 2 July 1888; Tate to Robert Cutting, Jr., 16 July 1888; both DF (*TAED* D8855ABD, D8818APG); "The Phonograph Works," *Orange (N.J.) Herald,* 1 Sept. 1888, Clippings (*TAED* SC88097C); N-88-8-02:17, Lab. (*TAED* NB051017); Sanborn Map Co. 1895, sheet 99.

4. That is, Fred Ott.

5. The editors have found a transcription only of the phonogram excerpted below, in which the copyist marked three words or phrases as uncertain or unintelligible. George Gouraud also referred to his plans for a demonstration to the press and his desire to retrofit two older phonographs with the newest motors and governors. Gouraud to TAE, 11 Aug. 1888, DF (*TAED* D8850ACN).

6. Fox's 18 August letter was a link in a chain of correspondence about Thomas Connery's wish to gain Gouraud's approval to represent the phonograph in Mexico and Central America; a copy was typed on letterhead of the Orange laboratory. After learning that Edison would remain away another week or so, Fox wrote him again a few days later, this time from Orange. Reporting that the graphophone interests were planning to establish a strong foothold in Mexico, Fox importuned him to intercede with Gouraud to allow Connery to make his own start there with the phonograph. Fox to TAE, 18 and 20 Aug. 1888, both DF (*TAED* D8849ABD, D8849ABE).

–3242–

From Edward Johnson

New York, Aug 22/88.[a]

My Dr Edison

Please send me word as soon as you return to Llewellyn[1] Villard and I want to make an early appointment with you in re. the business discussed last winter. It has broadened out materially at the direction of Pierpont Morgan[2] And now only needs that you V & I shall sit down & agree upon Values all round[3]—then we shall speedily have the biggest Edison organization in the World with abundant Capital when—Good Bye Westinghouse et al Yours

E[dward] H J[ohnson]

ALS, NjWOE, DF (*TAED* D8805AFR). Memorandum form of Sprague Electric Railway & Motor Co. [a]"New York," preprinted.

1. Samuel Insull wrote to Edison on 18 August about the matter broached by Johnson in this document. Receiving no reply, he inferred that his letter had not been received, and neither he nor Alfred Tate was sure of Edison's location or itinerary until late on the 22nd, when Edison telegraphed that he would return Saturday night, the 25th of August. Upon hearing that, Insull instructed Tate not to "let anybody else know that he is coming home. I want to see him before anyone gets chance at him— Will go to Orange Monday— Show this to Batchelor— He will explain my reasons." Tate confirmed to Henry Villard a meeting with Edison scheduled for Tuesday, 28 August. Insull to TAE, 18 Aug. 1888; William Gilmore to Tate, 23 Aug. 1888; Insull to Tate, both 23 Aug. 1888; Tate to Villard, 25 Aug. 1888; all DF (*TAED* D8832AAE, D8835AEH, D8835AEG, D8835AEI, D8818ARZ).

2. John Pierpont Morgan (1837–1913), a senior partner of Drexel, Morgan & Co., was an early backer of Edison's electric lighting research and a continuing influence in the industry. His personal investments included shares in the Edison Tube Co. Doc. 2467 n. 23; *TAEB* 7 App. 1.D.324; *ANB,* s.v. "Morgan, John Pierpont."

3. John McClement, comptroller of the Edison Electric Light Co., had recently asked Samuel Insull for financial information about the Edison Machine Works because "Mr. Johnson has requested me to examine into the matter of the respective values of the various shop stocks, and the Light Co. and make up, as an arbitrator, a statement of what value should be placed upon the L[igh]t Co's stock, if a general trust or consolidation is determined upon under the Villard deal." (In June, Insull had put off making a six-month summary of the Machine Co.'s business due to the shop's heavy workload.) McClement separately asked for similar information about the Edison Lamp Co. and Bergmann & Co., but Insull and Francis Upton each declined to cooperate without Edison's explicit approval. With Edison in Chautauqua, Insull tried to arrange a trip to there to discuss it in person; failing to get there, he instead cautioned in writing that "the proposed deal of last Spring is not going through…because Villard and the Drexel, Morgan people think that it is too good a deal for the shops. Now they can put the present proposals in any form they like, but you may be sure that when you sift the thing right to the bottom it will be no such advantageous deal as that previously proposed." Edison did eventually assent to McClement's examination of the shops' books. McClement to Insull, 16 Aug. 1888; Insull to TAE, 26 June and 18 Aug. 1888; all DF (*TAED* D8832AAF, D8835ADG, D8832AAE); see Doc. 3263.

–3243–

From Arthur Payne

Orange, N.J., Aug 23rd *1888*[a]

Mr. Edison:—

Did not write you before because experiments were not finished— They consume a great deal of time drying &c,— We have succeeded in matching the New Cylinder[1] & the process is simpler than ever before. Have done away with the saponification[2] of oil and precipitation of Fatty Acids.[3] By a trick in saponification we can make a better cylinder from the cheap grade of Crude Oil. Today gave Mr. Batchelor an outline sketch of what we would need at Bloomfield[4] & he says it shall be hurried through. In mean time we will arrange to make and cast into ingots about 500 lbs. here so that you will have some stock to work on while Bloomfield is being fitted up. We are anxious for you to "sit up" with this wax one night & give it a thorough test—then we will have a lot of different compositions for you to try. The <u>transparent</u> cylinder is not so very far off.

I think we have gotten there— it only remains for you to test the stuff & confirm it. Very Truly Yours

Arthur C. Payne

ALS, NjWOE, DF (*TAED* D8848ADF1). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" and "*188*" preprinted.

1. It is unclear which wax compound Payne refers to as the "New Cylinder." It could be experimental compound No. 810, composed of stearic and palmitic acids saponified by a standard lye (caustic soda) solution and precipitated with a standard solution of lead acetate; both solutions were adopted as standard on 27 July. Aylsworth described this compound as "very hard, dry, semi transparent but seemed to scratch same as regular on phonograph '<u>Bang Up</u>.' Hard powder [chip?], indentations not deep, fine talk 'nothing better wanted.'" N-87-01-01:145–46, 153, Lab. (*TAED* NB001145, NB001153A); Aylsworth's testimony, p. 20, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046, image 93).

2. That is, the chemical conversion of a fat or oil into soap. *OED,* s.v. "saponify"; see note 1 above.

3. Payne referred to results of experiments he and Jonas Aylsworth conducted at this time in which oil samples were treated by bleaching compounds. Among the oils they tried were cheap grades of cocoanut oil, which went into the compounds they made between 23 and 30 August. Aylsworth later recalled that they had been drawn to such neutral fats and oils because "they were cheaper than the fatty acids." However, on 31 August they determined that there was a "serious obstacle…in all cylinders made of cocoanut oil, palm oil, cotton seed, and in fact all of the oils and fats, in the shape of minute bubbles, which could not be seen by the naked eye, but could be very distinctly heard in the phonograph as a crackling and scratching noise, and could be seen under the microscope." They attributed the problem to bubbles caused by the glycerine that "always occurred in the wax unless it was especially well-made and washed with alcohol after precipitating or other processes, which would make it too expensive for practice." They concluded that "the only way left was to use fatty acids" from which the glycerin was removed during manufacture. They then began experimenting with compounds consisting of stearic acid, lead acetate, and caustic soda. No. 858 proved particularly promising: "It came out bang-up, non-crystalline, good cut, molded first-class but was electrical.

Not so likely to absorb moisture." Aylsworth later recalled that "this composition was the starting point or foundation for the composition which was finally accepted and put in use." Subsequent efforts focused on the proportions of these ingredients and how they were mixed together. Aylsworth described one variant (No. 871) as "very good in all respects and when filtered, is perfection almost." They tried to replicate this compound in essence while making some alterations. While working on the fourth iteration (No. 875), they also sought to standardize the solution of caustic soda and acetate of alumina. Having settled on No. 871 as the best composition, they then experimented with "molding and filtering the material" to find the

> best conditions of temperature of the wax, core and mold; also, with various forms of caps for the molds and by chilling the mold by water-jackets, after the wax was poured in; also, winding the core of the mold with string, silk thread and paper strips, with the object of reinforcing the cylinder; also, pouring the very hot wax in a cold mold, in order to allow the bubbles to rise to the top. The experiments on filtering were made with the object of eliminating crackling noises in the record when made, caused by foreign impurities in the wax. [Aylsworth's testimony, p. 34, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046 [image 100])]

The problem of electrification (see Doc. 3171) remained and they experimented with adding small quantities of other materials to overcome it but were unsuccessful. The solution proved to be an addition to "the cutting knife of the phonograph in the shape of a metallic trough or chute, which collected the shavings as fast as they were formed and conducted them into a receptacle provided for them." N-87-01-01:180–81; N-88-08-23:2–93; both Lab. (*TAED* NB001177 [image 94], NB050003, NB050009, NB050013, NB050013A, NB050017); Aylsworth's testimony, pp. 22, 26–27, 32, 34–36, 108, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046 [images 94, 96, 100–101, 137]).

4. Payne meant the small phonograph factory at Bloomfield, N.J., although the editors have not determined if this plan for making cylinders was ever carried out there. Jonas Aylsworth recalled that the Bloomfield factory had manufactured limited amounts of the ceresin and carnauba wax cylinders that had previously been standard. Aylsworth's testimony, p. 37, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046 [image 101]).

–3244–

From Ezra Gilliland

London Aug 30/88

Dear Edison

I am considerably worried as I can get no answer from you concerning the Phonogh. I have sent two or three cables—[1] The Graphophone have had their exhibition and with one or two exceptions only got paragraph notices in the papers.[2] Our getting in ahead of them had exactly the effect that we calculated we have taken all the boom out of them. Last night we gave an exhibition at the Press Club,[3] the object being to let the families of the reporters and Editors [—][a] and those who did not go out to upper Norwood have an opportunity to hear it—as it was largely to the same men and being a repetition of the other Exhibition there has not been so much said about it in the papers.[4] Gouraud has got off on the wrong tack he is harping on loudness altogether. I have tried to impress it upon him that loudness is a secondary ~~point~~ matter[b] and that articulation is the real point of improvement. I think I will bring him around in time.

The point on which we can knock the Graphophone out is articulation and it is the point ~~and it is the~~ wherein we always expect to excel— The Graphophone are going to Exhibit at the British Assn[5] on Sept. 5th and Edmunds is going to read a paper. I wanted to write a paper in reply to Tainters article (which they are distributing very freely here) and make an attack on them and put them to a competitive trial test, using your Cipher words and read back wards out of a paper, and call especial ~~and call especial~~ attention to the [~~fact~~?][a] unlimited range of music we can produce, and to the fact they cannot produce any in an acceptable manner, and in fact go for them bald headed[6] and[b] do our fighting before they get entrenched— Gouraud says he wants to read a paper[7] So I will have to wait for another opportunity—

I do not exactly see what Gouraud is going to do in a Controversy over technical points before the British Assn especially as Alex Graham Bell[8] will undoubtedly be there—

The instrument which I brought over again saved us as Hamiltons machine gave out again last night in the middle of the show There ~~were~~ there was an attendance of about 500 people between the hours of 8 PM and 4 am and it kept us humping to give them all a [~~show~~?][a] whack with only two machines I tinkered up the Hamilton instrument It gave out in the Governor. the contact points on the shunt spool would not work and the thing run away and knocked one of the Governors off Gouraud is using the Schanschieff battery[9] which is a large powerful battery and makes the motor hump—they claim it will run 12 hours. I think its good for 8 It will cost much more than a Grenet, both first cost and to maintain it— They are anxious to make some arrangements with him to adopt it as the Phonogh battery—

We set up type and worked a typewriter last night same as at the Electric Club—[10] It worked all right in both instances for

Type & Type Writing

I think I have given you all the news— For the Lords sake let me know when I am going to get the Phonogh so I can get out of this damn town nothing but drizzle and rain for two weeks With kindest regards to Every body I am Yours very truly

E. T. Gilliland

ALS, NjWOE, DF (*TAED* D8850ACT). [a]Canceled. [b]Interlined above.

1. The editors have not found cables from Gilliland after his arrival in England on or about 13 August, while Edison was in Chautauqua. By coincidence, Edison cabled him on this day (Thursday): "Finish twenty new machines Monday Will send you two Gouraud four." Charles Bruch to TAE, 13 Aug. 1888, LM 22:42A (*TAED* LM022042A); TAE to Gilliland, 30 Aug. 1888, Lbk. 26:295 (*TAED* LB026295).

2. The reported dearth of publicity notwithstanding, two substantial articles about the graphophone appeared about this time. Both concerned the ongoing display at a shop in Hatton Garden (London) of the instrument recently brought from New York by Henry Edmunds. "The Graphophone," *Invention,* 1 Sept. 1888; "The 'Tainter' Graphophone," *Investors' Guardian,* 1 Sept. 1888; both Clippings (*TAED* SC88098A, SC88099A); Tritton 1993, 96.

3. A London social and professional club for journalists, founded in 1882 and located in Fleet St. *London Ency.,* s.v. "Press Club."

4. According to British news clippings, George Gouraud demonstrated two phonographs for "Between 200 and 300 journalists and ladies" at the Press Club. He used a phonogram of Edison's voice, his own recordings of speech and music made on the spot, and a recorded speech that was rendered into type by a "nearly deaf compositor." The event reportedly was the first exhibition of the phonograph to women, at least in England. Gouraud's publicity offensive gave Edison an "unprecedented" level of support from the "press and public opinion" (as Gilliland crowed), and one London weekly praised him as a "very competent and amusing showman" (untitled clipping, *Liverpool Evening Express,* 30 Aug. 1888; "The Phonograph," *London Standard,* 30 Aug. 1888; both Clippings [*TAED* SC88047C, SC88092B]; "Mr. Edison's Phonograph," *Daily News,* 30 Aug. 1888, 6; Gilliland to TAE, 3 Sept. 1888, DF [*TAED* D8850ACY]; *Society Herald* 3 [3 Sept. 1888]: 183). The demonstration also received brief notice in the American press, including some speculation involving Gouraud about possible military uses of the phonograph ("Events Beyond the Sea," *NYT,* 30 Aug. 1888, 5; "Army Talk in England," *NYT,* 16 Sept. 1888, 11).

5. The British Association for the Advancement of Science, founded in 1831 to "promote the intercourse of the cultivators of science with one another, and with foreign philosophers," provided a platform for inventors and scientists, including many from outside Great Britain. Doc. 2600 n. 1.

6. Slang expression (probably originally American) for impetuous or vigorous action. *DSUE,* s.v. "bald-headed."

7. Edison had urged Gouraud at the start of August to "arrange quick several exhibits before Societies to come off soon as possible Gilliland

arrives." Gouraud wrote to "all societies proposing earliest dates," and promised that if he were provided with phonographs "quickly and amply…all honor will be ours." Gouraud to TAE, 2 Aug. 1888, DF (*TAED* D8850ACF).

Gouraud and Henry Edmunds made back-to-back presentations to the British Association's Section G (Mechanical Science) on 6 September, the first day of the meetings in Bath. The occasion aroused an "almost unprecedented" level of excitement (according to the *Times* of London): "Nearly every other section was emptied, and hundreds of persons had to be content with standing outside." Speaking first, Gouraud abandoned his hour-long prepared text when allotted only twenty minutes; his extemporaneous talk provided, in the judgment of *Engineering,* "the minimum of instruction during the maximum of time." He announced that he and Edison had largely ceased writing letters to each other and now corresponded principally by phonogram, a statement that drew cheers. Gouraud spoke again in reply to Edmunds, after which Gilliland made some claims on Edison's behalf, to which Edmunds then responded. The section president (William Preece) cut off the exchange at that point, and Gouraud and Edmunds went to separate rooms to demonstrate their machines to "constant streams of ladies and gentlemen" that persisted for "several hours." Gilliland telegraphed Edison that the exhibition was a "triumphant success" while the graphophone presentation "fell perfectly flat." The paper given by Edmunds was subsequently printed in full (Edmunds 1888). "The British Association," *Times* (London), 7 Sept. 1888, 5; "The British Association," *Times* (London), 14 Sept. 1888, 6; "The British Association," *Engineering* 46 (14 Sept. 1888): 262; TAE to Gouraud, 11 Sept. 1888, Miller (*TAED* HM88AAM).

8. Alexander Graham Bell (1847–1922), the Scottish-born elocutionist and teacher of the deaf best known for inventing the telephone, began working on improvements to Edison's phonograph in 1878. About 1885, he and his partners produced a recording and playback machine that was patented and marketed as the graphophone. Doc. 3071 n. 3.

9. The Schanschieff battery, brought onto the market about 1887, was a single-fluid zinc-carbon primary cell. Its novelty was not so much in its construction as in the high concentration of the sulphate of mercury electrolyte that made it compact, steady, and free of odor. Reportedly also easy to maintain, the battery had been applied to miner's lamps, incandescent lighting of railway cars, and sewing machine and similar small motors. "The Schanschieff Battery," *Electrician* 20 (16 Dec. 1887): 130; "The Schanschieff Battery and Lamps," *Teleg. J. and Elec. Rev.* 21 (25 Nov. 1887): 539–40; Coxon 1887.

10. In his presentation to the New York Electric Club in May, Gilliland described how the phonograph could be started and stopped to facilitate the preparation of typed transcriptions from recordings. The *Electrical World,* in an editorial note appended to its publication of the paper, pointed out that during Gilliland's exhibition a typesetter from the *New York World* similarly set type from a phonograph recording. Gilliland 1888.

–3245–

From Edward Johnson

New York, Aug 30/88.[a]

My Dr Edison

You are worth some 2 or [$3,000 000?][b] more or less. I am on the brink of financial ruin—

At this stage you accept without question every story you hear then charge me with stultifying a record of 18 years by "going back on you" and then in retaliation you turn and Knife me without the slightest Apparent hesitation. Do you not think I have earned the right to be heard before I am Condemned to total & irrevocable ruin[1] Yours Truly

E. H. Johnson

I wrote you for an Apptmt—you dont reply—[2]

ALS, NjWOE, DF (*TAED* D8805AFX). Memorandum form of Edison Electric Light Co. [a]"New York," preprinted. [b]Partially obscured by ink smear.

1. The context of Johnson's letter is elucidated by Edison's draft response to it (Doc. 3248). Johnson had recently been communicating with Uriah Painter and Josiah Reiff in support of Painter's plan to wait until Jesse Lippincott made his first payment to Edison for phonograph rights, by which the affairs of the two men would be enmeshed, before starting litigation on behalf of the old Edison Speaking Phonograph Co. Painter intended to force Lippincott's North American Phonograph Co., which he regarded as an "outfit of infringers," into a licensing agreement. Johnson agreed with Painter's opinion that the North American Co. would have to secure "the foundation" of its combined graphophone and phonograph business, presumably by settling with the Speaking Phonograph Co., else it would "find the Graphophone Walls and the Edison Roof a very poor House to dwell in." Johnson to Painter, n.d. [21 Aug. 1888?]; Painter to Reiff, 19 Aug. 1888; Johnson to Reiff, n.d. [20 Aug. 1888?]; all UHP (*TAED* X154A7DQ, X154A7DL, X154A7DN); see also Wile 2004.

2. The editors have not found Johnson's request.

–3246–

Joseph Pulitzer to John Cockerill

<Little Menlo, London.>[a] September 1, 1888[b]

<150 Rev.>[1c]

<Copy of phonogram from Mr Joseph Pulitzer to Mr. John A Cockerill, "N.Y. World">[2a]

My dear Cockerill,

I have just enjoyed the most agreeable afternoon of my entire European journey, thanks to the courtesy and kindness of Colonel Gouraud, a representative Edison.[3]

I believe that Edison is the greatest mind that we have produced, at least in our generation; all military and other glories stand aside. I have just now enjoyed what I believe to be a perfect demonstration of his phonograph, hearing the reproduction of the human voice, not only in one form or phase but in at least a dozen, from the most exact language of conversation to a variety of musical instruments. I think the reporters of our paper[4] had better look out, especially the shorthand men. I think the phonograph is apt to take the place of the latter, in some respects.

Well, goodbye, I hope you will take good care of yourself.

This is the first day of September, about six o'clock in the afternoon. I am in Norwood, near London, it's a part of London. Let me know how the presidential campaign is getting on.

Goodbye again.

J. P. <that's the signature. Joseph Pulitzer>[5a]

TL (transcribed phonogram), NjWOE, DF (*TAED* D8850ACX). [a]Marginalia typed. [b]Date and place from document; form altered. [c]Handwritten and followed by dividing mark.

1. This number presumably was the revolutions per minute at which the recording was made.

2. As with other typed documents, the editors have silently corrected what are obviously errors by the typist; they have, however reproduced more ambiguous mistakes that may have originated in Pulitzer's recording.

3. Pulitzer was a guest, with other British and American notables, for Gouraud's phonograph exhibition on 1 September. Having undertaken his European trip in June under orders to rest his diseased eyes and battered psyche, it perhaps was natural for him to find pleasure in an occasion devoted to sound and hearing ("The German Liberals," *Brooklyn Daily Eagle,* 3 Sept. 1888, 4; Swanberg 1967, 147–53; Brian 2001, 136–38; regarding reports of Pulitzer's condition see, e.g., "Editor Pulitzer's Health," *Cincinnati Enquirer,* 13 Sept. 1888, 4). Pulitzer's recording apparently was among a group of sixteen or so mailed to Edison. The shipment was inexplicably delayed and most of the cylinders were "reduced to chips" by the time Edison received them on 2 October (TAE to Cockerill, 2 Oct. 1888, DF [*TAED* D8818AUE]).

4. That is, the *New York World*.

5. The editors surmise that Pulitzer signed off the recording with his initials and that the explanatory note and his full name were added by the typist to clarify the written record.

–3247–

To Jesse Lippincott

[Orange,] Sept. 3, 88.

Dear Sir:—

I have received your letter 1st instant, asking me to grant you an extension of time in the matter of the payment now due of One Hundred and Fifteen Thousand Dollars ($115,000.00), on account of the sale of the capital stock of the Edison Phonograph Company.[1] As the transaction which is being completed between yourself and me involves a large amount of money and also the interests of others as well as myself, I consider it my duty to become informed fully as to the present status of affairs before granting you the extension of time which you request. Mr. Gilliland mentioned to me casually that he was making an arrangement with you in regard to his agency contract with the Edison Phonograph Co., but I have never been officially informed as to the nature of this arrangement, nor has Mr. Gilliland made application to the Edison Phonograph Company for permission to transfer his agency rights to yourself.[2] You will therefore oblige me by informing me of the exact nature of the arrangements between Mr. Gilliland and yourself, which will assist my judgment in deciding upon the request embodied in your letter under reply. Yours very truly,

TL (carbon copy), NjWOE, DF (*TAED* D8818ASP).

1. See Doc. 3200 (headnote). Lippincott sought a postponement of several weeks on the second of his four payments on the Edison Phonograph Co. stock, which he had already agreed to transfer to the new North American Phonograph Co. The shares were currently being held in trust at the Garfield Safe Deposit Co., seemingly leaving all parties in a precarious position. He explained that no money had yet come to the North American firm, in part because of Edward Johnson's remark to a prospective large shareholder that the rights to the phonograph were still controlled by the old Edison Speaking Phonograph Co. That comment (overheard by a *New York Herald* reporter, who planned to publish it) caused the potential purchaser to withdraw, at least for the time being, and Lippincott to suspend sale of stock in the new enterprise until he and Johnson could smooth things over. He expected to receive outside funds on 25 September and promised to pay Edison the next day. Even so, he still faced the prospect of some kind of settlement with Uriah Painter and the Edison Speaking Phonograph Co. (Lippincott to TAE, 31 Aug. and 1 Sept. 1888; both DF [*TAED* D8848ADK, D8848ADL]; Lippincott to Johnson, 23 Aug. 1888, UHP [*TAED* X154A7DS]; Charles Bruch to Gilliland, 4 Sept. 1888, LM 22:116 [*TAED* LM022116]; see also Doc. 3248). Lippincott was simultaneously obligated to pay $50,000 to Ezra Gilliland, who had exercised his option to sell back part of the North American Phonograph stock granted him for the sale of his agency contract. Unable to do so, Lippincott had to defer that payment as well, though he sent

$25,000 to Gilliland on 7 September (Gilliland to Lippincott, 20 Aug. 1888; Charles Bruch to Gilliland, 4 and 7 Sept. 1888; LM 22:72, 116, 127 [*TAED* LM022072, LM022116, LM022127]; see also note 2). Lippincott worked out an arrangement with Edison on 7 September and, three days later, gave him a check for $65,000 and a note for $50,000 payable on the 26th (Lippincott to TAE, 7 Sept. 1888, DF [*TAED* D8848ADN]; TAE receipt to Lippincott, 10 Sept. 1888, Heitz [*TAED* X225AF]); see also Doc. 3261.

2. The editors have not discovered exactly how Edison came to connect Lippincott's deferral of payments with the transfer of Gilliland's phonograph agency contract; he later stated that he met Lippincott about this time, who voluntarily disclosed the full nature of the arrangement with Gilliland. Gilliland may have discussed his contract "casually" while the sale of phonograph rights was being negotiated in May or June, but Edison later claimed that he had raised the subject himself and questioned Gilliland closely about it at the time. In any case, Edison apparently did not learn then that the deal would bring Gilliland a large sum of cash. TAE draft affidavit (pp. 10–14, 17–19), 25 Sept. 1888 and attached undated statement (p. 3), Misc. Legal (*TAED* HX88028); TAE draft affidavit (pp. 8–9), n.d. ([1889?], Miller (*TAED* HM89ACG); cf. Wile 2004, 7–8.

–3248–

Draft to Edward Johnson[1]

[Orange, c. September 4, 1888][2]

in This note[3] you credit me with retaliation without giving you a chance to be heard and accuse me of knifing you in my interview with Villard,[4] and that [—][a] I should not believe every statement I hear, which statement is as follows

That you did before The Board of directors of the Edison Electric Light Co state, that in The phonograph deal I had sold you out. Mr Upton & Hastings is my authority ~~That you~~ 2nd That you stated to the[b] wall street reporter of the New York Herald[b] that in the phonograph deal I Edison had sold your property and this statement was made when I was several hundred miles away and could not personally make any defence. Another reporter visited my house, and another reporter visited Mr Lippincott the gentleman who purchased the phonogh for an explanation. That my private Secretary Mr Tate called on you to correct the statement, that instead of Correcting it you reiterated it, but after a great deal of trouble my friends caused it to be suppressed[5] All who talked to you stated that your trouble seemed to be jealousy of Mr Gillilland

Having recited the above Let ~~me~~us see if I have sold your property. I will commence at the beginning and trace ~~y~~our relations in my own way, starting with the formation of the Edison ~~Phon~~Speaking phonograph Co— $10,000 was paid in for Experiments, 50 000 more was to be paid under certain conditions.[6] ~~The~~You were made an officer and had 1200 shares if I remember right out of 25,000.[c] I had the[b] same or less[d] shares, but[e] was to receive a royalty of 20 percent on the selling price. The 10,000. paid me was expended in experimenting and $15,000. more, the latter out of my own pocket, no commercial[b] instrument was made; about 100 instruments was sold, no royalty was ever paid me, ~~about 10 000~~ the original amount paid was thus got back[f] parties wanted to be released from further payments ie[g] $50 000, a mutual release was drawn up between Company & myself mutually releasing each other, the Co became defunct, no [~~usuall~~?][a] meetings held for years—[7]

Having my hands free 8 years after the events recited I concluded to perfect the phonograph about that time the graphophone became very active and promised to deprive me ~~not only~~ of the honor of the invention. I told[b] Mr Tomlinson to get all the data from you & Painter in regard to the old Co so that it could be rejuvinated again. He asked you to get the old phonograph people together again as time was pressing. You replied you would, a delay of a month occured. Tomlinson under pressure from me makes another application from you & states that if something is not done that I will form a new Co. You reply that you will try it again, another delay and finally you reply to Tomlinson that you are overwhelm'd with business & say Edison better go ahead & form his Co You state that Painter wants to wait. I had no confidence[b] in Painter so went ahead and formed a new Co assigning all my rights to it without prejudice to the ~~C~~old Company

The new Co had no money, it is no part of the inventor to furnish money I derive my interest for invention others can only derive theirs by money hence I offered[b] ⅓ of the whole to old stockholders for a small assessment to pay for experimenting which subsequent experience has shown to be totally inadequate— The old stockholders refused. I was therefore obliged to do all the inventing and furnish all the money. These Experiments to the first of Sept cost 67 000 In addition I had to invest $26 000 more dollars of my own and $90,000 of other peoples money in factories to enable me to competete with my rivals Meanwhile the old stockholders seeing a chance from my success[h] to get something after refusing to take any risk whatever or even rejuvinate their Co fell to quarrelling among themselves & there was a contest for control of the defunct Co.[8] boyish Attempts were made to pull me into the fight but I refused to participate and I wrote a letter to you asking that you remain neutral and that I was taking care of you[9]

I was aware that you had but 1200 shares out of ~~1~~25 000. in the hands of such sharks as[b] Painter & his ilk and that you would get a very small part of the ⅓rd I set apart for them, understand this ⅓ I was to give them was not because I was legally bound to give them a cent as I <u>held a release</u> but I gave it to them because I didnt like to see them get nothing and I a great lot, hence in addition to the proportion you would get as a stockholder I reserved for you nearly as much Extra as comes to Batchelor and more than Gilliland

Now I perfect the phonograph the newspapers make a great stir, an offer is made to me for the whole Capital stock of the new Co which represents only <u>my rights</u> as the Contract will shew. I accept this offer, but I still bargain with the purchaser to take care of the ~~old~~ stockholders of old defunct Co. and all the boys as I had originally planned, and I even went further and increased the amount. Your friend Painter tries every device to break me up, with the assistance of Bergmann[10] who aids him financially he gets a majority of the stock and impudently ~~tells~~ states that he is going to Compel~~l~~ me to give him ½ of what I got Now I want to know what warrent have you in stating that I sold your property, on the Contrary instead of having sold your property, I had the nerve to put[b] up 100 000 on an Experiment work a year night and day and create a property and give you, who have no claim whatsoever except that you was my friend, an interest which will net you many thousand dollars. in the last two years I have given you collateral saleable for over $20,000. for no other reason than I thought you were doing more work & getting less for it than the other boys Where do you find even amongst strong friends people who give $20,000 for such objects. Have I not given away to men who I could have hired on a salary over ½ million dollars because I wanted them to be well off. Do you suppose that I would sell another mans property for money.

Having said This much I will go a little further and state that you have actually done in[b] a sense[i] what[b] you allege but which I have not done—and you did it in this manner

As you are aware one of the great things in the early days was the scheme of supply Edison central stations with motors to be worked on our light circuits. The down~~s~~town station was even located in the place it is, instead of up town for the sole reason that I feared competition with gas ~~and by~~ but hoped to meet it by selling power as by acurate canvass 750 small[b] motors and industries requiring power were located in that district. I conducted a great number of experiments on motors and in the 1879 ~~experiment~~ exhibition I exhibited a motor running lathes, sewing machines etc on the Light circuit at Menlo Park. I took out 30 or 40 patents on motors transmission of power and many devices now in general use. I also conducted many Experiments on Electric Railways, built one 2½ miles long and Experimented with it for over a year The Later[j] mostly at my personal[e] expense—which were about $45,000—

~~You~~ I pioneered the first[k] several small stations devising from time to time such devices as would meet[b] requirements and learn a [~~core~~?][a] staff of men but before I could make these stations pay big which I would have done and thus render the subsequent career[b] of the Co an easy instead of an[l] uphill one I was cut off by the Co and my construction Staff[b] scattered. You became president. I then took no further interest in the Co.[11] After a while I hear of the formation of a Sprague Motor Co.[12] then I hear of your selling motors to the Light Cos licensees at a ~~big~~ large[e] profit over the Cost of such motors made in the Shops affiliated with the Co.[13] I ~~thought~~think it strange that the president of the Light Co should use the Light Cos patents and turn around and diminish the value of the Light Cos holdings in a license Co by reason of the taking out of a large profit ~~You are president I say nothing to the Company I never made a complaint I~~ when the Licensee might have got them direct for ½ the money

You became presdt of the Electric RR Co[14] I lost all sight of it ~~So~~ I then[e] learn that Sprague[15] has a motor. You[b] try it on the Elevated, you go into the Electric[b] Railway business. The result is that the old RR is dead any[b] chance of recovering my interest is lost ~~no provision is made~~[m] for if I tried to go into the Railway business I would be in the position of running opposition to You and If the shops wanted to go into the motor business they would again be running opposition to you. Thus you have rendered it almost impossible for me to regain what I have lost in the RR and ~~deprived me of n~~ caused a break in the policy of[n] the Co of which I am a large holder ~~of the~~ to have their licensees get all their material at the lowest Cost, to say nothing of my natural pride as an inventor who has[b] a stranger like Sprague[b] in a late stage of the art thurst in upon what was previously a happy family= Did you in the formation of your Sprague Co in which a large amount of stock was issued for patents which ~~would no more protect the motor busness than~~ are of no earthly value to protect a business by merely an excuse to get up a Co on did you ever think of even giving the boys or myself any of it, did you ever think that I had some property rights in Electric RR[o] not that I desired any because I dont want anything that I dont make myself but did it ever occur to you to reciprocate. You know that Your bringing Mr Sprague in the family has been a galling thorn in the side of[p] all the boys but they kept still because you were their friend, and as I told you two years ago in Tomlinsons[16] office that it was only a question of time when it would break up old associations which it has about done.

All these things have greatly disappointed me and I learn from them that Rochefocaulds estimate of human nature is about correct[17]

My plan of division dont seem~~s~~ to work ~~I have concluded~~ with some of my friends so I have about concluded to fall into the regular routine and do just as other men do, which conclusion they generally reach[b] when they are 40 to 45 yrs of age—[18]

I do not know[b] in what way you consider I have stabbed you in the back unless you refer to my conversation with Mr Villard relative to the Sprague Motor. I said nothing to him except what was strictly business. Our discussion was not of a personal nature. I as well as the other boys do not want to take the Sprague Motor Co in the new deal Except on actual asset values. You yourself stated to Insull Bergmann & myself at Chicago[19q] that you did not want to put it in, and nothing was said about it at Villards House[20] I told Mr Villard that ~~you~~the Sprague Co was using Edison Dynamos for furnishing electricity for their transmission of power plants & Electric RRs & that the motors were ~~Edison~~ our[e] Dynamos made[b] in a different shape & called Sprague Motors[21] that ~~I~~Our ideas of the Value of the Sprague Co and Johnsons were as wide as the poles— Mr Bergmann was the loudest in protesting against putting in the Sprague, yet I am told that he stated to you he defended you

You have no right to risk your whole fortune in a big kite flying game and because your associates do not feel like assisting you~~r~~ at our Expense to pull it through accuse me of stabing you in the back

I have written this because I cannot talk fluently—

E[dison]

ADfS, NjWOE, DF (*TAED* D8805AGG); a typed copy is in Edison—General (Unselected), DF, D-88-05. [a]Canceled. [b]Obscured overwritten text. [c]"out of $25,000" interlined above. [d]"or less" interlined above. [e]Interlined above. [f]"~~about 10 000~~…thus got back" interlined above. [g]Circled. [h]"from my success" interlined above. [i]"in a sense" interlined above. [j]"The Later" interlined above. [k]"the first" interlined above. [l]"an easy instead of an" interlined above. [m]"~~no provision is made~~" interlined above. [n]"caused a break in the policy of" interlined above. [o]"did you ever…in Electric RR" interlined above. [p]"the side of" interlined above. [q]"at Chicago" interlined above.

1. Edison drafted another version of this document, also undated. Probably written before the twelve-page version transcribed here, the variant is similar in content and tone but is about half the length, choppier, and organized somewhat differently. DF (*TAED* D8805AGF).

2. The editors have not found Edison's finished letter. Johnson received the completed version in time to share it with Uriah Painter on or before 7 September. Painter to Johnson, 7 Sept. 1888, UHP (*TAED* X154A7EA).

3. Doc. 3245.

4. Edison and Henry Villard had tried unsuccessfully to confer several weeks earlier about the electric lighting and ore milling businesses. Their meeting was finally scheduled at Orange for the morning of 28 August, soon after Edison's return from Chautauqua. Villard to TAE, 3, 9, and 23 Aug.; TAE to Villard, 4 Aug. 1888; Alfred Tate to Villard, 9 and 25 Aug. 1888; all DF (*TAED* D8832AAA, D8832AAC, D8832AAG, D8818AQU, D8818AQY, D8818ARZ).

5. The editors have found few solid details about this incident, which apparently aligned cross-cutting phonograph and graphophone interests for a brief period against the *New York Herald* (cf. Doc. 3247 n. 1 and Wile 2004). Josiah Reiff, who claimed some role in the affair, offered Uriah Painter an elliptical summary focused on the graphophone and its importance to Jesse Lippincott's business plans. The events seem to have started by 22 or 23 August with the prospect of a *Herald* story to the effect that the graphophone's backers did not control the necessary patents. Reiff afterward claimed to have "used all my power to prevent the publication of the story, claiming it could only injure us at this time as all questions were in process of settlement. It is our interest to have the first payment made to T.A.E because that will compel a settlement with us." Reiff to Painter, 24 Aug. 1888, UHP (*TAED* X154A7DV).

Lippincott saw the danger to his plans. In a 23 August letter to Edward Johnson, he cautioned:

> Should the matter that the Herald now has, or any matter of a similar nature go before the public, it will make it very difficult for me to comply with the terms of my contract with Mr. Edison, and the whole thing may fall through. I have paid him but a trifle, $10,000. so far, and should I fail to complete the transaction and the combination fall through there is a provision that I am to get value for the money advanced. I think that unless you tell the Herald that since you made the statement the matter has been arranged they may

insist on publishing it as a sensation. [Lippincott to Johnson, 23 Aug. 1888, UHP (*TAED* X154A7DS)]

A somewhat different version of events came later from Charles Bruch, Ezra Gilliland's confidant at the Edison Phonograph Co., ostensibly based on what he heard on 1 September from Lippincott. By then Lippincott had failed to make his scheduled payment to Edison but, Bruch reported,

> would have been ready to do so had it not been for the fact that the man with whom he had expected to place a large amount of the new Company's stock had happened to meet Mr. E. H. Johnson and to remark to him that he was about to invest in the Phonograph enterprise. Johnson said "They haven't got the Phonograph; I have it." This, of course, coming from a man who has been closely associated with Mr. Edison and occupying a prominent position at the head of one of Mr. Edison's companies, had the effect of spoiling Lippencott's arrangements in that direction, temporarily at least. A 'Herald' reporter also heard the remark and was about to publish it. Lippencott saw ~~Edison~~ Johnson and they succeeded in keeping the matter from publication. [Bruch to Gilliland, 4 Sept. 1888, LM 22:116 (*TAED* LM022116)]

From references in Josiah Reiff's 24 August letter, it may be inferred that Lippincott's prospective investor was Francis Smithers, a banker and director of the Edison Electric Light Co. and Edison Electric Illuminating Co. of New York, who was involved in organizing the Metropolitan Phonograph Co. ("Smithers, Francis S.," Pioneers Bio.).

6. See Doc. 1190.

7. Edison referred to the release signed by himself and by Gardiner Hubbard and Uriah Painter (and, in a printed version, also by Edward Johnson) on behalf of the Speaking Phonograph Co. in January 1879. The company essentially became dormant in 1881. Agreement with Edison Speaking Phonograph Co., 21 Jan. 1879; both DF (*TAED* D7932E, D7932ZBF07B); see also Doc. 1657 n. 3.

8. Uriah Painter and Charles Cheever wrestled for control of Edison Speaking Phonograph Co. stock and, ultimately, the firm's relations with Edison. Cheever had reluctantly agreed to Edison's buyout terms in October 1887 (Doc. 3102 n. 6). The rivalry figured in much of the correspondence among Painter and Johnson and, to a lesser extent, Gardiner Hubbard and Josiah Reiff, through the winter and spring; see especially Painter to Johnson, 19 Jan. 1888; DF (*TAED* D8848AAC); Johnson to Painter, 17 Jan. and 24 Feb. 1888; Painter to Hubbard, 27 Mar. 1888; Painter to Reiff, 1 Apr. 1888; all UHP (*TAED* X154A7AM, X154A7BA, X154A7BI, X154A7BN).

9. Edison may have had in mind the brief note he appended to Doc. 3149.

10. Bergmann reportedly was working on alternative phonograph machines for Painter's benefit. Wile 2004, 5.

11. Edison referred to the dissolution of the Edison Construction Dept. in mid-1884 and Johnson's subsequent election as president of the Edison Electric Light Co. See Docs. 2672, 2677, 2690, 2699, and 2753.

12. The Sprague Electric Railway & Motor Co. (SERM) was founded in 1884 by former Edison employee Frank Sprague to commercialize his inventions in heavy electric motors. With Johnson as president, the firm enjoyed advantages from its association with Edison, including a manufacturing contract with the Edison Machine Works. These favorable connections notwithstanding, SERM was rising on its founder's originality and ambition into the front ranks of an important and expanding market. Doc. 2998 n. 3; Dalzell 2010, chap. 2.

13. That is, the Edison Machine Works, which carried out manufacturing for the Sprague Electric & Railway Motor Co.

14. Edison pooled his electric railroad patents with those of inventor Stephen Field in April 1883, leading to formation of the Electric Railway Co. of the United States. Johnson became president in December 1884. See Doc. 2431; Johnson to Painter, 12 Dec. 1884, UHP (*TAED* X154A4AG).

15. Electrical inventor Frank Julian Sprague (1857–1934) worked for Edison in positions of increasing responsibility from June 1883 to April 1884, when he struck out on his own to commercialize his original electric motor design. The motor was suited to a variety of power applications, notably electric railways, and Sprague used it as the foundation of a pioneering railway demonstration project in Richmond in 1887 and the start of a brilliant engineering career. Intense and impatient, Sprague was, by many accounts, difficult to work with (one contemporary called him "A virile and aggressive person"), but he left Edison on good enough terms, and Edison afterward cooperated in the development and manufacture of his motors (see Docs. 2771 n. 14, 2885 n. 2, 2923, 2998; Dalzell 2010, chap. 2 and quoted p. 21). Edison's resentments (expressed a few lines later in this document) might have been stoked not only by personality and rivalry but by Sprague having forcefully advocated for alternating current (AC) distribution systems at a critical moment in 1886 (Doc. 3002 [headnote esp. n. 9]).

16. Attorney John Tomlinson was (with Sprague and Johnson) an incorporator of the Sprague Electric and Railway Motor Co. Incorporation certificate, 24 Nov. 1884, Sprague (*TAED* X120CAL).

17. Edison had read and quoted from the *Maxims* of French nobleman François de la Rochefoucauld (1613–1680) on vacation in 1885. The book consists of hundreds of epigrams collectively forming an unsentimental—even misanthropic—view of human nature and motivations. Doc. 2826 n. 18; see, e.g., "Review. La Rochefoucauld's Maxims," *Saturday Review* 40 (17 July 1875): 84–85; Dallas 1881.

18. In his alternate draft (see note 1), Edison elaborated on his disappointment: "my plan of dividing up or the anti-gould plan is a dam—d failure [~~an~~?] & this will explain why young men after reaching 40 or 45 change somewhat in nature. Experience has caused me to change hereafter I am going to be a hog myself and look out for myself—." That phrase evoked a line in a recent letter from Lippincott that Johnson and Painter hoped to get money out of him—but not Edison—for the phonograph rights: "He said that they had no intention of acting 'the hog,' but that they would deal fairly with me." Lippincott to TAE, 31 Aug. 1888, DF (*TAED* D8848ADK).

19. At Johnson's suggestion, Edison went to Chicago in February for a meeting of the Association of Edison Illuminating Companies. Doc. 3153 n. 3.

20. The editors have found no information about this meeting with Henry Villard.

21. Edison seriously understated the originality of Sprague's method of winding a heavy motor to operate at constant speed under varying load and to be controlled at variable speeds and loads. Doc. 2885 n. 2.

–3249–

Lewis Miller to Mina Edison

Cincinnati, Sept 6 *1888*[a]

Dear Mina

John[1] Theodore[2] & I are here in cincinnati doing up the Ohio Valley Centennil.[3] We are waiting for train to[b] take us to Columbus this afternoon, where we expect to Spend tomorrow at the Ohio Centennial.[4] This cincinnati Show is quite fine, and I think the finest thing of all is the Edison light Exhibit[5] It is quite wonderful I will not attempt to describe.[c] It is too wonderful. The show throughout is quite fine the boys seemed to enjoy it every much. I wished Thomas[6] and Wm.[7] were with us This morning we took a carriage and went over the cincinnati bridge[8] to Covington which you know is in Kentucky They J & T, were quite please to think they had got into Kentucky. When[c] we came back from Covington we arranged with same driver to[c] take us on the Walnut hills[9] among the fine residences. They think Cin. is quite a city.

In your letter[10] you speak about the many of your family. Now Mina I want you should not once reflect on yourself in this[c] way of bother you are to us. We want to feel toward[c] Marian Thomas & Wm. as we would toward any of the family They belong to the family & any thing we can do for their hapiness we do most cheerfully, never once thinking of any burden but as a pleasure

I was so glad and so was mother to know the whole family could be with us at the Lake,[11] and that they did seem to enjoy themselves. I want you should always feel free to let all or any of them come when circumstances will permit

The only thing I see in your relation to the family is your feelling of anxiety about the chil[dren].[12] If you could realize how much you have already impressed yourself upon their character, I am sure you would feel encouraged and be quite happy. Marian of her own free thought[c] without any drawing out, said she did want to be a nice woman like you She said she knew that she made many mistakes, for which she always felt sorry. She said her own mother was not concerned about her do things just right as you were, and that her own mother let her do things which were not right and that got her into bad habits &c. I am quite sure that if you can take to your heart as a mother, your future life will be the most happy. You will see the future life of the children your influence over them. I had quite a talk with Mr Ed. while on our drive out in the country. I could see in his talk his feeling in every way seemed to be all right. He said he never saw one do better than you. That you did so much work and did it so easily. That you had such complete control of the help &c &c. I am so anxious you should get rid of your jeolous feeling. Realize that your life ~~will~~ and character will make itself[c] felt on the three you have accepted as in your own blood. You must not look for perfection, only for improvements. The boys say its train time so good by. My love to all

Your Father

ALS, CEF, MFP (*TAED* X018C6AB). Letterhead of Grand Hotel. [a]"*Cincinnati,*" and "*188*" preprinted. [b]Interlined above. [c]Obscured overwritten text.

1. John Vincent Miller (1873–1940), Mina's next-to-youngest sibling. Doc. 2880 n. 1.

2. Theodore Westwood Miller (1875–1898), Mina's youngest sibling. Doc. 2880 n. 2.

3. The Cincinnati Centennial Exposition of the Ohio Valley and Central States was organized to commemorate the founding of Cincinnati and the development of arts and manufactures in the old Northwest Territory. The event opened in June and, with several large permanent buildings, claimed to occupy a larger area than any previous exhibition in North America. *Official Guide,* 1–7.

4. The Ohio Centennial Exposition opened to a crowd of 10,000 people on 4 September at the state fair grounds in Columbus, where several buildings had been constructed for the purpose. The event commemorated the region's first European settlement at Marietta and was held in lieu of Ohio's annual state fair. Lee 1892, 2:359–64; "Ohio's Centennial Exposition," *Chicago Daily Tribune,* 5 Sept. 1888, 6.

5. Several electric lighting companies were present at the Cincinnati exposition, but the display of the Edison Lamp Co. received special notice in the press. Designed by former Edison employee William Hammer, it featured a representation of a light bulb, nearly thirty feet high, formed by about 15,000 individual lamps (intended to signify the one-day output of the lamp factory). Other lamps formed a socket three feet tall and a pedestal, across which Edison's name flashed in colored lights. "Incandescent Lamps at the Cincinnati Exposition," *Western Electrician* 3 (11 Aug. 1886): 1; "American Notes," *Electrician* 21 (19 Oct. 1888): 767; "Electricity at the Cincinnati Centennial Exposition," *Electrical World* 12 (6 Oct. 1888): 185.

6. Thomas Edison, Jr. (1876–1935), the second of Edison's three children with his late wife Mary.

7. William Leslie Edison (1878–1937) was Edison's third and youngest child from his first marriage. Doc. 2904 n. 2.

8. Bridge engineer John Augustus Roebling designed and built the innovative wire-cable suspension span on the Ohio River between Cincinnati and Covington, Ky. When opened in 1867 (after years of construction and delays), its main span was a record 1,057 feet long. The distinctive cable stays fanning from the top of each tower created both aerodynamic stability and a much-admired appearance that became hallmarks of Roebling's design for the Brooklyn Bridge. *ANB,* s.v. "Roebling, John Augustus."

9. Walnut Hills is a neighborhood east and north of downtown Cincinnati, near the Ohio River, annexed to the city in 1870. It was considered one of the city's most desirable residential districts, with a mix of large old homes and more modest new ones. Maxwell 1974 [1870], 133–55.

10. Not found

11. That is, the Chautauqua Assembly, which Lewis Miller co-founded in 1874 with John Heyl Vincent as the Chautauqua Lake Sunday School Assembly. Located in western New York State, the Assembly was devoted to out-of-school learning and self-improvement, and it was a focus of the Miller family's summer activities. Doc. 2829 n. 2.

12. Cf. Docs. 3030 and 3036 regarding Mina's evident trepidation about raising three step-children, particularly fifteen-year-old Marion.

–3250–

Alfred Tate to Richard Dyer

[Orange,] Sept. 7, 88.

My Dear Dyer,—

Mr. Edison asked me the other day to look up his patents on meters with the view of ascertaining whether or not Westinghouse was infringing any one of them by using the Shallenberger.[1] I found that on the 14th June, 1881 Patent No. 242 901 was issued to Mr. Edison for a motor meter, which, so far as I am able to tell, anticipates in every respect the meter which is described in the article annexed.[2] You might speak to Mr. Edison about this matter.[3] Yours truly,

A O T[ate] Private Secretary.

TLS (carbon copy), NjWOE, DF (*TAED* D8818ASX).

1. Oliver Blackburn Shallenberger (1860–1898), a graduate of the U.S. Naval Academy, had been a classmate of Frank Sprague, whom he used as a reference in asking Edison for a central station job in 1884, just as Edison was withdrawing from that business. Shallenberger was presently chief electrician of the Westinghouse Electric Co., and he had obtained two patents on an alternating current (AC) electrical meter

on 14 August. The meter was based on his April 1888 discovery (independent of similar findings by Nikola Tesla and Galileo Ferraris) of a rotating magnetic field created by induction between a coil carrying AC current and a second conducting coil. Shallenberger found that if an armature were positioned properly between the conductors, their magnetic fields would present a rotating attraction to it so as to produce continuous mechanical motion from pulsating AC currents. This fact could be applied to AC motors generally, but in deference to his employer's pressing need for an electrical meter and the superior patent positions of Tesla and Ferraris, Shallenberger directed his efforts to developing a practical meter. His two August patents were nearly identical, only the claims of one being more general than those of the other. Shallenberger's meter proved critical to the commercial success of the Westinghouse central station AC system; by November, Westinghouse Electric's manufacturing capacity of 100 per week could not meet its own demands, and plans were made to triple the output. Shallenberger to TAE, 6 May 1884, DF (*TAED* D8413ZAB); U.S. Pats. 388,003 and 388,004; Terry 1898; Carlson 2013, 108–14; "Business Mention," *Western Electrician* 3 (17 Nov. 1888): 264.

2. The editors have not identified the article sent by Tate; illustrated descriptions of the Shallenberger meter had recently appeared in several U.S. trade journals. "Shallenberger's Alternating Current Meter," *Electrical World* 12 (25 Aug. 1888): 94; "The Shallenberger Alternating-Current Meter," *Electrician* 21 (7 Sept. 1888): 556; "Shallenberger's Electric Meter," *Electrical Engineer* 7 (Sept. 1888): 382–84.

Tate recognized mechanical similarities between Edison's patented motor meter and that of Shallenberger, notably dial indicators, fan blades to provide a mechanical load for the motor and, of course, the use of a motor (in contrast to Edison's standard electrochemical meter). What he apparently failed to see was that Edison's generic motor was not suited to run on AC currents. In his patent, Edison described three circuit configurations for the armature and magnet coils, only two of which might work with AC current. He also made no legally binding claims particular to the motor, whereas Shallenberger's patents (see note 1) claimed the design of an AC induction motor specially constructed for this purpose.

3. When Richard Dyer acknowledged this letter, he told Tate that the "matter has already been talked over between Mr. Edison, Mr. Upton and myself." He also sent the Shallenberger meter description to "Mr. Upton since he is having the question of infringement of various patents looked into." Dyer to Tate, 10 Sept. 1888, DF (*TAED* D8846ABQ); also cf. Doc. 3257.

–3251– [Orange,] Sept 7 1888—

Notebook Entry: Miscellaneous

Tomorrows work—

Design foot motion phono—[1a]

~~E~~Make experimental demonstration Regltg field phono by hand resistance little switch to regulate speed—[2a]

Put squirter in my room[3a]

Payne make lot stuff up & mould good lot new cylinders—[4]

Villards sample cases[5] make 1 doz 1 for [Sun?][6b]—one for Adams,[7] Birkenbine, Villard Dredge,[8] Perry[9]—Hix[10]—one for office—[a]

Gourauds machines— contract 20 Recorders 20 Hard 20 Soft Recvers—[11]

~~False shell plaster Paris &~~ [---][c]

False shells[12] ~~8~~ 20[d] for NY & Gouraud—

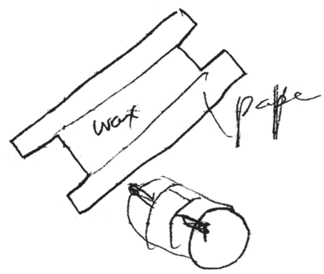
One good man on mailing Cylinders temporary supply[a]

See if very soft cylinder of paper & ozokerite turned off true can be recorded on without previous turning off

see if soft Ozokerite paper shell can be flattened  & then reproduced[a]

find that old Rubber false cylinder & true it up[a]

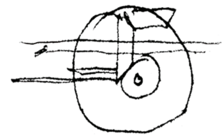
for truing cylinders outside 4 tools each taking slight chip & Seperately adjustable[13a]



false shell dip in wax Spirit Lamp & Resevoir[14]

Have Fred[15] make turning off Knife double Cut 2 chip one advanced other

for untrue [Machining?][b] cylinders



Write a Caveat on all new things—[16]

E[dison]

X, NjWOE, Lab., PN-88-09-07 (*TAED* NP035A). [a]Followed by dividing mark. [b]Illegible. [c]Canceled. [d]Interlined above.

1. That is, one powered by a foot treadle (like the graphophone), obviating the need for the user to maintain or replace a chemical battery.

2. Cf. the automatic field regulator for phonograph motors shown in Doc. 3272 (fig. 1).

3. Edison had a private room for experiments on the laboratory's second floor, just up the stairs from his office and library (Millard, Hay, and Grassick 1995, 23). A "squirter" may have had several uses. While still moving into the laboratory in November 1887, Edison envisioned making "squirted" lamp filaments by extruding a plastic carbon compound, an idea he had entertained for some time (Docs. 2994 and 3112). At the same time, he also planned to investigate squirting wax or glue onto a backing material to use for phonograph recordings (Docs. 3084, 3101, and 3117). And in August 1888, the Edison Machine Works was applying insulation coatings to wires through a new squirter machine. In November, John Kruesi, working on that process at Schenectady, was under the impression that Edison did not have similar equipment at the laboratory, at least for purposes of insulation (Samuel Insull to TAE, 9 Aug. 1888; Alfred Tate to TAE, 18 Aug. 1888; Charles Batchelor to John Kruesi, 27 Aug. 1888; Kruesi to TAE, 20 Nov. 1888; all DF [*TAED* D8835ADY, D8818ARU, D8818ASA, D8835AEW]).

4. Cf. Doc. 3243.

5. The editors have found no information about sample cases beyond that suggested by a brief exchange between Edison and Alfred Tate, who sent a typed inquiry on 6 September: "Have you sent Mr. Villard the papers which he wanted in regard to separating iron ore?" Edison responded in his own hand: "No— You should get photos Wiley is making the samples Have [Edward] Thomas write the description." Tate to TAE (with TAE marginalia), 6 Sept. 1888, DF (*TAED* D8845ADJ).

6. Edison's spelling of this word is ambiguous, and the editors have not found any connection between his ore milling projects and the *New York Sun,* Gardiner Sims, or other plausible readings of it.

7. Henry Herschel Adams (b. 1844) was a prominent New York iron merchant. Adams had recently visited Edison's laboratory to see the ore separator and planned to return with colleagues in September. *NCAB* 11:177; Alfred Tate memorandum, n.d. [Aug. 1888]; Adams to TAE, 8 Aug. and 26 Sept. 1888; all DF (*TAED* D8845ADT, D8845ADT).

8. James Dredge (1840–1906), trained by his brother as a civil engineer specializing in railroads, worked in London as a draftsman or

illustrator until 1866, when he joined the staff of *Engineering* for its first issue. Dredge became the journal's co-editor in 1870, a position he held until shortly before his death. "The Late James Dredge," *Engineering* 82 (24 Aug. 1906): 241–42.

9. William Sumner Perry (1848–1933), a Wall St. broker, was secretary of the Edison Ore Milling Co. and an investor in Edison electric lighting and at least one other mining firm in which Edison was involved. Doc. 3061 n. 1.

10. As an agent for Edison lighting companies since 1882, William Preston Hix (1836–1911) helped organize local lighting plants, such as the one recently opened in Philadelphia. After his contract with the Edison Electric Light Co. expired at the end of June, Edison seems to have taken him on as a promoter of his ore milling processes. At the end of September, Hix was arranging for Edison to meet several investors in New Jersey iron mines, who he thought could purchase "all the stock we may want them to, provided we convince them that our system is practicable and commercial." Docs. 2470 n. 2 and 2945 n. 11; Hix to TAE, 28 June, 20 July, 17 and 27 Sept. 1888; all DF (*TAED* D8831ABI, D8805AET, D8845ADQ, D8845ADU); Voucher (Laboratory) no. 812, July 1888, Vouchers (*TAED* VC88027).

11. Edison presumably referred to the first batch of twenty handmade phonographs just being completed at this time; the rate at which Gouraud would accept machines subsequently made in the factory was still being worked out (TAE to Gouraud, 10 Sept. 1888, Lbk. 26:314 [*TAED* LB026314]; TAE to Gouraud, 11 Sept. 1888, Miller (*TAED* HM88AAL); Docs. 3236 n. 9 and 3238 n. 6). The editors have not definitively learned the difference between a "Hard" and a "Soft" receiver. The terms likely referred to adaptations in the reproducer mechanism for harder or softer wax, a distinction that was just then being made according to whether speech or music was to be recorded (see Doc. 3253 esp. n. 26). A few weeks later, in response to a query from Gaston & Marsh, phonograph promoters in Detroit, Alfred Tate relayed Edison's suggestion that "In connection with musical cylinders you should use a soft receiver," one of which he promised to send. Tate to Gaston & Marsh, 27 Sept. 1888, DF (*TAED* D8818ATY).

12. That is, an interior cylinder for supporting the recording material placed over it; see Docs. 3252 and 3253.

13. Figure labels below are "wax" and "pape[r]."

14. Figure label above is ["closed"?].

15. Probably Fred Ott.

16. See Docs. 3253 and 3256. On the two pages following his signature, Edison made several undated phonograph sketches. He also wrote two ideas to try, again without date. One was to "See if an oil like Linseed or Hexchlorobenzine or Asphalt will mix with the molten sulphur to prevent it crystallizing & thus make a cylinder or perhaps Hard Rubber like material." The other was to "Mix Kaolin with japan wax or even softer material Oleate Lead etc to make a [stuf?] Like Rouge we used to sharpen points with."

–3252– [Orange,] Sept ~~8~~9 1888

Draft Patent Application: Phonograph

<803>[1]

The object of this invention is to make a phonogram [–][a] convenient [–][a] to mail and one that shall take up little space—[2]

The invention consists in forming a cylinder of thin paper, Coating the same with a flexible indenting material, Then by a scraping action make two longitudinal breaks in the continuity of the indenting material, on opposite sides of the cylinder The tool taking the material off right down to the paper— Then the cylinder can be flattened & placed in an ordinary Envelope & sent by mail. The paper which is intact serves between[b] the breaks as a hinge— one reception The flattened cylinder is grasped[b] by finger[b] & thumb at the creasing points & pressed out to a cylinder & being a taper cylinder is forced on[c] the taper false shell of the phonograph[3] very tightly [~~&~~?][a] being quite flexible the cylinder draws it into a perfectly cylindrical form and the ~~Letter~~ Communication previously recorded is perfectly reproduced by the phonograph The material which I prefer to use for[b] recording material is Various mixtures of the salts of the fatty acids such as Oleate of Lead & Palmitate of Magnesium mixed to desired consistency, melted & the paper coated by dipping while in a cylindrical form around a metallic dipping cylinder— The method of obviating eccentricity of the paper cylinder on the inner surface due to the lap of the paper is obviated by previously Cutting the paper to such size that it will just go around the cylinder & butt end to end over the butt joint & for the whole length of the butt joint I paste a narrow strip of tissue paper covered with a cementing material say hot thick Dextrine put on very thin. I am devising machinery to make these cylinders quickly & cheaply which will be the subject matter of another patent.[4] After the cylinders are dipped they are put into a Creasing device, consisting of two thin scrapers & the longitudinal slot made. they are then flattened & [~~pap~~?][a] in boxes like envelopes ready for sale.[5]

Dick= This works fairly well. get <u>Very broad claim</u> as I am going to work this up to perfection= also new article mfr claim etc[6]

Edison

ADfS, NjWOE, PS (*TAED* PT032ABF1). [a]Canceled. [b]Obscured overwritten text. [c]Repeated at bottom of one page and top of the next.

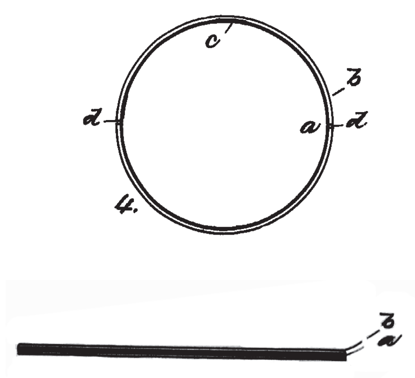
1. This is the case number assigned by Edison's patent attorneys to the application they prepared from his draft.

2. Edison's interest in a flat phonogram contrasts with his dismissal of that general idea at the beginning of the year (cf. Doc. 3156 esp. n. 4). In the intervening months, he had experienced the initial failure of phonogram cylinders to withstand transatlantic mailing (see Doc. 3221 n. 5). In recent days, he had also received (through Franck Maguire in Washington, D.C.) a letter from Charles Stolpe, formerly an assistant to Charles Tainter. Stolpe professed to have created, more or less at Tainter's request, a machine for winding strips of paper into cylinders that could be coated for phonographic recordings or used as mailing tubes. Tainter, he claimed, had appropriated and patented the ideas for himself (including a specification issued at the end of August), and Tainter did indeed take credit for these inventions in his memoir (U.S. Pats. 374,133 and 388,462; Tainter n.d. [1931?], 84–85). Seeking financial help to mount a legal fight, Stolpe sent a sample cylinder to Maguire, though it is not clear if that was forwarded to Edison. Edison offered to hire Stolpe at four dollars a week; this was below the rate Stolpe claimed to have been earning, and he evidently declined. In any case, Stolpe's spiral winding technique appears to be entirely different from the cylinder envisioned by Edison, but his claim threw into question at least one of Tainter's patents and could have turned Edison's thoughts anew to a flexible design suited to the rigors of the mails (Maguire to TAE, 5 Sept. 1888 [with TAE marginalia], enclosing Stolpe to Maguire, 3 Sept. 1888; Alfred Tate to Maguire, 7 Sept. 1888; all DF [*TAED* D8847ABZ, D8847ACA, D8815ACC]; Stolpe classified advertisement, *American Machinist* 13 [20 Mar. 1890]: 10, col. 1).

3. About three weeks later, Edison executed a separate patent application for a "false shell" to adapt the machine's tapered cylinder to a straight or less tapered phonogram. U.S. Pat. 397,706.

4. The editors have found no evidence of an application for manufacturing machinery, but Edison did obtain two patents for the process of making coated cylinders (see note 6).

5. Two small sketches, perhaps by Edison, atop the last page of this draft were drawn so lightly (or perhaps erased) that the editors have not reproduced them here. Representing the cylinder before and after being collapsed, they became the basis for two drawings in the completed application.



*Two drawings in the final version of Case 803 were based on faint sketches in Edison's draft. They show the cylinder before (above) and after (below) being flattened for mailing. The ends of the strip of paper **a** are joined at **c**; the coating of recording material **b** is scraped off along longitudinal lines **d** and **d**.*

6. Edison's patent attorneys incorporated the substance of his draft into an application signed on 17 September and filed two days later. It had four drawings and three claims; only the first claim pertained specifically to a collapsible phonogram cylinder. Following the dissolution of an interference proceeding with Isaac Heysinger of Philadelphia, Edison dropped that claim in 1892 and the Patent Office then swiftly allowed the patent. Edison, however, for some reason chose to abandon it rather than have it issued. Patent Office to TAE, 28 Jan. 1889, 18 Apr. 1890, 24 Aug. 1892, and n.d. (with TAE marginalia); Dyer & Seely to Patent Office, 15 Aug. 1892; Alfred Tate to Dyer & Seely, 3 May 1893; all Case 803, PS (*TAED* PT032ABF, images 13–18).

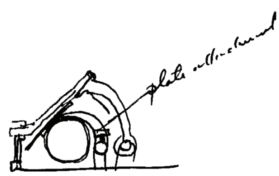
The actual process of manufacturing coated paper cylinders was the subject of two separate applications by Edison. The first, executed on 29 September, covered the general method of wrapping paper around a tapered core, securing the ends, dipping the whole in a melted recording material, and turning the cylinder on a lathe (U.S. Pat. 400,649). The second, signed on 15 October, pertained specifically to making the collapsing paper cylinders described in this document (U.S. Pat. 400,650). The specifications were issued simultaneously in April 1889.

–3253–

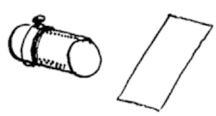
Draft Caveat: Phonograph[1]

[Orange,] Sept 9 1888

Phono Caveat
[A][2]



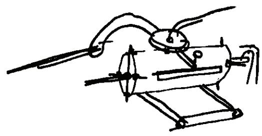
false shell with points & straight strip flexible paper coated with flex material with one straight edge & a flange ring [~~of~~?][a] on Shell[3] strait part of phonogram goes against it. <OK>



Double row points where joints meet. space in between to allow of expansion.

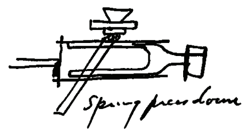
false shell with roughened surface or points to wrap flexible phonogram around & side ring to register <OK>[b]

plate machine[4] have roughened surface of fine points to keep phonogram ~~blank~~ down also oil—also holes & air suction. also presser to press it flat near point



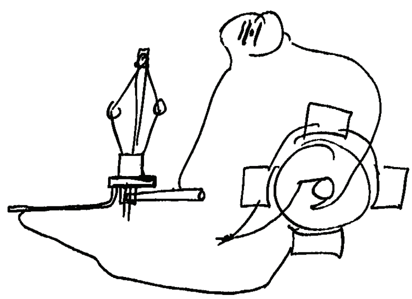
<OK>

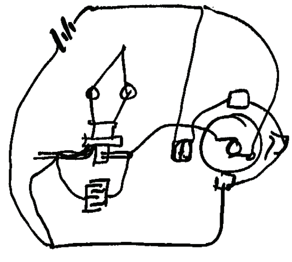
[B][5]

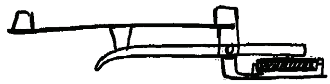


<OK>

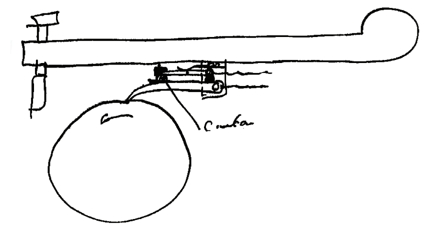
Plaster paris cylinders or shells with groove like old phono[6] put in them then Coated with thin sheet Oleate Salt, also glue & glycerine, also films of Chloride sulphur on Asphalt mixed with a fatty oil—also flexible Collodion—Balata & a salt of Oleate palmitate or a wax or Hydrocarbon mixed in a Solvent & [filim?][c] dried—



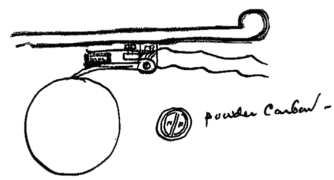




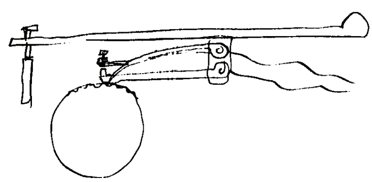
disk machine heavy paper—covered with [——][a] recording material.



<OK>[7]

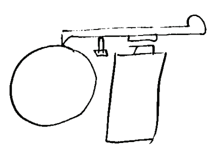


<OK>[8]



<OK>

Reproducing or rather repeating Morse—on phono—magnet working sub diaphragm or direct thus



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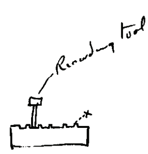
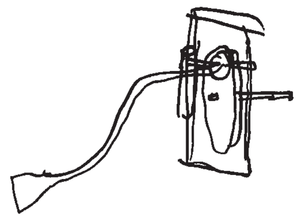
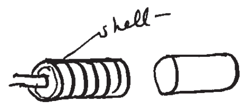


turning tool tracks a square place thus preventing injury to Record both in cylinders or flat plates x always acts [as grooved?][c] for record on bottom of spaces between[9]





old phono grooved cylinder— continuous shell of oleate then turned use blunt [---][c] cutting tool—[10] <OK>

~~paper~~ silk[d] cylinder very thin coated with flexible oleate palmitate[d] salt & colapsable—[e]

Woven flexible cloth blank ~~wax coated or~~ Oleate Palmitate coating flexible—

Recorder

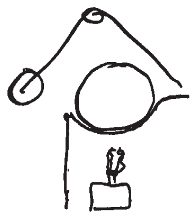
Receiver

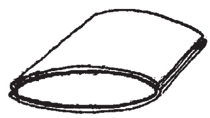
Recording tool.

Reproducing tool to get more bearing

to get more bearing

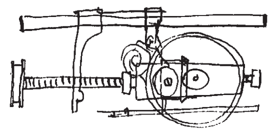
Heat cylinder <OK>

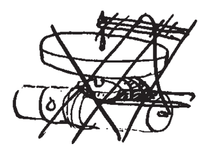


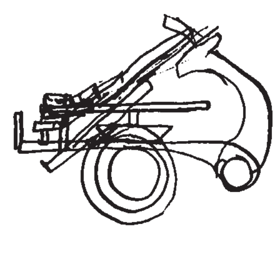


<OK>

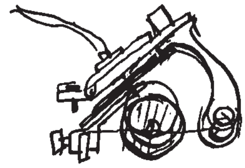
parchment paper or tissue paper filled with parafine— or tissue paper





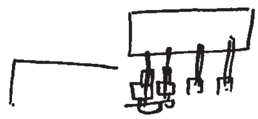


Describe it=



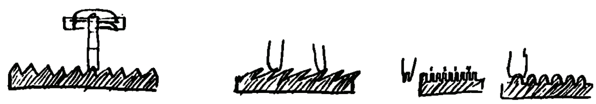
strched belt=

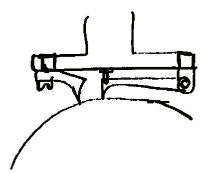
Turning off one knife ahead of other[f]



on Reg phonograph One knife ¼ inch in advance taking principal chip other edge close to knife but one knife ie[g] 1 knife 2 Cutting Edges—

In preparing big cylinders turn off with Several knifes ~~or~~like a chaser one Little[f] deeper than the other— Turn inside with knife working on a taper guide—





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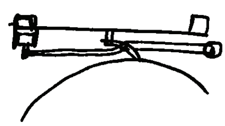
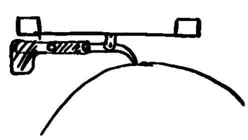
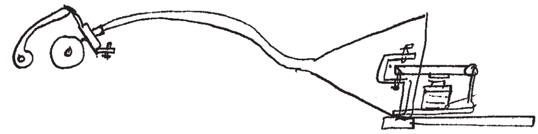


7 <OK>[11]



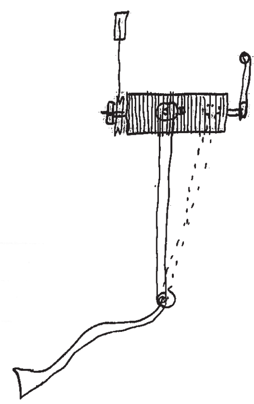
8 <OK>



Telgh inst, recording by several dif quality sounds High note, Low note, several dif Sounders—[12] also Record Composite turning fork sounds & then reproduce them by tubes running to di[a]p[hra]ms connected to tuning forks—also as Morse Repeater recvg from Washn & then transferring to Boston wire, the repeating being done by Indcton coil & Carbon button, or better make indentations work lever & platina point, diaphragm worked direct by magnet from Washn[h] or better make Telephone Recorder, phono left ready on ringing call bell release lever closes ckt & connects Receiver to phono runs until rung off—[13]

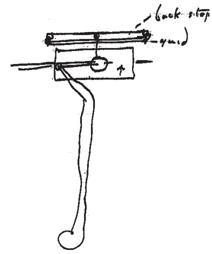
~~Several tube~~ Swinging large funnell for Music, Metallic Connection[f] no braided tube— Metallic funnell bound with Cord or other deadening material.

Caveat phono[14]

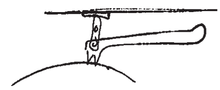


grooves previously put in wax to guide both for trans & recorder— or wax may be smooth & chaser with doz threads be in advance & in bottom of grooves record—

[C][15]

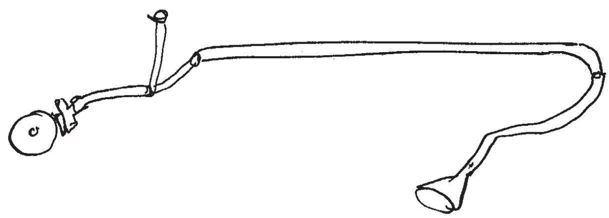


double recording knife for music to double the pitch for fine musical effects—

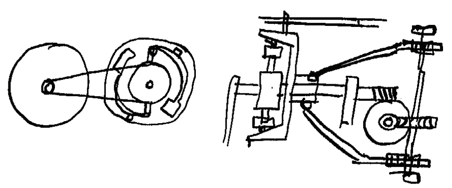


String telephone from one room to another

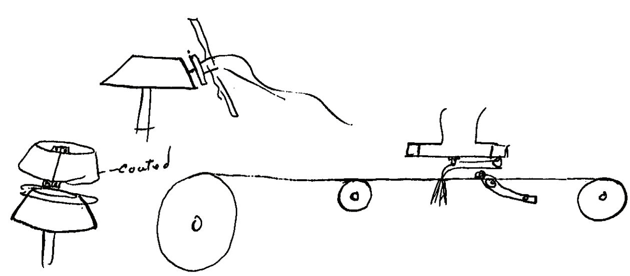
speaking tube, to other room



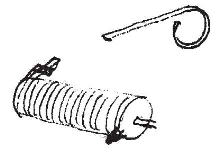
Constant surface velocity—[16]



thread Coated with flexible recording fatty acid salt—[17]



waxed paper—go over twice or 3 times

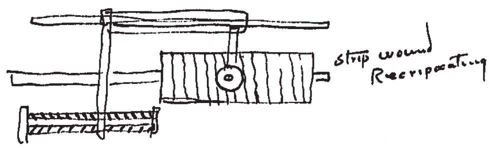


Recording tool grooving tool

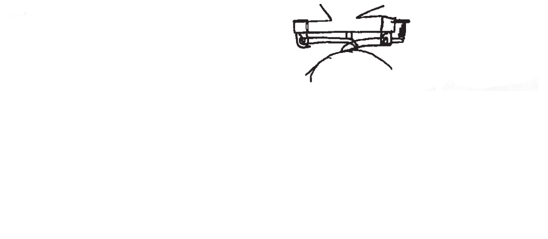
Recording tool grooving tool

Recording Tool grooving tool

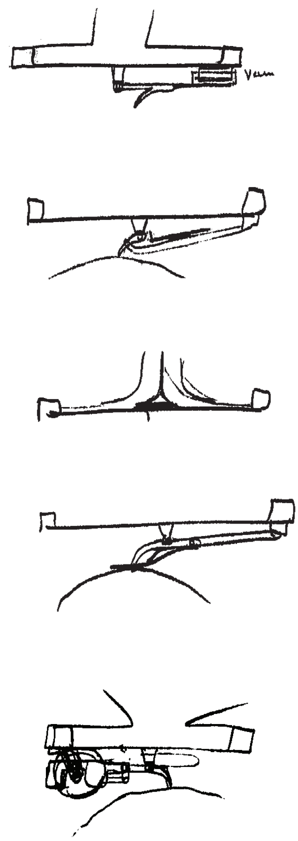
[E][18]



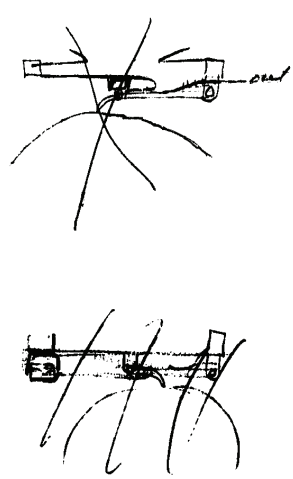
Disk machine auto Reg for surface velocity[19]



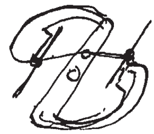
[F][20]



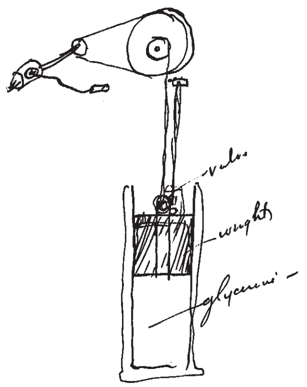
[G][21]



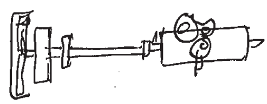
spreading fan governor— <OK>

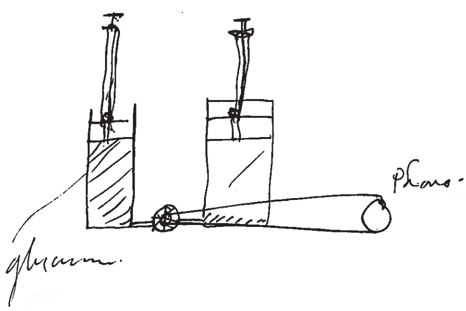


Regulating the general speed by a Res to weaken the field & use of governor to keep Even revolution speed—[22]

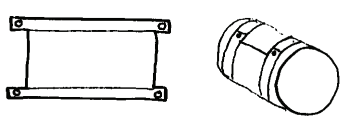


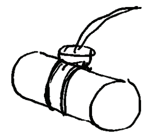
Water Motor & governor— <OK>



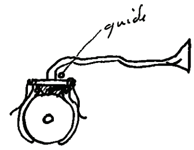


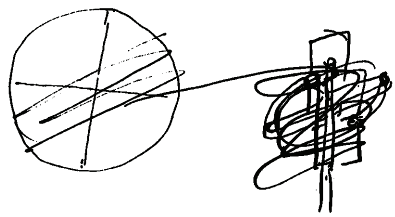
<OK>[23]



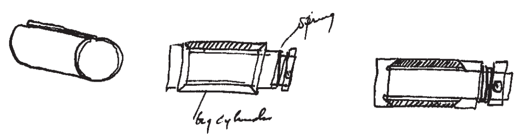


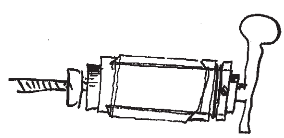
<chaser guide> cylinder has thread previously in or made as it goes along by chaser—[24]





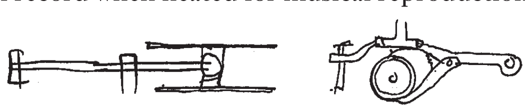
false shell for big cylinder[25]

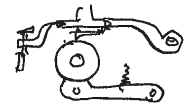


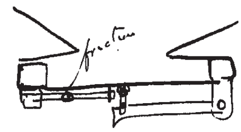


a shell made of Asphalt & coated with a soft indenting material—

an asphalt shell mixed with[f] a softener in such proportions that it will record when heated for musical reproduction.[26]







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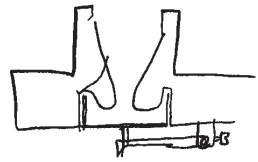

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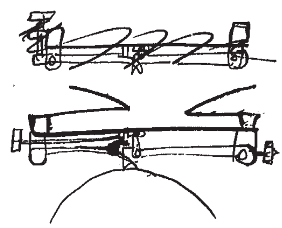

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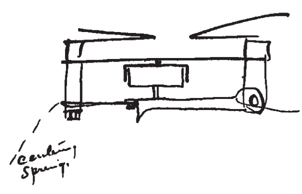

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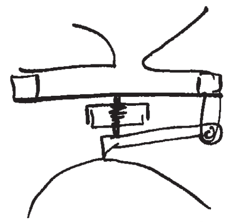
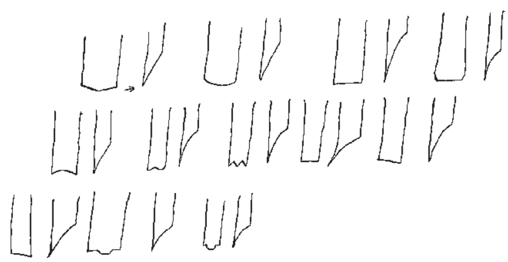
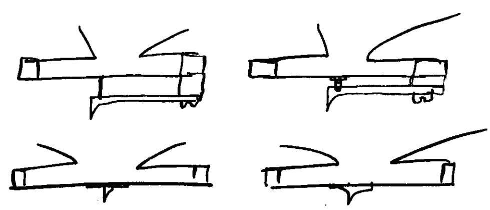


<OK>

<OK>

wire wound oxidized iron wire armatur pressed pacinnoti[30] Like by Hydraulic pressure. ditto short pieces of wire with Sal ammonic sol d[itt]o Iron turnings. then shellacd or Japanned to stop further oxidation.[i]





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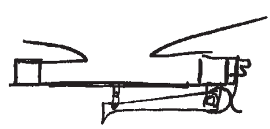

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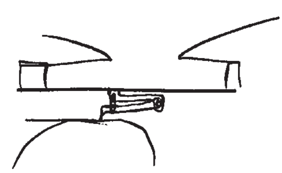

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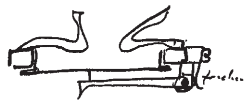

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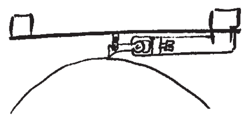

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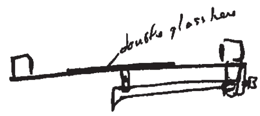

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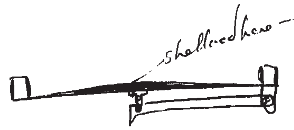
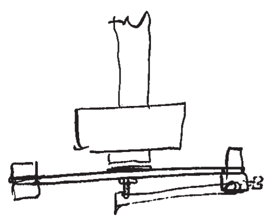
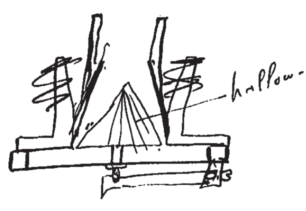




<OK>[33]

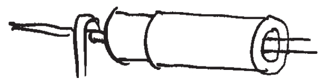
[H][34]



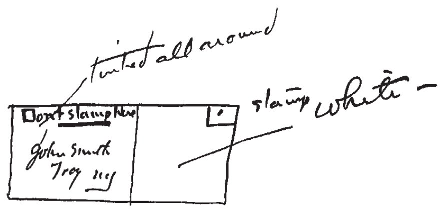
Diaphragms— Mica, steel, phos bronze—Laminated steel phos bronze, brass, glass, celluloid— also Hard Rubber, Shellacd cloth, asphalted cloth, Cork—

metallic shell dipped

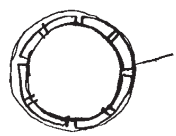
cartridge like false shell dipped—



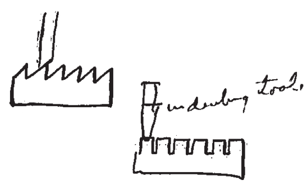
phonogh[f] Envelope—[35]



colapsing paper or other light cylinder Coated Continuously with flexible Recording Material



[I][36]



TAE

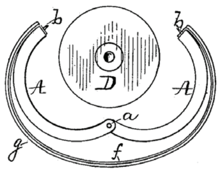
ADfS, NjWOE, Lab., Unbound Notes and Drawings (1888); and PS, NjWOE, Caveat Files (*TAED* NS88ABX, PT031AAQ). Document multiply signed and dated. [a]Canceled. [b]Line drawn nearly completely around paragraph. [c]Illegible. [d]Interlined above. [e]Line drawn nearly completely around preceding two paragraphs and respective drawings. [f]Obscured overwritten text. [g]Circled. [h]"indentations work…from Washn" interlined. [i]Followed by dividing mark.

1. This document is comprised of two sets of manuscript pages dated 9 September. One is headed "Phono Caveat" (with several pages marked "Notes phono Caveat"); the other, with pages numbered by Edison, is titled "Caveat phono." The two sets were filed separately in Edi-

son's laboratory papers, but the editors have joined them (at the point marked below) because of their obvious overlaps. Doc. 3256 and another set of "Phono Caveat" manuscript pages from 13 September may be read as a continuation of this draft (Unbound Notes and Drawings, Lab. [*TAED* NS88ABZ]). Docs. 3253 and 3256 were not revised into finished caveats, but Edison incorporated some of the ideas represented in them into an extraordinarily long caveat (52 manuscript pages and more than 220 numbered figures) that he wrote out himself and dated 21 September; that document was filed on 26 October as his Caveat 111 (PS [*TAED* PT031AAB1]). Edison also drafted at least a half dozen phonograph-related patent applications in the latter part of September.

2. Figure label is "plate attachment."

3. About five weeks later, Edison executed two patent applications on a "false shell" for holding a sheet of flexible recording material on the phonograph machine's cylinder. One was for a shell consisting of a split tapered cylinder hinged longitudinally that could be clamped over the machine's tapered cylinder. This "shell" provided a non-tapered surface around which the recording material could be wrapped and pinned in place. The other application covered a shell having "numerous fine sharp points" to hold the recording material in place without actually perforating it. U.S. Pats. 406,568 and 437,424; see also Edison's draft drawings for the latter patent in PS (*TAED* PT032ABJ)



*In Edison's U.S. Patent 406,568, **A** and **A** are halves of the hinged false shell, **D** is the phonograph shaft, and **g** is the flexible recording material pinned by **b** and **b** at the shell's open end.*

4. That is, a machine to play records made on flexible sheets.

5. Figure label is "Spring press down."

6. In Edison's earliest phonograph machines, the recording and reproducing point was guided by a continuous spiral groove cut in the cylinder over which the tinfoil was wrapped. See, e.g., Docs. 1101, 1140, 1144, and 1150.

7. Figure label is "carbon."

8. Figure label is "powder carbon—."

9. Figure labels above are "Recording tool" and "x."

10. Figure label above is "shell."

11. Figure label is "dash pot."

12. That is, like Edison's acoustic telegraph system where tuning forks were used to send different frequencies (notes) over one wire at the same time.

13. In this paragraph, Edison imagines applying the phonograph to the telegraph and the telephone, including using it to repeat or capture messages.

14. This heading marks the start of the other set of manuscript pages, numbered by Edison from page one.

15. Figure labels are "back stop" and "guid."

16. This mechanism appears to be more of a governor than the "auto Reg[ulator]" specifically for disk phonographs shown a few drawings below (see note 19).

17. Figure label is "coated."

18. Figure labels are "strip wound" and "Reciprocating."

19. As the recording point traced a smaller spiral towards the center of the disk, its speed relative to the surface would decrease, consequently diminishing its ability to register the higher frequencies. The speed problem apparently remained unsolved in any practical or commercial

sense into the twentieth century. U.S. Pat. 730,986 (Tainter); Koenigsberg 1990, xxii, 14.

20. Figure label is "[vane?]."

21. Figure label is "[out?]."

22. Figure labels are "valve," "weight," and "glycerine—."

23. Figure labels are "glycerine—" and "Phono."

24. Figure label is "guide."

25. Figure labels are "Spring" and "big cylinder."

26. Edison seems to have referred to an emerging distinction at the laboratory between wax compounds better suited to music (soft) or speech (hard). Jonas Aylsworth, amid his ongoing experiments on wax compounds, remarked on 1 August that a particular hard compound gave "indentations not deep, fine talk." There was, he said, "nothing better wanted," though his experiments continued. See Doc. 3251 esp. n. 11; N-87-01-01:153, Lab. (*TAED* NB001153).

27. Figure label is "friction."

28. Figure label is "air dash pot."

29. Figure label is "centering spring."

30. Edison's meaning of "pressed" is not clear. Italian physicist Antonio Pacinotti (1841–1912) developed a ring armature in the early 1860s that became the template for many later variations. Fitted with a commutator and brushes, Pacinotti's armature was the first rotary generator to produce a steady direct current. Doc. 2099 n. 3; Bottone 1887, 28–31.

31. Figure label is "friction."

32. Figure label is "double glass here."

33. Figure label is "shellacd here—."

34. Figure label is "hollow."

35. Figure labels are "[tinted?] all around," "stamp," and "white—"; text on envelope is "Dont stamp Here" and "John Smith Troy NY." Edison executed a patent application for such a mailing envelope (with a very similar drawing) on 29 September. The envelope was to have an extension, restricted so that the phonogram could not enter, to which postage could be affixed and any stamping done. The application was filed on 11 October, rejected for insufficient originality in March 1889, amended, and rejected again in April 1890. Case 805, PS (*TAED* PT032ABH).

36. Figure label is "indenting tool."

–3254–

Henry Villard to George Westinghouse

[New York,] Sept. 10 [188]8

Dear Sir:

I am in receipt this morning of your favor of 8th inst.[1]

In reply I beg to say that you are correctly informed as to my purpose to interest myself largely in electrical enterprises, or, to state the case more correctly, myself and friends, including Messrs. Siemens & Halske, of Berlin,[2] propose to largely increase our present interests in the several Edison Companies by means of their consolidation into one corporation. I have been interested in Mr. Edison's undertakings for the last nine years, and am therefore familiar with the condition of the electric business in this country.

Your suggestion may prove a good one, and I will take pleasure in meeting any appointment you may be pleased to make for Wednesday or Thursday next.[3] Yours truly,

H. Villard

LS (letterpress copy), Villard, Letterbook 59:589.

1. Not found.

2. In addition to Siemens & Halske, Villard counted among his "friends" Deutsche Bank, for whom he worked as an agent; see Doc. 3302 n. 4.

3. The editors have not determined whether Edison and Villard met as a result of this correspondence. The exchange produced nothing concrete at this time, but Villard later approached Westinghouse again to explore further mergers in the electric light business. Carlson 1991a, 291 esp. nn. 32–33; McDonald 1962, 48.

–3255–

To Ezra Gilliland

[Orange, September 11, 1888][1]

Gilliland

I just learn you have made a certain trade with Lippincott ~~with request You~~ of a nature[a] unknown to me, as you did not have permission to sell [~~witho~~?][b] from Company ~~I be~~—[2]

I have this day abrogated your contract and notified Mr Lippincott of the fact and that he pay any further sum at his own risk[3]

Since you have been so underhanded ~~I~~ shall demand refunding of <u>all money</u> paid you & stoppage of further payments [~~without?~~ ----------][c] and I do not desire you to exhibit phonograph in Europe—[4]

Edison

ALS (telegram), NjWOE, DF (*TAED* D8848ADP). [a]"~~with request You~~ of a nature" interlined above. [b]Canceled. [c]Text from "& stoppage" interlined above; illegible portion canceled.

1. This date is inferred from Edison's formal letter to Jesse Lippincott (see note 3).

2. See Doc. 3200 (headnote).

3. In his capacity as president of the Edison Phonograph Co., Edison sent a letter to Jesse Lippincott on 11 September referring to this same-day cable to Gilliland and enclosing a resolution approved by the directors regarding the transfer of Gilliland's phonograph agency contract. The resolution, voted on by Edison, Charles Batchelor, and Alfred Tate, declared that the contract's value lay in Gilliland's personal service to the company and that, by attempting to transfer it, Gilliland

had "violated the very essence of his agreement." The directors canceled the contract (conferring its rights on Edison instead), and asserted the company's rights to prevent further payments to Gilliland and to recover any money already paid to him. To Lippincott, Edison emphasized that Gilliland was "powerless" to transfer his agency privileges "without the consent of the Company which I represent." Edison sent a formal notice to Lippincott and the North American company a few days later, holding them liable for any further payments to Gilliland. This second letter seems to have been the one which Lippincott read aloud to Charles Bruch at the Edison Phonograph Co., who advised Gilliland of Edison's allegations. TAE to Lippincott, 11 and 15 Sept. 1888, both DF (*TAED* D8848ADQ, D8818ATF); Edison Phonograph Co. minutes, 11 Sept. 1888, Miller (*TAED* HM88AAQ); Bruch to Gilliland, 24 Sept. 1888, LM 22:166 (*TAED* LM022166).

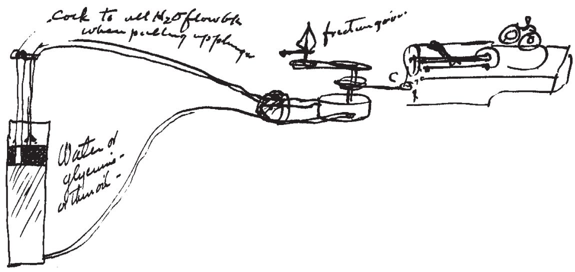
4. Gilliland's reply is Doc. 3258. Edison disavowed Gilliland to George Gouraud, whom he instructed not to give Gilliland any phonographs for exhibition. TAE to Gouraud, 13 Sept. 1888, DF (*TAED* D8818ATD).

–3256–

Draft Caveat: Phonograph

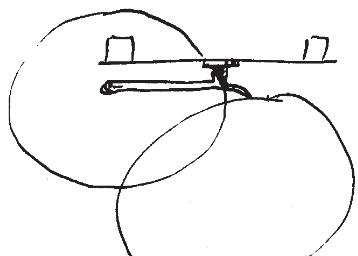
[Orange,] Sept 11 1888

phonogh Caveat.[1]

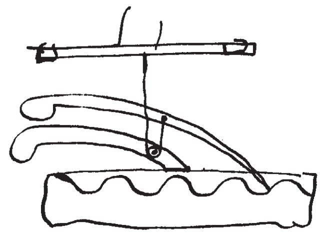


<OK[2a]>

an agate of Saphire or Iridosomine[b] Cutting tool point—

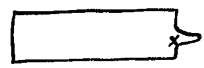


<OK> <n[o] g[ood]>



<OK>

A cylinder of paper [~~wa~~?][c] of say 1/64— over this a thin sheet of paper put on tight & fastened[b] by lap & cement. This is coated with recording material turned off thin & then covered by a new sheet of paper & this Covered[b] with with recdg material & so on until a composite Cylinder is build up 1/4 inch thick The end X stix out so they can be turn off & expose[3]



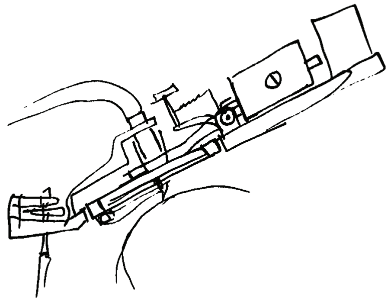
a fresh recording surface from time to time

Sewed Belts— sewed Belt with silk surface— Crowning

For trueing dipped paper phonograms— dip in Recording material then put in a polished mould & Run in a taper to force paper to proper taper & true the Wax— use a press—

phonogram blanks for [giving?][b] a surface ie[d] material outside of recording surface. Hot asphalt Moulded by pressure, ditto mixed with powdered mica, saw dust,[b] Lime, Talc, Cylinders of plaster Paris, ditto soaked in asphalt in a solvent, Linseed oil & other things to make them impervious to moisture, paper wound on a mandril

several layers Thin paper.— ditto paper soaked in parafine, oleate Lead, Linseed oil oxidized afterwards by chloride sulphur fumes,[4] Rosin hot, and also of the same material the recording surface is made of—Rosin & Parafine, Rosin & Linseed oil, Castor & olive oil & then treated with Hyponitric acid, any fatty oil made solid by ~~Cl~~ Chlorinizing agent Like pentachloride of antimony or Chloride Sulphur, paper soaked in hot asphalt solution, in any resin or gum made soft by a solvent or semisolvent or a mixture with a softer body when hot which on cooling will be somewhat flexible—



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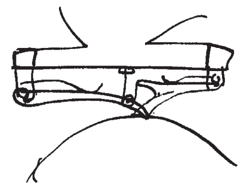

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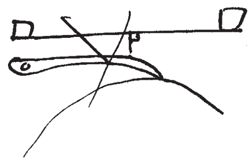
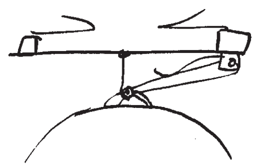




<OK>

TAE

ADS, NjWOE, Lab., Unbound Notes and Drawings (*TAED* NS88ABY). Document multiply dated. [a]Drawing followed by dividing mark. [b]Obscured overwritten text. [c]Canceled. [d]Circled. [e]Followed by dividing mark.

1. These unnumbered loose-leaf pages presented here may be read as a continuation of Doc. 3253 and, like that document, they are thematically connected to Edison's further notes and drawings for a "Phono Caveat" on 13 September and to a burst of patent activity. See Doc. 3253 n. 1.

2. Figure labels are "cock to all H_2O flow bk when pulling up plunger," "Water or glycerine—or thin oil—," and (at right) "friction gover[nor]."

3. Figure label is "X."

4. This idea is similar to a suggestion Edison made to Albert Dick for preparing impervious stencil paper; cf. Doc. 3185.

–3257–

To Edison Electric Light Co.

Orange, N.J., Sept. 12, 88.[a]

Dear Sirs:—

You have a large number of small detail patents which have never been litigated. They relate to details of manufacture &c. I desire to obtain the privilege of engaging our enemies upon the ground of these minor patents, a list of which I append.[1] I wish to conduct these cases in my own name and in my own peculiar way, without interference from the Company, its Agents or Attorneys, and to accomplish this, should you consider favorably my request, it would be necessary for you to assign these patents to myself, so that the title may stand in my name on the books of the Patent Office. I will execute any contract to reassign them at any time the Company may direct. I will personally bear the whole expense in connection with these litigations and trust for reimbursement to the damages or back pay which I may be able to collect in successful cases.[2]

I do not wish in any way to interfere in the suits the Company itself is conducting,[3] but desire to take up a branch of litigation, which will in all probability never be reached by yourselves and which can be used with telling effect upon our opponents.

It is possible that some of the patents embodied in the attached list are already in litigation. If this is so, or if it is proposed to litigate any of them, such numbers may be eliminated. Yours truly,

<See Upton & have him finish list Steringer got additional lot & ask if he will see L Co & talk matter over[4] E[dison]>

TL, NjWOE, DF (*TAED* D8830ABZ); a carbon copy, initialed for Edison by Alfred Tate, is in DF (*TAED* D8818ATB). Letterhead of Edison laboratory. [a]“*Orange, N.J.,*” preprinted.

1. The editors have not identified the origin of Edison’s interest in this litigation but conjecture he may have been prompted by his investigations into possible patent infringements by the new Shallenberger meter and the Sawyer-Man lamp plug, both used by the Westinghouse Electric Co. Edison had discussed the meter with Francis Upton, Alfred Tate, and patent attorney Richard Dyer a few days earlier and designated Upton to look into the question of infringement (see Doc. 3250). The Westinghouse firm began in 1887 to use lamps made by the Consolidated Electric Light Co. under the Sawyer-Man patents and was now on the verge of acquiring by perpetual lease (signed in October) the Consolidated Co.’s assets in preparation for making its own lamps (“The Recent Electric Light Combination,” *Electrical World,* 10 [19 Nov. 1887]: 270; “The Westinghouse Electric Co.,” ibid., 12 [20 Oct. 1888]: 215; “The Consolidated Electric Light Co., *Commercial and Financial Chronicle,* 48 [30 Mar. 1889]: 428; Wrege and Greenwood

1984). The Sawyer-Man Co. (which continued its legal existence under the Consolidated's ownership) was, according to Upton, enjoined from using the Edison screw plug. With Edison's blessing, Upton asked Charles Chinnock, vice president of the Edison Manufacturing Co., to confidentially obtain some Sawyer-Man products because "If they can be caught selling lamps with Edison Plugs and lamps in which the connection between the cap and ring is made of plaster, it will be a very great service to the Patent Attorneys, when they appear in Court next fall." Chinnock in turn instructed company agents to collect the evidence (Upton to Chinnock, 11 Sept. 1888; Chinnock to Upton, 12 Sept. 1888; Chinnock to Edison Lamp Co., 12 Sept. 1888; Upton to TAE, 15 Sept. 1888; all DF [*TAED* D8833ACI, D8833ACJ, D8833ACK, D8833ACH]). Upton also directed Luther Stieringer and James Russell, Edison's private investigator, to "procure full evidence in the manufacture of lamps by the Sawyer-Man, Thomson, Houston, Westinghouse, and United States Company" (Upton to Stieringer and Russell, 14 Sept. 1888; Upton to TAE, 14 Sept. 1888; both DF [*TAED* D8833ACG, D8833ACF]).

2. Alfred Tate initialed a carbon copy of this letter for Edison (DF [*TAED* D8818ATB]), but the fact that Edison did not sign the original and instead wrote further instructions on it indicates that it was not sent. The editors have found no evidence of the proposed litigation over the "detail patents."

3. In May 1885, the Edison Electric Light Co. initiated dozens of patent infringement suits in federal court in New York against the U.S. Electric Lighting Co., the Consolidated Electric Co., the Swan Incandescent Electric Lighting Co., and other entities regarding fifty-eight of Edison's patents relating to incandescent lighting. Thirty-four of these actions reportedly were lodged "against the United States Electric Lighting Co., and its licensees, and customers, alone" (see Doc. 2809; Edison Electric Light Co. annual report [p. 11], 27 Oct. 1885 [*TAED* CA001A]; *New York World,* 3 May 1885, Cat. 1140:4b [*TAED* SB017004b]; "The Edison Claims Summarized," *Elec. and Elec. Eng.,* 4 [June 1885]: 205). The U.S. Electric Lighting Co. initiated its own suits against the Edison companies in an effort to protect the lighting patents of Hiram Maxim, Moses Farmer, and Edward Weston, to which it had acquired title ("The United States Company's Claims Summarized," *Elec. and Elec. Eng.,* 4 [June 1885]: 206). For the disposition of the Edison Light Co's litigation as of 1 October 1888, see Edison Electric Light Co. "Schedule of Suits," 1 Oct. 1888, DF (*TAED* D8830ACC).

4. A typed copy of a LIST OF DETAIL PATENTS was appended to the carbon copy of this letter. It identified twenty-two patents covering a variety of components and devices relating to electric lighting and lamp manufacture. Alfred Tate subsequently asked Luther Stieringer for "the list of Patents in his possession," perhaps referring to the dozen or so specifications issued to Stieringer for electric lighting fixtures, conductors, and fuses. TAE to Edison Electric Light Co., 12 Sept. 1888; Upton to Tate, 3 and 6 Oct. 1888; all DF (*TAED* D8818ATB, D8833ACQ, D8833ACR); *TAEB* 6 App. 5.C, *TAEB* 7 App. 4.C, *TAEB* 8 App. 2.B.

–3258–

From Ezra Gilliland

Hotel Victoria[1] London 9 13 188[8][a]

Edison Orange NJ[2]

Sale made to Lippencott Exactly as represented and had your approval Lippencott volunteered make subsequent agreement had good object in So doing I see nothing underhanded in this transaction. Your interests were no way injured thereby I have throughout acted under Tomlinsons advise you Certainly are acting without Knowledge of facts and are doing me great injustice have in this and at all other times worked faithfully in your interests[3] Shall return at once.[4]

Gilliland

L (telegram), NjWOE, DF (*TAED* D8848ADR). Message form of Western Union Telegraph Co. [a]"188" preprinted.

1. The Victoria Hotel was one of two four-story hotels designed in 1839 and constructed adjacent to the entrance to London's busy Euston Station. *London Ency.,* s.v. "Adelaide Hotel and Victoria Hotel."

2. Gilliland cabled in reply to Doc. 3255; see also Doc. 3200 (headnote).

3. Edison later stated that before Gilliland and John Tomlinson left New York in August, each man separately asked him for money on the ground that they had realized little profit on the sale of phonograph rights to Jesse Lippincott. TAE draft affidavit (pp. 19–21), 25 Sept. 1888, Misc. Legal (*TAED* HX88028).

4. Gilliland left London about this time but, instead of returning to New York, went to Paris and then, by early October, to Geneva, with the idea of returning to New York about the end of that month (Charles Bruch to Ezra Gilliland, 14, 18, and 24 Sept. and 5 Oct.1888; Bruch to James Gilliland, 6 Oct. 1888; LM 22:151, 160, 166, 180A, 181 [*TAED* LM022151, LM022160, LM022166, LM022180A, LM022181]). Edison and Jesse Lippincott would offer accounts at odds with Gilliland's version of the sale of his agency contract with the Edison Phonograph Co. Edison acknowledged having known beforehand of the prospective deal and that Gilliland would receive $250,000 in stock of Lippincott's new company (with a portion going to John Tomlinson), but he stated emphatically that he was deceived into thinking the stock would have cash value of only about $50,000. Even that, he believed, was too much because Gilliland "had never performed any agency services or done anything whatever under his contract…no phonographs had been made and none sold, and he had earned no right so far as personal service goes, to realize for his own pocket" anything close to that amount. Gilliland's contract had included an ambitious sales goal of more than 15,000 phonographs in the first year (TAE draft affidavit [pp. 13–18], 25 Sept. 1888; Gilliland agreement with Edison Phonograph Co., 28 Oct. 1887; both Misc. Legal [*TAED* HX88028, HX87013A]).

–3259–

Draft Patent Application: Phonograph

Orange NJ Sept 13 1888

<804>[1a]

<Hurry this want it in patent ofs Wednesday <u>Sure</u>>[2b]

The object of this invention is to produce Reproducers for phonographs which shall work[c] independantly of the irregularity of the recorded surface.

The invention consists of ~~the~~ a new & novel moveable fulcrum, which although not a fulcrum in an ordinary mechanical sense is still a fulcrum to the motions [~~reprd~~?][d] ~~vibr~~ produced in levers etc from recorded sounds on phonographic material In previous Applications I have shewn phonographic Reproducers which accomodate themselves to irregularities but in those Cases there was an elastic material like Rubber between the reproducing lever ~~or~~ [-][d] ~~lever~~ and the diaphragm but a larger portion of the Energy or rather amplitude given the lever by the indentations was lost in the elastic material & thus diminished the diaphragm amplitudes, of course producing a very greatly diminished sound[3] The range of irregularity of the record surface was not very great ~~but~~ & while[e] for all practical purposes sufficient, was of no value when by ~~the~~ accident or imperfection in manufacture was very irregular as in the case of a phonogram in a cylindrical form it was eccentric when rotated.

The present invention supplies a reproducer which will reproduce without change of Volume or scraping noise, from round cylinders to oval cylinders

fig 1[4]

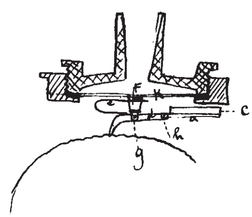


fig 2

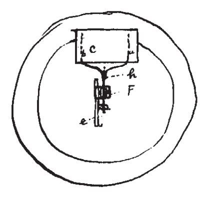


fig 3

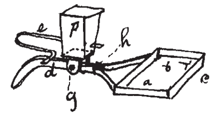


fig 1 shews the improved form of reproducer—a section view, fig 2 a top view & fig. 3 a perspective. K is diaphragm F a Cork e a spring to press the lever point down on the phonographic[c] record. it is pivoted at g by a bearing the flat surface being secured to the Cork by a cement like melted shellac. a slit in the cork serves with the aid of cement to hold the Spring the Cork is cemented to diaphragm in usual way by melted shellac. the lever at h ends & two prongs of very thin metal but deep to ~~give it an~~ make it rigid like for up and down motions. Theses prongs are soldered to the end of lever d—over the Ends is a trough of very thin mica. This acts a a vane, or like a fan in a clockwork governor. I have discovered that for the exceedingly rapid to & fro vibrations of the lever point due to the record that this vane or fan like retarder is practically rigid as if it was fixed mechanically to the rim of the reproducer & not suspended in air—but to slower movements like that due to eccentricity in the cylinder it responds to the movement of the point & this follows up the surface perfectly and with a movement of the point of $1/16$ of an inch up and down in following the eccentric movements the pressure of the point on the record is very little greater in the high & low parts of the revolving cylinder. ~~the~~ for slow movement of two[c] or 3 ups & downs in a second it offer no appreciable redardation & hence the pressure [~~ove~~?][d] on the record of the points is practically equal. The spring being very Elastic & used to counter balance the weight of the Vane & give a bias the other way But to the sound waves which ~~last only~~ occur with a frequency of several hundred per second it is practically rigid & all motion due to indentations is transferred directly[f] to the diaphragm & not lost in moving the vane[g] hence I have here a moveable fulcrum or support for one kind of movement but not as a fulcrum or a support for another kind— a weight instead of a vane does not act so well

fig 4

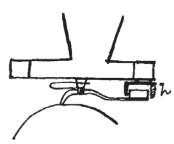


fig 4 shews diagramatically[c] variations The power of the[h] retarding vane being increasing by causing it to be inclosed in a chamber

fig 5

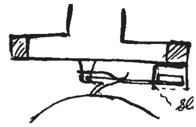


fig ~~4~~5 another slight change in the form of the lever—
fig 6[5]

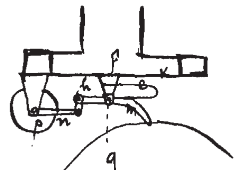


fig ~~5~~6 shews a device which allthough not so simple or effacacious is a mechanical Equivalent as far as the production of a moveable fulcrum for one kind of ~~waves~~ motion[i] & not for another K diaphm— F cork, e spring h a link connecting to lever n which is fixed to a heavy wheel on bearings The slow motions due to Eccentricity allows the [~~p~~—][d] lever m to respond to it but the weight cannot respond to the rapid to & fro motions of m due to the sound waves on the record it having vastly too much inertia[c] hence the entire motion is transferred to the diaphragm of course there are many ways of designing reproducers for taking advantage of this peculiar effect but those I have shewn will sufficiently illustrate the nature of the invention—

ADDENDUM[j]

[Orange,] Sept 14 1888

Seeley Claim Everything— Throw your whole intellect on this. its a daisy[6]

Edison

ADf, NjWOE, PS (*TAED* PT032ABG2). Document multiply dated. [a]Marginalia possibly written by Henry Seely; followed by dividing mark. [b]Obscured overwritten text and underlined repeatedly. [c]Obscured overwritten text. [d]Canceled. [e]"& while" interlined above. [f]Interlined separately. [g]"& all…the vane" interlined above. [h]"power of the" interlined above. [i]Interlined above. [j]Addendum is an ALS.

1. This is the case number assigned to the application by Edison's patent attorneys. The draft was marked as received (possibly by Henry Seely) on 18 September.

2. The application prepared from this draft was signed by Edison the following Wednesday, 19 September, and filed at the Patent Office on 27 September. In preparing the application, Henry Seely adhered closely to Edison's draft and six illustrations. Some short while later, however, Edison sent him undated notes and two drawings for incorporating

the principle of the invention into recording devices as well, with instructions to revise the claims accordingly. He separately sent another directive to claim the attachment of the pressure spring integrally with the diaphragm. When the patent issued (in February 1889), it included these alterations among its eleven claims and eight illustrations. U.S. Pat. 397,280; PS (*TAED* PT032ABG2, images 8–11).

3. Edison likely had in mind the pending application that became his U.S. Patent 400,647 and possibly also applications that became his U.S. Patents 394,105, 394,106, and 393,466.

4. Figure labels are, from top left to right, "e," "F," "K" and, below, "g," "d," "h," "a," and "c."

5. Figure labels are, from left, "p," "n," "h," "F," "m," "e," and "K" and, at bottom, "g."

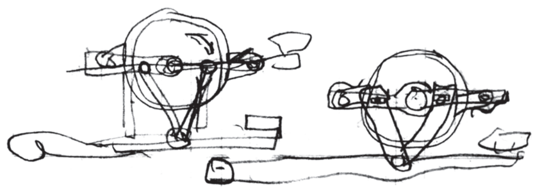
6. That is, American slang (evidently of recent origin) for a "first-rate thing or person." *OED,* s.v. "daisy" 5.

–3260–

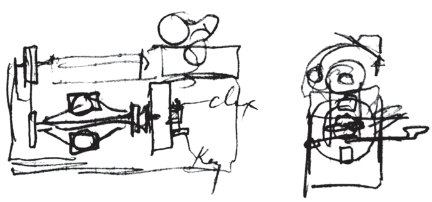
Notebook Entry: Phonograph

[Orange,] Sept 13 1888

Hand Motion for Desk phonogh—

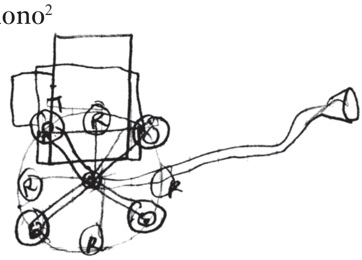


[A][1]

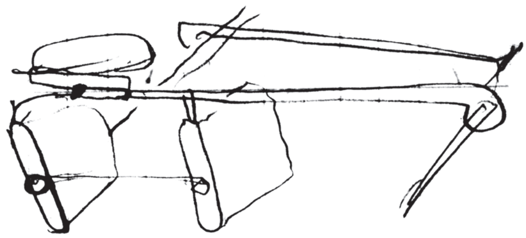


Take paper coat by pressure with Light substance by pressure or as paste which on drying leaves it soft & porous, say Carbonate magnesia etc then coat with soft material like flexible oleate & perhaps Little stearate Lead & indent without removing stock

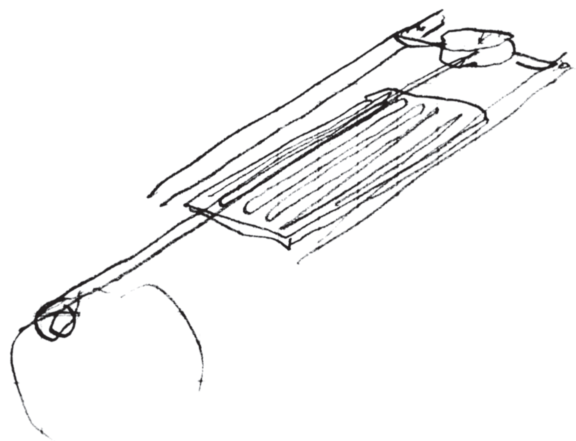
flat sheet phono[2]



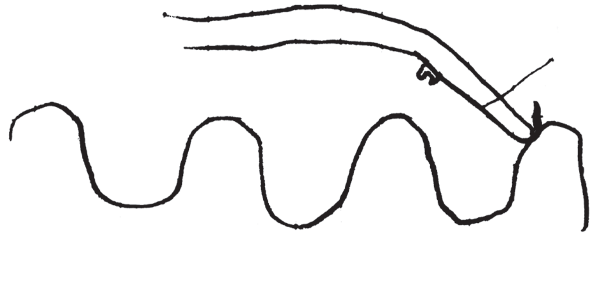
Reciprocating phono—[3]



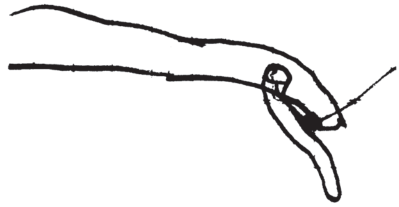
Eccentric phono



Spring stop Knock



Rubber to stop Knock sound on hitting side indentation



[B][4]

Rubber or soft material on End lever & faced with steel—[5]

TAE

X, NjWOE, Lab., PN-88-09-07 (*TAED* NP035B). Document multiply signed and dated.

1. Figure labels are "clix" and "Key."
2. This drawing is like figure 26 in Doc. 3272, where Edison offered some explanation of the device. The circles alternately represent recorders and reproducers passing over a moving strip of recording material; every other one is labeled "R."
3. Edison apparently turned the notebook and wrote the two facing pages ("Reciprocating phono" and "Eccentric phono") upside down from those preceding and following. The sketches appear to represent different ways of orienting the grooves on a (non-cylindrical) recording surface and guiding the recording and reproducing points through the tracks.
4. Figure label is "Spring."
5. The drawing below is followed by several undated pages of notations to the end of the book. On one, Edison sketched a device possibly related to the strip phonograph shown above. He also listed materials and chemical to try as artificial lamp filaments and others as "Volitile compounds for microbes" (see Doc. 3265).

–3261–

To Josiah Reiff[1]

[Orange,] Sept 18/88

Reiff—

Johnson asked me by letter to come into a meeting with Painter & yourself & bring contracts etc'[2] all the papers in Re Phonograph deal are in Mr Tomlinsons safe & I could only give from memory[3] Insull has a copy of my contract with Lippincott but he took it before I read it & I am not sure its the first or second copy—

The first deal was that I was to receive $500,000 cash & no stock I was to have royalty of 15 per cent which was agreed to be given me by the Edison Phonograph Co, as Lippincott bought only the stock of the Co he had to assume the royalty payments.

I received[a] $167,000 of the 500,000 to pay the old stockholders.

Afterwards the contract was altered— He agreed ~~to~~ in the contract which is the one Insull has a copy of I think that if I would forgo my royalty & bind myself for future inventions. He Lippincott would assume the payment of $167,000[a] to the old stockholders. I understand he has already paid 35,000 & is bound to pay to the extent of $167,000. of course I have nothing to do with what he pays extra.[4]

My contract is firm for cash The only reason I was anxious the things should be settled up is that he holds back orders from the factory & if I dont get something soon the d__d factory will eat me up & as you will see[b] from the contract he may withdraw from it the contract any moment, while I dont think he wants to [still he?][c] may be compelled to, as it looks as if he had bit off more than he can chew— Look at contracts & explain to UH.P.

Edison

L (copy), PHi, UHP (*TAED* X154A7EI). Written by Josiah Reiff. [a]Obscured overwritten text. [b]Interlined above. [c]Illegible.

1. Reiff met with Edward Johnson and Sigmund Bergmann on 14 September and then had a long private meeting with Edison later that day, in which Edison disclosed his recent breach with Ezra Gilliland and John Tomlinson. A few days afterward, Johnson urged Edison to meet in New York with Reiff, Uriah Painter, "and the rest of us" (presumably including Bergmann) about the long-running dispute over the old Edison Speaking Phonograph Co. He asked Edison to bring his contracts with the old company as well as those with the successor Edison Phonograph Co., suggesting that "you will find that all matters can be adjusted to your Satisfaction as well as your profit." Johnson hoped that such a conference would "put us all straight with each other once more and put more money in your Coffers than you expected." The

editors have not confirmed that such a meeting took place, and perhaps Reiff instead sent copies of Edison's letter to the other principals; the copy reproduced here, in Reiff's hand, was filed in Painter's papers. Reiff to Painter, 14 Sept. 1888, UHP (*TAED* X154A7EH); Johnson to TAE, 17 Sept. 1888, DF (*TAED* D8848ADW); see also note 2.

2. Reiff seems to have had a role in bringing the contentious parties together. On 14 September, he wrote Uriah Painter a long letter from New York, where he had just seen Edison who, he said, "manifested a good deal of feeling in the Phonograph matter & an Especial desire to get the whole thing out of the way." Edison had confided to him his sense of betrayal by Ezra Gilliland; referring indirectly to that, Reiff urged Painter that it was time "to act definitely, reasonably & outside of any personal feeling. An opportunity has arisen which we did not did not create" but has caused "complications with which we cannot deal with perfect independence." Reiff declined to commit to paper the details of this conversation, yet he promised that "when I see you Monday, I think I can remove some scales from your Eyes & change the temper at present existing." Referring specifically to Gilliland's sale of his phonograph agency contract for stock in the North American Co., Reiff querried Painter why "Your friend Lippincott in his frankness did not tell you that?" (Reiff to Painter, 14 Sept. 1888, UHP [*TAED* X154A7EH]). It is not clear why the Gilliland affair should have mattered in this context, except that it exposed the precariousness of Lippincott's position—and of the entire phonograph enterprise—as Gilliland could steadily convert his North American stock into cash that had to be raised either by the formation of regional companies or, as it turned out, by Lippincott himself. Lippincott may, in fact, have been in more danger than Reiff could have known. Detroit phonograph agents Gaston & Marsh reported to Edison about this time that the American Graphophone Co. seemingly had "the whip hand of Lippincott" and was dictating new terms for payment of the cash he was expecting from them (Gaston & Marsh to TAE, 18 Sept. 1888, DF [*TAED* D8847ACF]). In any event, an agreement for Painter to sell Lippincott his stock in the old Speaking Phonograph Co. evidently was in place by 18 September, with Sigmund Bergmann's participation and Edison's concurrence (TAE to Painter, 18 Sept. 1888; Bergmann to Painter, 21 Sept. 1888; Lippincott to Painter, 27 Sept. 1888; all UHP [*TAED* X154A7EJ, X154A7EK, X154A7EM]; Wile 2004, 5–6; see also Doc. 3274). Painter thereafter took care to act in accord with Edison's own interests when Lippincott sought to defer cash payments to him under that deal (see, e.g., Doc. 3300). Details of Lippincott's struggles to meet his obligations are in his correspondence with Painter in UHP (*TAED* X154A7); with Edison, Samuel Insull, and Alfred Tate in Phonograph—Companies, DF (*TAED* D8848); and between Charles Bruch and Ezra Gilliland in Gilliland Letterbook LM-22 (*TAED* LM022); see also Doc. 3274 n. 4.

3. The previous day, Edison deputized Samuel Insull to act in his stead with Lippincott in relation to the Gilliland-Tomlinson affair. On 21 September, he signed a directive authorizing Insull to take possession of "all my papers & those of any of the Corporations I control which may now be in the office of my former attorney Mr Jno. C. Tomlinson." Insull prepared a general inventory of papers he took from Tomlinson's

office on 22 September (some pertaining to the phonograph), "under protest from Mr. R. N. Dyer, who is in charge of said office." TAE to Lippincott, 17 Sept. 1888; TAE to Insull, 21 Sept. 1888; Insull statement, 22 Sept. 1888; all DF (*TAED* D8818ATH, D8805AGO, D8805AGP).

4. Cf. Docs. 3200 and 3215; regarding an eventual settlement between Lippincott and Painter, see Doc. 3274 n. 4.

–3262–

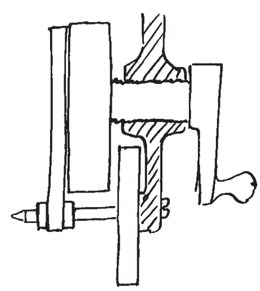
Charles Batchelor Notebook Entry: Talking Doll

[Orange,] Sept. 24 1888

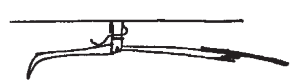
Model Doll Phono. for manufacturing—[1]

Doll now says "Jack & Gill"[2]
2— Winds to a stop
3— Regulates its speed
4— lifts up the needle when turned backward[a]
5 Trips to start[3] so that it can be wound up & left for any length of time[a]
6— Goes by spring
7 Has 13 revolutions
8 Weighs 2 lb $2\frac{7}{8}$ oz.
9 Has parts
10 Has tin cylinder
11 Has double spring each long
12 Has Jacques resonator[4]
13.

Model Toy Phono Doll[b]
1 Instead of a belt put in a rubber ring "  this section" And make it drive on a V ring—[b]
Stop at both ends instead of Geneva[5b]



Swivel & hair spring to bring it back



X, NjWOE, Lab., N-87-12-26 (*TAED* NB011AAI). Document multiply dated. [a]Paragraph enclosed by wavy line at left. [b]Followed by dividing mark.

1. Expenses for the ongoing development of this device were borne by the Edison Phonograph Toy Manufacturing Co. Costs totaled about $632 in September and $392 and $1,016 for the preceding two months, respectively. Alfred Tate to Edison Phonograph Toy Mfg. Co., 29 Oct. 1888, Lbk. 25:290 (*TAED* LB025290).

2. "Jack and Gill" was an alternative spelling of the familiar nursery rhyme "Jack and Jill," although Batchelor may also have been punning on the nickname of Ezra Gilliland. This and other rhymes were recited (rather than sung) in the commercial version of the doll produced later. *ODNR,* s.v. "Jack" 254; website of Thomas Edison National Historic Park (National Park Service), talking doll recordings (nps.gov/edis/learn/photosmultimedia/hear-edison-talking-doll-sound-recordings.htm, accessed 4 Oct. 2016).

3. That is, starts upon the release of a catch. *OED,* s.v. "trip" 14a.

4. Batchelor likely referred to the resonator tube described and illustrated (but not claimed) in a patent issued in May to William Jacques. The tube extended from the phonograph reproducer, through the doll's neck and head, to a concealed aperture at the top of the head. U.S. Pat. 383,299.

5. Also called the Maltese stop for the shape of one of its gear wheels, the Geneva stop is a mechanism designed to limit the number of revolutions and prevent over-winding, as in a Swiss watch. H. Brown 1896, 54–55.

–3263–

To Sigmund Bergmann

[Orange,] Sep 25/[188]8

Dear Sir:

Mr Insull informs me that you object to his representing the Manufacturing Interests when Mr McClement[1] makes an examination of Bergmann & Co's books with a view to preparing a statement for the proposed deal with Mr Villard.[2]

I think it essential that the Manufacturing Interests should be represented throughout these investigations by one man and I know of no man better fitted for this work than[a] Mr Insull.

Of course he would have the assistance and advice of your Bookkeepers but I would hardly consider them (the Bookkeepers) competent to deal with Mr McClement alone.

You must remember that the matter is one of Accountancy and that questions are liable to arise which will call forth considerable discussion and that if such should be the case some one with ability in such matters equal to Mr McClement, and who is more over familiar with our business, should handle the matter on our[a] behalf.

I would remind you that our interests are identical in connection with this deal; that the same principles govern the settlement with Each shop and that Mr. Insull's duty in each case will be to show as great an earning capacity as is consistently possible.

I would like to hear from you on this subject by return[3] Yours truly

Thos A Edison

LS (letterpress copy), NjWOE, Lbk. 26:344 (*TAED* LB026344). Written by Alfred Tate. [a]Repeated at bottom of one page and top of the next.

1. John Hall McClement (1862–1924), a noted accountant and railroad executive, was comptroller of the Edison Electric Light Co., a position he held until the end of 1889. In the twentieth century, McClement was a director of General Motors and the Allis-Chalmers Manufacturing Co. "John Hall McClement," *NYT,* 17 May 1924, 15; G. Black 1921, 106; McClement to Alfred Tate, 16 July 1888, DF (*TAED* D8830ABG); "The Edison Companies," *Electrical Engineer* 8 (Dec. 1889): 543; Arculus 2011, 147.

2. Edison appointed Insull a few days earlier as his personal representative in the process of placing a monetary value on the manufacturing shops. TAE to Insull, 22 Sept. 1888, DF (*TAED* D8818ATO).

3. Expressing surprise at Edison's letter the next day, Bergmann noted that "you and I are not of the same mind regarding Mr. Insull's abilities," though he denied his opinion was shaped by Insull's "persistent attempts to antagonize, if not this concern, at least myself." Edison stood by his selection of Insull as someone "well acquainted with our business and who is also a good accountant" and who, moreover, "has my confidence." Separately, Edison instructed Insull to represent the shops (excepting Bergmann & Co.) during McClement's review of their books. Bergmann to TAE, 26 Sept. 1888, UHP (*TAED* X154A7EO); TAE to Bergmann, 28 Sept. 1888; TAE to Insull, 29 Sept. 1889; both DF (*TAED* D8818ATZ, D8818AUB).

–3264–

To James Hood Wright[1]

[Orange,] Sep 25/[188]8

My dear Sir:

I am going into New York to see you as soon as I can spare the time from my Laboratory work to discuss what course we had better take in the Light Company in relation to Mr Tomlinson.[2]

In dealing with some personal matters for me he has acted in a way which appears to me, to say the least, very questionable.

I feel that I should explain the affair fully to yourself[a] and your firm and meantime would suggest that great care be exercised by the Light Company in any further dealings they may have with Mr Tomlinson as their patent attorney

I write you on this subject rather than officially addressing the Light Company because Mr Tomlinson was originally engaged to act for the Company after I had seen either you or one of your partners in relation to the matter[3] Yours truly

Thos A Edison

LS (letterpress copy), NjWOE, Lbk. 26:342 (*TAED* LB026342). Written by Alfred Tate. [a]Repeated at bottom of one page and top of the next.

1. Long active in the Edison electric lighting business, financier James Hood Wright (1836–1894) was one of the Edison Electric Light Co.'s trustees. He also was a founding partner of Drexel, Morgan & Co. and presently Edison's closest connection with the firm. Doc. 2908 n. 5; also cf. Doc. 2617; Edison Electric Light Co. annual report, 25 Oct. 1887 and 23 Oct. 1888, both PPC (*TAED* CA019C, CA019D).

2. John Tomlinson began serving the Edison Electric Light Co. as patent attorney sometime prior to January 1885. By the end of that year, the scope of his work also included contractual matters. See Docs. 2770 n. 1 and 2771.

3. The editors have not determined when or if Edison met with Wright. He apparently had not by 1 October, when Samuel Insull urged him to do so. The next day, Insull reiterated in a telegram from Schenectady: "Strongly advise your going to New York today to see Hood Wright about Tomlinson matter Understand Tomlinson sailed last Saturday Important you see Wright before he returns" (probably about 6 October). Insull to TAE, 1 and 2 Oct. 1888, both DF (*TAED* D8805AGT, D8805AGX).

–3265–

Article in the New York World

[New York, September 26, 1888][1]

SURE DEATH TO MICROBES.[a]

Edison Thinks He Has Found a Conquerer for Yellow Jack.[2]

Since the 15th of this month Inventor Edison, who is unremittingly engaged in making experiments, has been devoting his attention to the microbe and an efficacious method of its extermination.[3] The result of these experiments has led him to think that he has discovered a remedy for the extermination or effectual check of the yellow fever.[4] The experiments were made with well-known substances whose cheapness is the chief claim in recommending them for disinfectants on a wholesale scale. They are gasoline, whose commercial price is about one cent a pound, exhigoline,[5] which can be bought for 16 cents, and a 10 per cent. solution of caustic soda, made from 48 per cent. of the crude material. The cost of the solution is about one-fourth of a cent per pound.

"I cannot understand," said Mr. Edison, "how, in the face of the progress of modern science, nothing has been done to check the fever. Occasions like this are always productive of some discovery, and furnish a limitless field for experiment. But the people, as in preceding instances, take the fever and sicken and die. It is as yet unchecked, and instead of decreasing, is rapidly spreading. My experiments have been purely sentimental, and from the results obtained I feel confident that I have at last found a means of stamping out the fever germs. From my observation I am convinced that the fever germs must be either of two things—animal organization or fungus growth. It is not due to gases, or the whole of a district would be affected at once. I believe that the fever microbe is parasitic, as it travels slowly along the ground and is known to have been stopped in some cases by street-paving.[6]

"In 1878 I experimented to find some chemical to kill the Colorado beetle[7] and at last found that gasoline was immediately destructive to animal and vegetable matter. It is effective and evaporates in ten minutes, leaving nothing, so that all danger of combustion is soon passed. One-sixteenth of an inch of it goes fifteen inches below the ground and kills everything. Rhigolene[8] is a little dearer, but could prove valuable for quarantining purposes. Cold is an accepted exterminator of the germ and both gasolene and rhigolene lower the temperature sufficiently to prove of value in treating the fever. I took an old woolen coat, tied up one of the sleeves to hold the thermometer and then drenched it with gasoline. The temperature when the thermometer was first introduced in the sleeve was eighty-two degrees Fahrenheit, but it gradually fell to seventy-five degrees. After thirty minutes it fell to fifty-two degrees. The same experiment was tried with rhigolene and after fifteen minutes the temperature fell to twenty-three degrees and the coat was covered with hoar frost, so that had it contained any microbes they would have been thoroughly exterminated.

"Gasolene has the peculiar property, also, of displacing the water in all organic matter, causing it to perish. But as gasolene is not easily absorbed by wet ground, and would probably fail in a measure to do its work, I have discovered that caustic soda will answer the purpose in these instances. Microbes, being organic, must contain fatty acid, and caustic soda will saponify anything containing fatty acid. So in the wet places I would liberally sprinkle caustic soda, which could be done at a very small cost with the aid of a street-sprinkler. The houses and dry places could be protected with gasolene. With $5,000 I could cover Decatur[9] with gasolene and caustic soda one-eighth of an inch in thickness.

"Our experiments with microbes have been encouragingly successful, and not having any of the yellow fever germs to work upon, we can only draw our conclusions by analogy. These things that I have experimented with are simple. So much the better; they can easily be procured, and it would cost but little to try them in the infected districts. When an isolated case occurs the house should be cordoned so that no communication can be made to the outside until the quarantining measures are taken. Then the house should be thoroughly saturated with gasoline and the wet places, if any, sprinkled with caustic soda. This would be in the way of an experiment, but it is one well worth trying and one which I think would result in finding at last a remedy to check the ghastly march of the dread disease."

PD, NjWOE, Scraps., Cat. 1077:31a (*TAED* SB018031a). [a]Followed by dividing mark.

1. The editors have matched this date, written by hand in the scrapbook, to the 26 September 1888 edition of the *New York World,* which carried the article on page one.

2. A slang term for yellow fever. *OED,* s.v. "yellow Jack."

3. Edison's research was likely spurred by a yellow fever epidemic centered on Jacksonville, Fla., a city where he had vacationed in each of the four preceding winters. The outbreak began in the second week of August and continued until colder weather returned in early December. "Account of the Epidemic of Yellow Fever in Florida," *Journal of the American Medical Association* 11 (1888): 782–83; Adams 1888, 11–49; Fairlie 1940; Humphreys 1999, 5, 120–26; Burnett 1988, 2:240–43; Huffard 2013.

4. The first record of Edison's research may be an undated list of "Volitile Compounds for Microbes & uninflammable" following a 13 September notebook entry (Doc. 3260). By 17 September, Arthur Kennelly was conducting experiments similar to those described by Edison to the *New York World* reporter. In fact, it appears that Kennelly conducted almost all of these experiments himself, including one Edison describes below as his own experiment with "an old woolen coat" and a thermometer. At the end of October, Kennelly was assisted by Dr. Frank Deems, a member of the laboratory staff and a physician who had formerly been a laboratory instructor in the Medical Department at New York University. The experiments seem to have concluded by the end of December, though time sheets show that Deems continued "bug killing" work, a separate but probably related line that originated in

early September and continued well into 1889. Edison's notebook entry is PN-88-09-07, Lab. (*TAED* NP035B [images 17–16]); Kennelly's experiments are N-88-08-28:60–63, 66–67, 70–71, 85–88; N-88-73–76; Lab. *TAED* NB051064 [images 79–80, 83–84], NB051080 [image 98], NB051088, NB051088A, NB051088B, NB056013, NB056014, NB056014A, NB056016 NB056017, NM023034, NM023034A, NM023036A, NM023036, NM023036B); Time Sheets, WOL.

5. In reprinting extensive excerpts from this article, the editors of a Louisville medical journal identified this substance as rhigoline. "The Yellow Fever Epidemic," *American Practitioner and News* 6 (10 Nov. 1888): 319–20; see note 8.

6. By the 1880s there was general agreement that yellow fever was caused by a microbe but there was much debate over the specific germ that caused the disease. The best account of this debate is Warner 1985, which describes the divisions between the fields of bacteriology and epidemiology. Edison and Kennelly, who carried out Edison's experiments, certainly understood the importance of bacteriological research to their work. On 2 October, Kennelly ordered thirty-two works on bacteriology, among them Antoine Magnin's *The Bacteria,* translated by U.S. Army Surgeon George Sternberg, who was the leading American researcher on yellow fever. Sternberg's preface discusses the connection between Magnin's work and his own research on yellow fever. For more information on Sternberg's yellow fever research see Craig 2013 (chap. 9). Kennelly also paid at least some attention to the epidemiological research as evidenced by a set of notebook entries on medical and scientific accounts of yellow fever from the 1850s and 1860s (Kennelly to Charles Speirs, 2 Oct. 1888, enclosing list of books, Kennelly Letterbook LM-1:143–47, WOL [*TAED* LM111143, LM111147]; N-88-05-24, Lab. [*TAED* NB042AAA]). In addition, it was Kennelly who wrote to the to the mayor of Memphis asking for more detailed information after Edison received a letter containing an account by a Memphis physician (Kennelly to R. C. Lewis, 26 Sept. 1988; Kennelly to Mayor of Memphis, Tenn., n.d. [c. 26 Sept. 1888]; Kennelly to unidentified recipient, 30 Sept. 1888; all Kennelly Letterbook LM-1:136, 138, 141, WOL [*TAED* LM111136, LM111138, LM111141]). An old laboratory scrapbook containing articles on microscopy was used for news clippings about Edison's yellow fever research, including this *New York World* article (Cat. 1077, Scraps. [*TAED* SB018]).

7. Edison mentioned these experiments in his reminiscences years later (*TAEB* 3 App. 1.D253). What appear to be undated notes related to these experiments are in Unbound Notes and Drawings (NS-Undated-002), Lab. (*TAED* NSUN02, images 59–71).

8. Rhigolene, a petroleum distillate derived in the 1860s by Henry Bigelow, was used at this time as a local anaesthetic due to its freezing qualities. Bigelow 1866; Richardson 1885; Jarvis 1887; "Rhigolene," *Therapeutic Gazette* 9 (1880): 245–46.

9. Yellow fever was identified in Decatur, Ala., on 20 September and in Jackson, Miss., the next day, resulting in quarantine of those cities and panic throughout the Gulf states. Seventeen cases and four deaths were reported in Decatur by 25 September. George Sternberg investigated the outbreak in Decatur, where he had the assistance of his friend,

Dr. Jerome Cochran, head of the Alabama Board of Health. Cochran 1888, 41; "Progress of Yellow Fever," *Journal of the American Medical Association* 11 (29 Sept. 1888): 456; Sternberg 1890, 17.

–3266–

From William Pitt Edison

Wales[1] Sept 28th 1888

Dear Bro

please find a letter from A Hartsuff[2] requesting the [Mor?][a] payment of the interest on the farm Mortgage. I wish you would write him and pay the interest or a part of it for he is liable to fore close should it not be don thare is two years and six months due up to 6th day of last July

WPE

Nellie[3] is bad off we think she will loose the use of her right arm it has been 10 weeks and she has no use of it yet will take her to Detroit next week and see what can be done[4]

<Write & ask How much the interest is & that if I pay it this time I want Pitt to understand that I shall never do so again His farm must go before I will do it—[5] E[dison]>

ALS, NjWOE, DF (*TAED* D8816AAV). [a]Illegible.

1. The agricultural township of Wales and the village of the same name within it are situated in St. Clair County, Mich., a few miles west of Port Huron. Romig 1986, 579; *History of St. Clair County* 1883, 781.

2. Albert Hartsuff (1837–1908) was an army surgeon and Civil War veteran. A New York native, he attended medical college in Vermont but received his army appointment from Michigan. As of 1890, Hartsuff was posted at Fort Omaha, Neb. A few years later, he was named deputy surgeon general and then assistant surgeon general; he retired in 1904 at the rank of brigadier-general (*WWW-1,* s.v. "Hartsuff, Albert"; Sherburne Eaton to TAE, 30 Apr. 1890, DF [*TAED* D9014ABL]). In 1879, Hartsuff granted a $2,500 mortgage on a Port Huron property to John and Emeline McAvoy, husband and wife; the obligation was assumed at some later date by William Pitt and Ellen Edison, who now occupied the property (Hartsuff note and mortgage to Emeline and John McAvoy, both 6 Oct. 1879; Eaton to TAE, 15 July 1890; all FR [*TAED* FU001AAL, FU001AAM, FU001AAK]).

3. Pitt referred to his wife, Ellen J. (née Holihan) Edison (1840–1927), rather than to his married daughter Nellie Poyer, who lived in Ohio. Doc. 3036 n. 2; U.S. Census Bureau 1970 (1880), roll T9_605, p. 398A, image 0688 (Port Huron, St. Clair, Mich.); *Michigan Marriage Records*, 1867–1952, online database accessed through Ancestry.com, 27 Feb. 2017.

4. The editors have found no other information about Nellie's health.

5. Edison did pay $650 of interest due on the note in November 1888 (Frank Whipple to Pitt Edison, 15 Oct. 1888, DF [*TAED* D8816AAX]; TAE to Hartsuff, 26 Nov. 1888; TAE to Frank Whipple, 26 Nov. 1888; Alfred Tate to Pitt Edison; 26 Nov. 1888; all Lbk. 27:177,

178, 179 [*TAED* LB027177, LB027178, LB027179]). In early 1890, he began what became a long process to take over the mortgage by paying Hartsuff about $2,800. The transfer was completed by early June, by which time Pitt, who was in ill health, may already have been in default. In 1892, after Pitt's death, Edison seems to have reassigned the mortgage to the widowed Ellen (Alfred Tate to Sherburne Eaton, 7 Feb. 1890; TAE to Hartsuff, 1 May 1890; Lbk. 37:185, 40:311 [*TAED* LB037185, LB040311]; Hartsuff mortgage assignment to TAE, 21 Apr. 1890; Eaton to TAE, 15 July 1890; both FR [*TAED* FU001AAM1, FU001AAK]; Eaton to TAE, 30 Apr. 1890; Ellen Edison to TAE, 2 June 1890; both DF [*TAED* D9014ABL, D9014ABT]).

–4– October–December 1888

Even as news of his efforts to eradicate yellow fever made headlines across the country, Edison spent much of early October drafting patent applications and caveats for inventions unrelated to health or disease.[1] Among them were a patent application for a new ore-milling process (Doc. 3268) and a caveat covering the kinetoscope (Doc. 3271), the only surviving direct evidence of Edison's work with motion pictures at this time. But most of his attention seems to have been taken up with improving the new phonograph, which was making a splash in London through the efforts of his agent there, George Gouraud.

Edison continued to imagine new ways to perfect "the transmitting and receiving of sound," though it is hard to say how many of his ideas on paper were ever reduced to practice.[2] His October draft phonograph caveat (Doc. 3272) covered a number of improvements, including a better means of governing the electric motor, changes to the knife and recording mechanisms, and new material for manufacturing collapsible cylinders. Edison also told Gouraud that he had perfected a treadle-operated machine. The hope was that the foot-powered phonograph, aimed at the business market, would prove useful in areas where batteries were difficult to obtain or service or where office workers lacked the skills to use them.[3] In November, he drafted a long patent application (Doc. 3289) that included a number of mechanisms to automatically set the recording and reproducing points at the proper depth in the wax cylinder.

At the end of October, Edison formally hired William Hammer to oversee the installation of his exhibits at the Exposition Universelle, scheduled to open in Paris in May 1889. Show-casing virtually all of Edison's inventions from the 1870s up to his latest marvel—the wax-cylinder phonograph—was a daunting task, but Hammer's prior experience with European exhibitions made him a good choice to take it on. The appointment also gave Edison more control over how the public would see and hear the phonograph. Long dissatisfied with Gouraud's approach, which he thought reduced the machine to an entertaining spectacle or novelty, he brushed aside his agent's claims to the instrument on foreign soil and instead gave Hammer full authority over its exhibition to the Exposition's expected crowds.[4] The phonograph was still a limited edition item as the new Edison Phonograph Works in Orange started tentative operations (not without problems) in early October and began gearing up in the expectation of producing large numbers of machines in late November. The factory also began turning out new wax cylinders. The plant was managed—for the time being—by Frank Toppan, who came into Edison's world as a friend of Ezra Gilliland and left the scene before the year's end.[5]

As part of the effort to improve and market the phonograph, Adelbert Wangemann, who had charge of the recording department at the laboratory, began to invite musicians and singers to record at Orange. Among those who did so in November and December were the Arion Singing Society (a German-language chorus) and the National Fife and Drum Corps, both of Newark, and the minstrel Lew Dockstader. Dockstader, who recorded the tune "If I Were a Millionaire," mused that the phonograph, which required no meals and would not "object to second-hand tobacco" or make any "unreasonable demands on the manager," might soon replace live musicians. The musical recordings made at the laboratory during this period would be used to analyze and improve the phonograph as a sensitive recording device; some would also be sent to phonograph distributors in the United States and to Edison's representatives abroad for demonstration purposes.[6]

Development of a marketable talking doll was tangentially related to the larger phonograph enterprise. Edison received a number of inquiries from girls who hoped to receive one from Santa Claus, and the initial expectation was to have them ready for the Christmas market.[7] But it was increasingly clear by November that the toys could not be produced in any quantity until after the first of the year, and Edison and his associates contemplated holding them off the market until Easter.[8]

While Edison was skirmishing with Gouraud about the manner of exhibiting the phonograph, he was learning that another—quite different—exhibition had gone awry. Hopeful of quietly enticing mine operators to adopt his improved magnetic ore separator, he had sent the machinery to London with Osgood Wiley to be shown privately to James Dredge, co-editor of *Engineering,* and to some of Dredge's investor friends. Edison was appalled to learn that Wiley, under Gouraud's influence, was preparing a public demonstration at the Crystal Palace, one which might jeopardize his patent rights. Although he nipped the Crystal Palace plan in the bud, Edison found it was just the first of a number of problems with both Wiley and the ore-milling machinery that proved difficult to manage from afar.[9]

Edison's disagreements with Gouraud and Wiley were over business matters, but a far more personal breach opened in November with his longtime business colleague Sigmund Bergmann. The proximate cause of their dispute may have been Bergmann's attempt to help Uriah Painter secure a payment from Jesse Lippincott for the patent rights of the old Edison Speaking Phonograph Company, which might have compromised Lippincott's ability to pay Edison what he owed on the new phonograph rights. Bergmann penned a long letter of grievance (Doc. 3283) about rumors that Edison had disparaged him behind his back; he defended himself and cataloged the business sacrifices he had made on Edison's behalf. His one mistake, he said, was running his affairs without "continually divining into your Ear, nursing your little hobbies and blowing my own horn to you as I am told many others do." Edison responded in kind, denying the central charge that he had put down his friend in private. Left hanging over their exchange, however, was Bergmann's perception that "your whole wrath has been concentrated upon me," surely an allusion to the aftermath of Edison's bitter falling out with his associates Ezra Gilliland and John Tomlinson and a blowup with his intimate ally Edward Johnson.[10]

Edison narrowly escaped serious physical harm in late November when the horses pulling his carriage bolted and caused a runaway crash. According to press reports, Edison left the laboratory for his Llewellyn Park home at 4 a.m. on 29 November in a buggy pulled by "a pair of fine grays." The horses were "restless" but Edison took the reins from his coachman. He lost control and the horses were "soon dashing along at a terrific rate"; eventually the buggy overturned and was “dashed to pieces,” with both men ejected from it. Edison received only a few bruises, but the coachman was reportedly “badly cut and injured internally” and one of the horses was killed. “I was pretty severely shaken up, but sustained no serious injury and am now all right again,” Edison wrote the next day to Everett Frazar, who had seen the newspaper stories.[11] Only a few days later, the papers noted that Mrs. Edison was involved in a similar incident. The horses drawing her carriage bolted down Main Street in Orange after a rider carelessly bumped into them. Her team, though skillfully managed by the driver, eventually crashed into and overturned another carriage before thundering “along up Mt. Pleasant Ave.” Neither Mina nor her driver was injured, and the paper claimed that she was “not at all agitated by the fearful peril she had been in.”[12]

In early December, Edison allowed the New York Medico-Legal Society’s committee on electrocution to use his laboratory for additional experiments aimed at finding the best means of administering the death penalty by electricity. Edison was present at these experiments, which were conducted by Harold Brown and Arthur Kennelly. Two calves and a horse were electrocuted by alternating current in the hope of gaining a better understanding of what voltage levels might inflict painless death on a human. Edison took time from his schedule to address the committee members and other witnesses, but his comments went unrecorded.[13]

Discussions about consolidating the Edison Electric Light Company of New York with the Edison manufacturing shops (the Edison Lamp Company, the Edison Machine Works, and Bergmann & Company) came to a head in December. While false rumors circulated in the newspapers that a merger of the Westinghouse and Edison electric lighting interests was imminent, Edison, Samuel Insull, and financier Henry Villard worked out the details for the amalgamation of the Edison entities into a new company with fresh capital. Villard took the lead in organizing the financing, largely among German investors. One of Edison’s chief concerns was to prevent Drexel, Morgan & Company, which he saw as overly cautious, from gaining a controlling interest. Reassured that the American banking firm would be a minority investor, Edison came to an understanding with Villard in mid-December, and the Edison General Electric Company began to take shape within weeks.[14]

After winding up business for the year, Edison and Mina and the children (Marion, Thomas, Jr., William, and baby Madeleine) headed to Akron to spend Christmas and the New Year holiday with Mina's family at Oak Place. There, beneath "a mammoth Christmas tree" decorated with forty incandescent lights, he held court, giving an extended interview to a local reporter from the *Summit County Beacon.* Asked who he thought would be most likely to use the new phonograph, Edison said he expected it would be "used chiefly in offices for correspondence. And then actors use it, singers use it." He said he already had 350 men and boys working at the new Phonograph Works in Orange and expected to hire 150 more in anticipation of a booming business; he had in hand, he declared, a single order that would require the production of eighty-five machines a day for the next six months.[15] He also renewed his commitment to the idea of producing electricity directly from coal, promising to invent "some simple contrivance" to do so. "All our expensive machinery for getting work out of coal," he predicted, "will be done away with."[16] He was evidently less sanguine about other projects, some of which he had pursued on and off for years. More than two dozen lines of research, including an incandescent gas lamp, magic lantern, tobacco curing process, mimeograph ink, and a flying machine, were consigned to a "Dead Experiments" account at the end of the year.[17]

1. See Doc. 3265 esp. n. 3. A sample of newspaper articles includes "Edison's Yellow Fever Remedy," *Davenport (Iowa) Morning Democrat,* 28 Sept. 1888, 1; "Edison's Remedy," *Deerfield Valley (Vt.) Times,* 4 Oct. 1888, 4; "Edison on Yellow Fever," *Wichita Daily Eagle,* 6 Oct. 1888, 4; and "Here from Florida," *Minneapolis Star Tribune,* 10 Oct. 1888, 5.

2. Alfred Tate to Sylvester Baxter, 5 Dec. 1888, Lbk. 27:251 (*TAED* LB027251).

3. Doc. 3267.

4. Docs. 3276 and 3298.

5. See Doc. 3277 esp. n. 3; Frank Toppan to Jesse Lippincott, 24 Oct. 1888, DF (*TAED* D8848AEM).

6. See Doc. 3285; "Various New-Jersey Towns," *New York Tribune,* 17 Dec. 1888, 2; "Negro Melodies in Wax," *New York Evening World,* 20 Dec. 1888, 2.

7. See Doc. 3279.

8. Doc. 3280 esp. n. 4.

9. See Doc. 3284.

10. See Docs. 3283 and 3286

11. "Edison Has a Narrow Escape," *Cuba (Kans.) Daylight,* 30 Nov. 1888, 2; "Mr. Edison's Escape," *Greensboro (N.C.) North State,* 29 Nov.

1888, 1; TAE to Everett Frazar, 30 Nov. 1888, Lbk. 27:230 (*TAEP* LB027230).

12. "Mrs. Edison's Dangerous Ride," *New York Tribune,* 1 Dec. 1888, Clippings (*TAED* SC88131B).

13. See Doc. 3292; "Shocked to Death," *Chicago Inter-Ocean,* 6 Dec. 1888, 1; "Surer than the Rope," *NYT,* 6 Dec. 1888, 5.

14. See Docs. 3290, 3291, 3293, 3294, 3295, 3302, and 3303; "They Are Not to Combine," *NYT,* 25 Dec. 1888, 4.

15. See Order #1 in Edison Phonograph Works General Ledger #1:123 (*TAED* CK102 [image 88]).

16. Tate to Lemuel Serrell, 22 Dec. 1888, Lbk. 27:515 (*TAED* LB027515); "A Talk with Edison," *Summit County (Ohio) Beacon,* 2 Jan. 1889, 7; "What Edison is Working On," *New York Sun,* 30 Dec. 1888, 6; Untitled, *Lima (Ohio) News,* 31 Dec. 1888, 2.

17. App. 3.

–3267–

To George Gouraud

[Orange,] October 1, 1888.

Private (Original sent).

Gouraud,—

Treadle machine perfect; photo sent;[1] new indenting material elegant; 200 times turning off. Hard, black; no chips to dirty machine, falls as a fine powder into closed chamber, not like the box sent on the six. Mailing problems solved perfectly, no boxes &c..[2] You will drop dead when you see it. Music now audible in largest room and perfect (only got these results yesterday). Treadle machines costs little more than motor machine.[3] New three pint battery last twelve hours constantly turning off. Articulation better and louder. Scratch less on new material. Have nothing to do with Gilliland or Tomlinson; lawyers will take hold of them on return; bad job, cheated and deceived me most horribly.[4] Expect first phonographs for shipment 20th October or thereabouts. Portugal is the patent you took out that kills us.[5] Very bad job. Last patent is most important, contains new transmitter and receiver that work on cylinders that wabble and run out true 1/16 of inch.[6] Knocks graphophone out in this respect. Taintor started factory Bridgeport.[7] Make for U.S. and foreign; second hand machinery. Taintor not practical man; don't know how make cheap. Wont be ready for three months; meantime you can flood the country. Don't be troubled in least about Edmunds blowing about engraving.[8] Look close at paragraph in my 2nd English patent, where I state, wax may be recorded on directly, but as point cloggs up prefer cover with foil under conditions old phono that is true used waxes too soft;[9] graphophone wax was only got hard enough to prevent clogging by great amount experimenting. Very hot weather here caused it to even clogg badly. Can furnish you transmitters which will indent <u>without cutting</u> if you want; results just as good

(Signed) Edison.

TL (copy), NjWOE, DF (*TAED* D8850ADK).

1. The editors have not found other information about this photograph. Edison had promised Gouraud a treadle machine in a 13 September cable: "Shall make some machines with foot power; phonograph proper will interchange with motor or foot power." Two days after that, John Randolph apprised Alfred Tate (who was in Ontario) that "we have had a Phonograph put on an old Graphone stand and is run by foot power and it is a great success and works very good, in fact a great deal better than the Graphone." TAE to Gouraud, 13 Sept.1888; Randolph to Tate, 15 Sept. 1888 (p. 5); both DF (*TAED* D8818ATD, D8820AAU).

2. See Doc. 3252.

3. The editors have not found official price plans for Gouraud's market territories at this time. The question came up following the September demonstration at the British Association, where Gouraud suggested a probable range of £20–25; there was some expectation that the simpler graphophone would be cheaper. Under terms being discussed in October, Edison proposed to sell wholesale to companies under Gouraud's control for the cost of manufacture plus twenty percent profit. "The British Association," *Engineering* 46 (28 Sept. 1888): 319; Tate to Insull, 31 Oct. 1888; Tate memorandum of draft agreement, n.d. [Oct. 1888]; both Miller (*TAED* HM88AAV, HM88AAW).

4. Edison had already disavowed Ezra Gilliland; see Doc. 3255 n. 4.

5. Cf. Doc. 3239. At Edison's request, his New York patent attorneys had asked their European agents in August to investigate what Gouraud had done in several countries. This inquiry led to a report showing that, according to Henry Seely, Gouraud had secured two Portugese patents for five years apiece. Seely also noticed that Gouraud had been silent on the subject of Portugal in a lengthy 7 September letter about short-term countries, and the status of patents in that country was also unclear even to Gouraud's own attorney. Gouraud, upon receipt of the present document, instructed his Portugese agent to extend the patents there to fifteen years. To prevent confusion in the future, Seely and Richard Dyer added to Gouraud's powers of attorney for Portugal (and other countries) a clause restricting patents there to fifteen-year terms. Dyer to Tate, 17 Aug. 1888; Seely to Tate, 12 Oct. 1888; Gouraud to TAE, 7 Sept. and 16 Oct. 1888; G. G. M. Hardingham to Gouraud, 29 Sept. 1888; all DF (*TAED* D8846ABF, D8846ABX, D8846ABY, D8849ACD, D8849ACE).

6. See Doc. 3259.

7. The American Graphophone Co. approved on 28 July an internal proposal by James Saville to manufacture its own instruments, ending its contract with the Western Electric Manufacturing Co. Saville and Charles Tainter left Washington, D.C., for Bridgeport, Conn., a center of typewriter and sewing machine manufacture, where they leased a factory from the Howe Sewing Machine Co. American Graphophone

closed the Volta Laboratory in Washington and, on 6 August, authorized $10,000 to start the factory in Bridgeport. Tainter [1931?], 98–100; American Graphophone minutes, 17 May, 6 Aug., and 8 Oct. 1888, *Edison v. Hardin* (pp. 121, 124–29), Lit. (*TAED* QP009A121A); Wellman 2011, 41–43.

8. Edison likely was responding to the paper on the graphophone that Henry Edmunds read to the British Association in September (a published copy of which was saved in a laboratory scrapbook). Edmunds quoted Charles Tainter to distinguish the graphophone's "entirely different mode of recording" from that of Edison's early phonograph, largely because, rather than embossing or indenting in a pliable material, it "engrave[d] the record directly in the solid material by a cutting style adapted to grave or gouge out the material acted upon." Gouraud reportedly said little in reply but referred instead to the likelihood of future legal contests. Edmunds 1888, 319; "The British Association," *Engineering* 46 (14 Sept. 1888): 262.

9. Edison apparently referred to a short paragraph about recording materials in the final version (p. 7, ll. 26–33) of his British Patent 1,644 (1878):

> Paper or other materials may be used, the same being coated with parafine or other hydrocarbons, waxes, gums, or lacs, and the sheet so prepared may itself be indented, or the material, say paper, may be made to pass through a bath of hot parafine and thence between scrapers. Thin metal foil is now placed on the material, and the sheet passed through rollers, which give it a beautiful smooth surface. The indentation can now be made in the foil, and the parafine or similar material, and the indenting point, does not become clogged with the parafine in consequence of the intervening foil. [Cat. 1321, Batchelor (*TAED* MBP012)]

Shortly after the British Association affair, William Wiley telegraphed James Dredge, editor of *Engineering*: "Edison says Look at his British Phonograph Patents & you will find wax & all graphophone claims in there   Tainter trying to work himself into the swim." Dredge answered that he had made the journal's "Graphophone article as mild as I can" but found Edison's protests wholly unpersuasive (Wiley to Dredge, 11 Sept. 1888; Dredge to Wiley, 12 Sept. 1888; both DF [*TAED* D8850ADD, D8850ADE]). Edison would repeat his contention in a more formal and consequential manner a year later (see Doc. 3428).

–3268–

Draft Patent Application: Ore Milling

Orange, N.J., Oct 1 *1888*[a]

<Dyer & Seeley>
Patent—[1] Improvement in Iron Concentrating

The object of this invention is to seperate non magnetic iron ores from their gangue so the Concentrate will be sufficiently rich in iron for furnace use

The invention consists in first pulverizing non magnetic[b] Hemitite or specular iron ores to ten mesh[2] or thereabout, bringing The same to a red heat. on cooling The particles will be magnetic and are Then run through the Magnetic Seperating Machine described in patent and in applications now pending—[3]

The trajectory of the falling magnetic particles being altered [~~are alter~~?][c] fall[d] one[d] side of a dividing board while the non magnetic particles fall on the other side—

Claim process 1st crushing— 2nd heating to make it magnetic 3rd seperating by our seperator or any other magnetic seperator—

Edison

Dyer & S P.S. All ore milling patents are to be taken out in Canada for Long period—[4] This also Edison

ADfS, NjWOE, PS (*TAED* PT032ABM1). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" and "*188*" preprinted. [b]"non magnetic" interlined above. [c]Canceled. [d]Obscured overwritten text.

1. This application was filed as Edison's Case 816. It was twice rejected and amended before being finally rejected in November 1892. Case file, PS (*TAED* PT032ABM).

2. Screens and sieves are standardized by the number of meshes per inch. Doc. 3079 n. 4.

3. Edison likely had in mind the fundamental 1880 patent for his magnetic separator (U.S. Pat. 228,329). Improvements on that machine were the subject of several later patents and two pending applications filed in March and September 1888; those issued in January and June 1889, respectively (U.S. Pats. 396,356; 430,275).

4. In addition to the application filed in December (see Doc. 3227 n. 1), Edison was awarded five Canadian ore-milling patents in 1893. Canada Pats. 41,891; 42,036; 42,037; 42,075; 42,249.

–3269–

To Henry Villard

[Orange,] Oct. 2, 88.

Dear Mr. Villard,—

I have your letter 1st instant, in regard to appointing an expert other than Mr. McClement to examine the books of the shops.[1]

There has been a great deal of discussion and considerable correspondence, in which I have participated to a certain extent, with relation to the way in which this examination should be conducted, and a decision has finally been reached.[2] I do not think it would be well now to make any change, but that Mr. McClement should proceed with his investigation and submit his reports as soon as practicable. Yours truly,

Thos A Edison

TLS, Villard, Box 78, Folder 551; a carbon copy is in DF (*TAED* D8818AUF).

1. Before departing for the American West, Villard addressed "the friction that seems to arise in connection with the examination of the status of the manufacturing Companies through Mr. Mc.Clement." He suggested as an alternative John Dougherty, "an expert accountant, well known to me and to Mr. Coster as fully competent." Dougherty was separately endorsed by George Ristine, the husband of Edison's niece. McClement and Dougherty each examined the books in some fashion, each man receiving $2,000 in December for his work. Villard to TAE, 1 Oct. 1888; Ristine to TAE, 10 Oct. 1888; both DF (*TAED* D8832AAI, D8807ACM); Edison General Electric Co. statements of account with Henry Villard, 10 and 14 June 1889, Letterbook 62:398, 462, Villard.

2. See, e.g., Docs. 3242 and 3263.

–3270–

From Arthur Sullivan[1]

[Little Menlo, London, October 5, 1888][2]

Dear Mr Edison,

If my friend, Edmund Yates,[3] has been a little incoherent, it is in consequence of the excellent dinner and good wines that he has drunk, therefore I beg you will excuse him. He has his lucid intervals. For myself I can only say that I am astonished and somewhat terrified at the results of this evening's experiments: astonished at the wonderful power you have developed, and terrified at the thoughts that so much hideous and bad music may be put on record for ever, but all the same I think it is the most wonderful thing that I have ever experienced and I congratulate you with all my heart on this wonderful discovery.

Arthur Sullivan[4]

L (transcribed phonogram), NjWOE, DF (*TAED* D8850ADW4). Letterhead of Little-Menlo.

1. The greeting transcribed here was among several recorded by a small group of dinner guests at George Gouraud's home. Gouraud called the event the phonograph's "first appearance in the 'role' of Toast-master and Speech-maker," but it was part of his larger effort to capture the voices of prominent Victorians in wax (Picker 2003, 113–26), a project that required Gouraud to try to acclimate guests to an unfamiliar machine in a social setting (Feaster 2012b). In addition to tributes from Sullivan and Edmund Yates (see below), the event included

remarks by Gouraud, postmaster general Cecil Raikes, and Alexander Broadley, a prominent barrister, editor, and social figure who served as toastmaster. Also in attendance were Augustus Harris, manager of the "Drury Lane" Theatre Royal, journalist and editor Joseph Parkinson, and Hugh de Coursey Hamilton. The recorded cylinders evidently were sent to Edison and are now in the collections of the Thomas Edison National Historical Park (acc. nos. E-2439-7 [Sullivan], E-2439-8, E-2439-11, E-2439-13, E-2439-14, E-2439-16, E-2439-17, E-2439-18). A transcript of the affair was typed onto seven pages of Gouraud's letterhead, one of which was stamped: "SPOKEN INTO EDISON'S PHONOGRAPH BY COLONEL GOURAUD WRITTEN FROM THE PHONOGRAPH'S DICTATION BY ." The editors have chosen Sullivan's greeting to represent the event both because of the composer's wide fame and because it has been widely excerpted in print. The original recording is available as an audio file on the website of the Thomas Edison National Historical Park: (www.nps.gov/edis/learn/photosmultimedia/very-early-recorded-sound.htm).

2. The place and date are taken from Gouraud's recorded statement identifying the start of the second cylinder immediately preceding Sullivan's remarks. They were omitted from his typed transcription.

3. Scottish-born Edmund Hodgson Yates (1831–1894), a journalist, essayist, and novelist working in London, secured his transatlantic reputation as a lecturer and entertainer with an 1872 tour of the United States. (In his own remarks, Gouraud recalled his pleasure at having been among "that vast army of Americans who welcomed him in America.") Yates cofounded, published, edited, and contributed news and gossip to the weekly *World,* whose popularity made him a celebrity in Britain. His work for the *World* led to his conviction on charges of criminal libel and seven weeks imprisonment in 1885, from which neither his physical nor mental health fully recovered. In his recorded remarks to Edison, he explained that their brevity was "because I am so enrapt and enchanted by your invention that I find myself much more stupid than I ought to be after the grand excitement of our friend's meats and wine." *Oxford DNB,* s.v. "Yates, Edmund Hodgson"; Gouraud to TAE, 5 Oct. 1888; Yates to TAE, 5 Oct. 1888; both DF (*TAED* D8850ADW, D8850ADW3).

4. Composer Sir Arthur Seymour Sullivan (1842–1900) was renowned for a series of operettas written in collaboration with librettist William Gilbert. Their latest, *The Yeomen of the Guard,* opened in London two days earlier, as Gouraud remarked in his introduction of the after-dinner affair. Edison was among the pair's enthusiastic American audiences, and he was also slightly acquainted with their business manager, Richard D'Oyly Carte. *Oxford DNB,* s.v. "Sullivan, Sir Arthur Seymour"; Gouraud to TAE, 5 Oct. 1888 (phonogram transcription), DF (*TAED* D8850ADW); see Docs. 1711 esp. n. 4, 2216 esp. n. 20, and 2829 esp. n. 4.

–3271–

Draft Caveat: Motion Pictures[1]

Orange N.J. Oct 8 1888.

<Seely Rush this I am getting good results Edison>

Caveat

I am experimenting upon an instrument which does for the Eye what the phonograph does for the Ear, which is the recording and reproduction of things in motion, and in such a form as to be both cheap practical and convenient[2] This apparatus I call a Kinetoscope "Moving View" In the first production of the actual motions that is to say of a continuous Opera The Instrument may be called a Kinetograph[3] but its subsequent reproduction for which it will be of most use to the public it is properly Called a Kinetoscope The invention consists in photographing continuously a series of pictures occurring at intervals which intervals are greater that Eight per second, and photographing these series of pictures in a continuous spiral on a cylinder or plate in the same manner as sound is recorded on The phonograph. At the instant the chemical action on the cylinder takes place the cylinder is at rest and is only advanced in rotation a single step which motion takes place while the light is cut off by a shutter. Thus there is a practically continuous rotation of the cylinder but it takes place step by step and at such times as no photographic effect takes place For Illustration say the[a] The cylinders ~~which I propose to use~~ may be about the same size as the phonograph the number of threads to the inch on the feed screw is about 32[b] This will give a photograph image about 1⁄32 of an inch wide giving about 180 photographs per revolution or 42 000 for the whole cylinder It is probable that 25[b] per second will be sufficient to give the illusion ~~of~~ as if[c] looking at the actual scene with all its[b] life &[d] motion this will therefore record & reproduce[e] all the motions or scenes[b] occurring during a period of 28 minutes.

By gearing or connecting the Kinetograph by a positive mechanical[b] movement, ~~The~~ a continuous[f] Record of all motion is taken down on the Kinetograph & a continuous record of all sounds are taken down by the phonograph and by substituting the photograph recording devices on the Kinetograph for a Microscope Stand[b] & objective it becomes a Kinetoscope & by insertion of the listening tubes of the phonograph into the Ear The illusion is complete and we[b] may[d] see & hear a whole Opera as perfectly as if actually present although the actual performance may have taken place years before.[4]

~~by this means~~

~~If~~ I prefer to use the cylinder form instead of a plate with Volute spiral. A continuous strip could be used but there are many mechanical difficulties in the way while the cylinder with the microphotographs taken on its surface in continuous spiral permits of the use of very simple mechanism The cylinders which are hollow shells slip onto a taper cylinder permanently connected to the instrument just as in the phonograph—

The shells may be of any substance which will preserve its shape such as plaster paris and other mouldable bodies. The Collodion or other photographic film may be flowed over it just as if it was[b] an ordinary flat photo plate, a positive being taken,[5] but if it is desired to produce a negative series of photographs a glass cylinder is used [~~the inner~~?][g] surface of the Cylinder or shell is flowed & the records taken. The cylinder or shell being Exceedingly thin say of Mica is slipped over the regular Cylinder to be used in practice whose surface is sensitized & printed from the negative by light in straight lines without reflection from side surfaces. A positive may be taken & with proper ~~Micros~~ lenses reproduced on another cylinder just as one photograph may be taken from another.

The permanant cylinder may even be Covered with a shell and a thin flat film or transparant tissue sensitized by wrapped around it which after being filled with images may be detached from the shell and use as a negative to print many[b] positive on sheets which are permanently pasted on shells for actual use. perfect alignment and no eccentricity of the surface must be had as the focus of the observing objective will be changed— ~~If~~ [--][g] Although a presser foot might move the objective & thus keep it in focus Even if the surface of the cylinder did not run true.

In figures 1 .2. & .3. I illustrate diagramatically the principal features of the apparatus

fig 1[6]

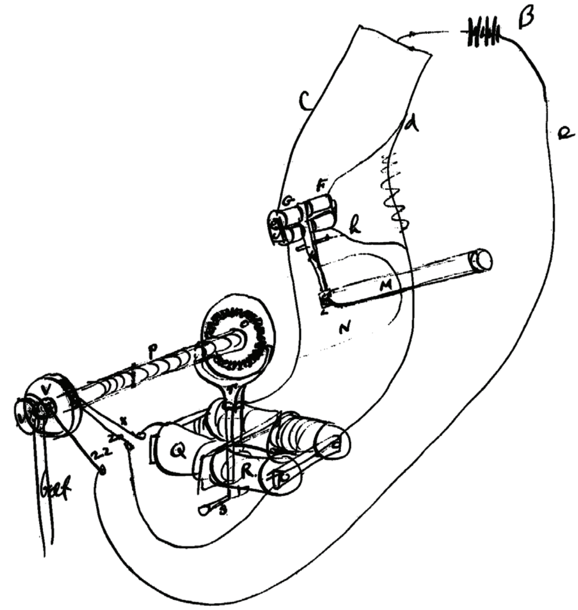


fig 2[7]

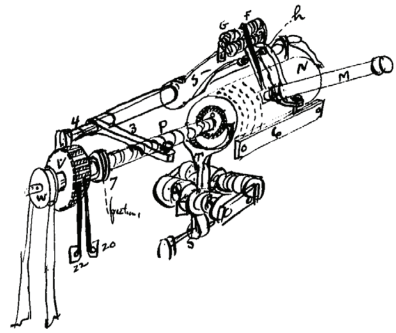
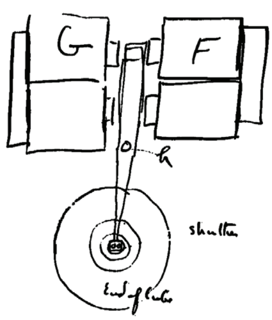


fig 3[8]



W fig 2[h] is the drive pulley preferably run by a belt from an Electromotor. V The break wheel, ~~best shewn in fig 2~~ P is the feed screw as in the phonograph 7 a friction connecting the drive pulley & break wheel with the ~~P~~Screw p and attached Apparatus 3 the traveller arm for Carrying the micro[d] photographic apparatus while recording and the observing Microscope when reproducing 5[b] is the Arm Carrying the above a shutter with two openings see fig 3 is vibrated by double magnets G .&. F. between the surface of the cylinder and the recording or reproducing apparatus M. The lever of the vibrator is pivoted at .h. When the lever is to the right or to the left the aperture is opposite the objective but when in the act of moving the line of vision between the Cylinder & objective is Cut off by the space between the two holes in the shutter

when the shutter is at Either the left or right limit and still the cylinder is also in a state of rest and no movement of the cylinder takes place ~~except~~ while an aperture is opposite the objective, hence in recording and reproducing the photographic surfaces are in a state of rest. The intermittant rotation of the cylinder takes place by means of an Escapement O & fork T reciprocated by the double magnets Q .&. R. The reciprocation of the shutter as well as the Escapement being controlled by magnets and the break wheel V & springs 20 & 22 One spring being in contact with the metallic part of the wheel (see fig 1) while the other is on the space between on[b] a further rotation of the break wheel the opposite effect occurs and the spring which was previously on insulation now comes in electrical Contact with the wheel & the other Set of magnets are energized thus advancing the cylinder $^1/_{32}$ of inch only at the time the shutter has closed the vision between objective & cylinder As the speed of w should be much greater[b] than .p. The break wheel V need have but few breaks—this insures greater rapidity of advancement of the cylinder during the interval when the shutter closes the light beam off—The Motor should be governed so as to produce even results.

Of course in practice the mechanism will be considerably changed from that shewn as the figures are merely diagramatical~~ly~~ so as to simplify the Explanation of the [~~germ~~?][g] of the invention

A Tuning fork with break might control the magnets.[9] The fork being kept in continuous vibration by a magnet & automatic make & break Contact. The levers T & the shutter lever may be Reeds or tuning forks themselves their magnets being in one circuit & Controlled by a Master fork or Reed Electrically operated or by a self make & break attached to one of them The break wheel V might be run by a governed motor or mechanism [~~& t~~?][g] Independent of the motor driving the main devices

The levers T & shutter may be operated mechanically by means of a undulating surfaced rotating[b] wheel which reciprocates a lever which not only serves to release the Escapement O but works the shutter. a strip paralell to the cylinder & between the objective & surface of cylinder may be reciprocated up and down two continuous aperatures are in the strip. The whole of the shutter is then detached from the traveling arm rendering the images free from blurring due to any movement or vibration of the arm. A plate machine with feeding mechanism say a volute spiral or worm or multiplying gearing may be used and flat records taken instead of using Cylinders but I do not think this form is so practical.

By using Very large transparent shells The pictures may be even projected on the screen as in microphotographic projection or enlargement.[10] The cylinder being revolved & the source of light inside of the cylinder, negative records being only recorded—[b]

Thos A Edison

ADfS, NjWOE, PS (*TAED* PT031AAA1). Drawings made on two separate sheets. [a]"For Illustration say the" interlined above. [b]Obscured overwritten text. [c]"as if" interlined above. [d]Interlined above. [e]"& reproduce" interlined above. [f]"a continuous" interlined above. [g]Canceled. [h]"fig 2" interlined above.

1. After his patent attorneys prepared a finished caveat from this draft, Edison signed it on 15 October. It was filed at the Patent Office two days later as his Caveat 110 for improvements in photography. The final text and figures closely followed Edison's draft, although reference marks in the drawings were re-lettered (Caveat files [Case 110], PS [*TAED* PT031AAA). The caveat was later entered on Edison's behalf into the printed record of a major patent infringement suit (*Edison v. American Mutoscope Co. & Keith,* pp. 348–51, Lit. [*TAED* QM001348]).

2. This caveat—and Edison's marginal note on it—are the only direct evidence of Edison's work related to motion pictures before January 1889 (see Doc. 3307). In a handwritten foreward to a published account of this work (Dickson and Dickson 1895), Edison claimed that he had conceived the idea of a photographic analog to the phonograph in 1887. That book, coauthored by William K. L. Dickson, Edison's primary experimenter on motion pictures, also attributes the conception to 1887 and describes early experiments employing apparatus like that shown in this caveat. In testimony in 1900, Edison would recall beginning his experiments "in the latter end of 1888" (*Edison v. American Mutoscope & Keith,* Complainants Exhibits, p. 91, Lit. [*TAED* QM001091]). When

Dickson published an article on this subject in 1933, he included Edison's 1895 foreword and described experiments that he claimed took place in 1887. Dickson also provided drawings to show what the 1887 apparatus looked like, including Edison's first method for synchronizing the phonograph and motion picture apparatus (Dickson 1933, 9–11).

In *The Edison Motion Picture Myth*, Gordon Hendricks discounted the possibility of such work having taken place before the end of November 1888, when Dickson was preparing experiments using the daguerreotype process discussed in later accounts (see note 5). Hendricks based this claim on the fact that all of Dickson's time was credited to the account for ore milling, for which there are extensive laboratory records. However, timesheets for Charles A. Brown, a machinist who was Dickson's primary assistant in October 1888, show that he spent significant time working in the photo room on the second floor of the laboratory. Brown's work was charged to indirect costs and may well have included kinetoscope experiments, which did not receive their own account until February 1889. Brown testified in 1900 that his kinetoscope experiments with Dickson did not take place until February 1889, but his memory may have been influenced by the payroll records entered into evidence in the same case. Hendricks 1961, 23–28, 32–33; Time Sheets for Brown, WOL; Spehr 2008, 92–98; Brown's testimony (p. 141) and "Complainant's Exhibit Work on Kinetoscope from February 1, 1889, to February 1, 1890" (pp. 360–62), both *Edison v. American Mutoscope Company & Keith,* Lit. (*TAED* QM001140, QM001 images 200–201).

3. As he had done with other inventions, Edison named his motion picture device by drawing on classical roots (cf. Doc. 3357). He evidently solicited the opinion of attorney Sherburne Eaton, who objected to mixing Greek and Latin roots as in, for example, Edison's coinage of "motograph." Eaton also passed on a letter from Daniel Henry Chamberlain, his former law partner and an ex-governor of South Carolina, who agreed with his critique and suggested instead the word kinésigraph. By the time Edison received this correspondence, however, he had already settled on kinetograph and kinetoscope. Eaton to TAE, enclosing Chamberlain to Eaton, both 10 Oct. 1888, DF (*TAED* D8805AHH, D8805AHI); Musser 1994 (62–63) mistakenly confuses Eaton with his law partner Eugene Lewis.

4. As pointed out in Spehr 2008 (85), this paragraph was rewritten and the final optimistic sentence removed by Edison's attorneys before the caveat was filed.

5. Here Edison appears to be trying to use the wet collodion photographic process, which created negative images used for producing positive copies, as if it were a direct-positive process like that for daguerreotypes (Jenkins 1975, 38–39). Dickson and Dickson 1895 (8) indicate that daguerreotype processes were used in some early experiments with devices described in this caveat. A later account by William K. L. Dickson goes into more detail about experiments with various photographic processes and describes making "a small micro camera, using various objectives or lenses taken from one of my microscopes to produce the pin-head photos" (Dickson 1933, 10).

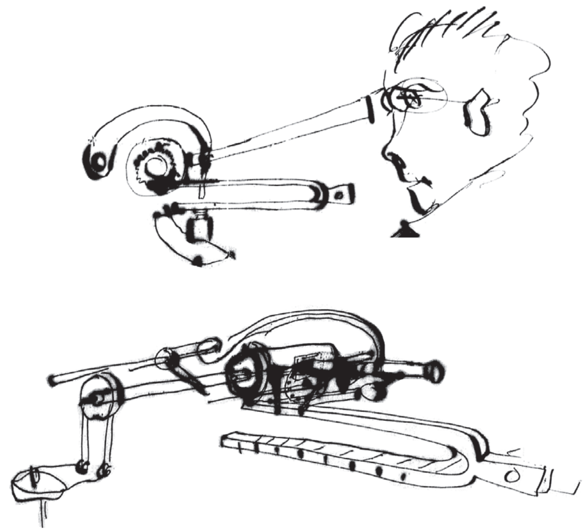
6. Figure label is "belt."

7. Figure label is "friction." The lettered labels in figure 2 correspond generally to those in figure 1. "W" and "V" are at far left; "7" and "P" are to the right on the same shaft, with "3" riding on the shaft between them. At the top center is "5" with "G" and "F" to the right; "h" is at top right and "M" is the tube at the extreme right. "O" and "T," near the center above the magnets "Q" and "R," are more legible in figure 1. Springs "20" and "22" are near extreme left.

8. Figure labels are "shutter" and "End of tube."

9. Edison made two separate undated sketches on laboratory letterhead that relate to this idea. The pages were slipped into a notebook containing miscellaneous dated entries between 1887 and 1889, including Doc. 3307. N-87-09-02, Lab. (*TAED* NA010K154A).

10. See Doc. 3301 n. 1.



Edison's undated sketches of photographic shutter apparatus regulated by vibrating tuning forks.

–3272–

Draft Caveat: Phonograph[1]

[Orange,] Oct 17 1888

Caveat[2] Improvements in phonographs & appliances

Fig. 1. <gov[ernin]g by weakening & strengthening field>

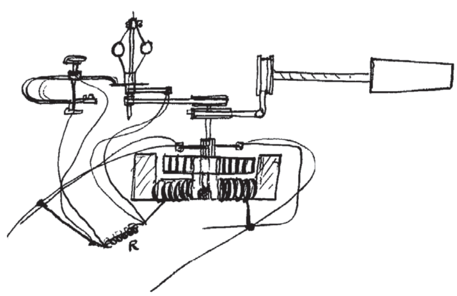


Fig 1 shews a method of governing the Electric Motor by causing the governor to throw in & out of the field a Resistance to slow the motor by strengthening the field and increasing its speed by diminishing the strength of the same. The governor might be dispensed with and an Extra Coil in series with the armature but wound to weaken the field when the load increases

Fig 2 <govg by friction>

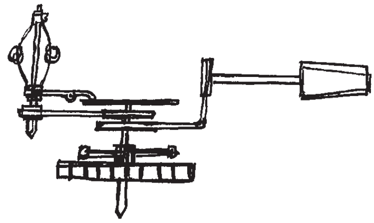


Fig 2 shews the governor arranged to govern by friction.

Fig 3[3]

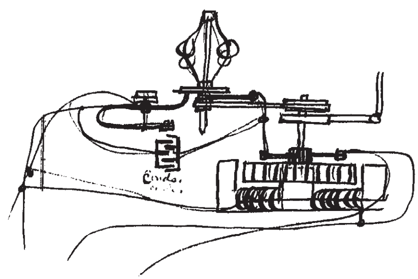


Fig 3 shews a Condenser around the governor break current contact to Eliminate the spark

Fig 4[4]

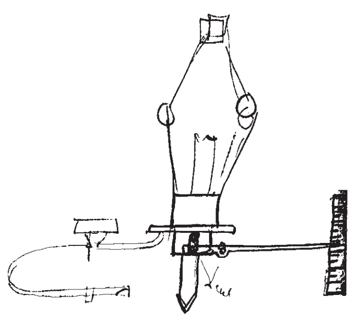


Fig 4 shews the governor provided with an index to indicate the speed of the phonograph

fig 5

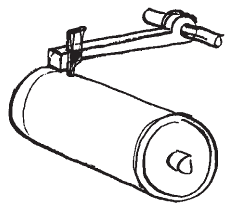


Fig 5 Shews a turning off tool with pressure foot, the[a] foot resting on the turned off part while the Knife is turning off the talking previously put on. The End of the Knife being flush with the bottom of the pressure foot which prevents the same from riding up or down The object of this form of tool is to render adjustments unnecessary The Edge of the ~~pressure foot~~ turning off tool[b] being sharp a slight tap of the finger starts it at the right depth. I will mention here that a Knife the full width of the phonograph Cylinder could be used in the form of a planing machine knife and with a pressure foot The Cylinder could be turned one revolution by hand & all the previous talking turned off—

fig 6

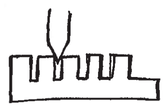


Fig 6 shews a method of indenting without removing material ~~the~~

fig 7

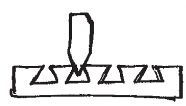


fig 7 shews the same

8 9 10 <3 tools to follow>

figs 8 9 & 10 shews knifes to produce the groove shewn in figs 6 & 7[c]

fig 11

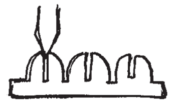


fig 11 shews indenting without removing stock ~~also~~ fig 12 fig 16 fig 1~~8~~7 fig 1~~7~~8 and fig 20 show other forms.[d]

fig 12

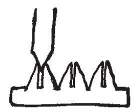


fig 13 <make both Ends move abrupt use double point similar Receiver>

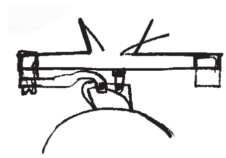


Fig 13 shews a double recording tool so arranged ~~as to~~ that say the front point makes a wave more abrupt at one End than the other to the right & the other End makes a wave more[e] abrupt to the left, as described in an application now pending[5] by Employing double point receivers The volume of sound is greatly increased

fig 14

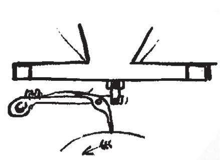


fig 14 shews a Recorder or Receiver if the motion is reversed when used as the latter.

fig 15

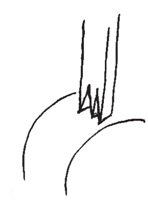


fig 15 shews a Triple recording tool.

fig 16   <non cutting>

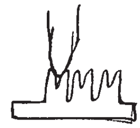


fig 17   <non cutting>

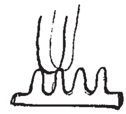


fig 18

fig 19[6]

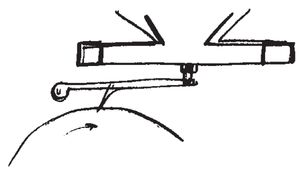


fig 19 shews recording with leverage & yet producing a wave more abrupt at one End than the other
fig 20

fig 21

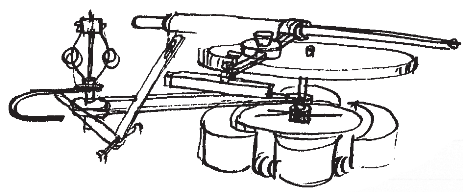


Fig 21 shews plate phonograph[a] The speed of the disk being increased as the recorder approaches the Center this being done by Causing the movement of the screw arm to increase the speed of the motor by acting on the governor fig 22 <split ends rub bands>

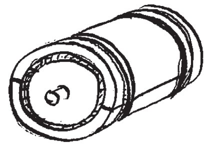


Fig 22 shews a Recording[a] Cylinder split in half & held on the phonograph cylinder by Rubber bands

fig 23

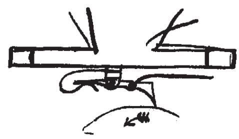


Fig 23 shews a Recorder which by Reversing the motion of the recording cylinder becomes a receiver

fig 24[7]

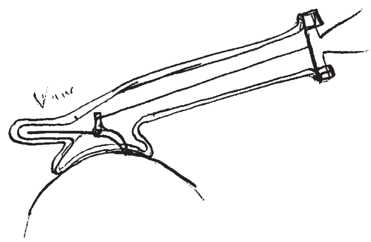


Fig 24 shews a receiver with Vane for dampening on the lever

fig 25

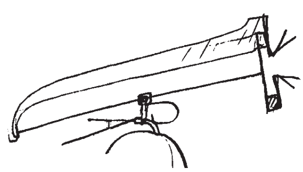


Fig 25 shews the vibration of a wire to give waves to diaphragm of the receiver[8]

fig 26 <Continuous strip phono>[9]

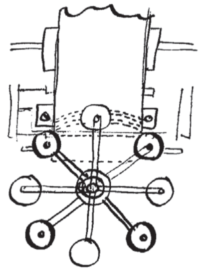


Fig 26 shews a continuous sheet phonograph 4 or more Recorders & 4 or more Receivers are secured to a revolving shaft, the hearing and speaking tubes being attached at the center so the tubes can stand still while the recorders and Receivers revolve. In revolving a portion of the travel of Each takes place[a] over a ~~pl~~ flat continuous roll[a] phonogram which is fed[a] at such a speed as to Cause the records to be about 1/100 inch apart. This feeding may be continuous or intermittant taking place just as one recording point leaves the recording surface and the other comes on= devices are attached to raise the recorders & lower the receivers when receiving

fig 27

Fig 27 shews the Core of the mould for casting phonogram blanks wound with thread or string or narrow sheet paper or wire or metallic bank[10] or Cloth band or Cloth, mosquito netting[a] Etc. When the Cylinder is poured it adheres to this and[a] it becomes a part of the cylinder Causing the inner part to be quite true, rendering the sizing by reaming unnecessary, and by the loose character of the inner coating causes[a] it to be easily put on or off the phongraph cylinder & yet not cause the cylinder to crack when left on & a cold snap comes up— This is especially true of [~~loose~~?][f] soft Cotton string—

fig 28 <Thread inside cylinder>

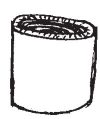


fig 28 shews the string inside of a moulded cylinder—

fig 29 <Telephone always adjusted>

Fig 29 shews a Carbon telephone The connection ~~being~~ between[e] the Electrodes & the diaphragm being only through an air dash pot. Thus the previous difficulty of the change of initial pressure being changed by buckling of diaphragm by continuous mechanical stress or Temperature, is obviated. The lever which gives the initial pressure is also provided with a dash pot.

fig 30

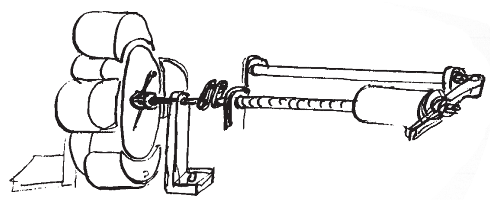


Fig 30 shews a motor directly Connected to the phonograph

fig 31

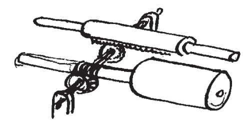


Fig 31 shews a mechanical movement for advancing the devices holding the recorder & Receiver

fig 32[11]

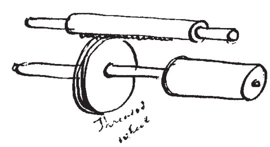


Fig 32 a disk with threads in it runs into a rack on travelling sleeve This being a variation on fig 31

fig 33

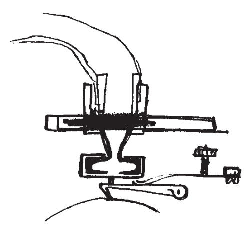


Fig 33 shews a recording tool or[a] Recorder without a diaphragm The sound waves impinge direct on a cup connected to the recording lever

fig 34

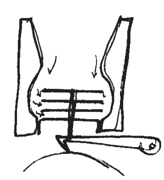


Fig 34 shews same thing with multiple disks
fig 35

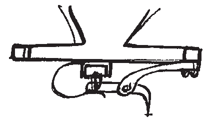


Fig 35 shews a sinuous curve receiver as in fig 36 on a plate machine
fig 36

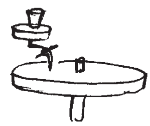


fig 37

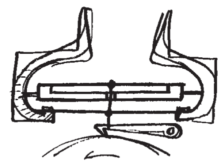


Fig 37 shews two diaphragms Connected together & the the recording lever so as to get double power
fig 38[12]

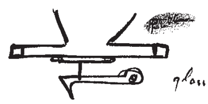


Fig 38 shews a small glass disk Very close to the diaphragm & secured to it & around its edges So as to be air tight. This acts as a dash pot
fig 39

fig 39 shews Recorder which makes waves very abrupt at one End. The movement of the lever to & from the recording material taking place is a small arc of circle ie[g] a Circle of very small diameter
fig 40[13]

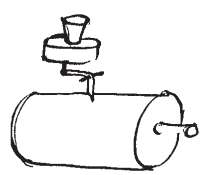


Fig 40 shews a sinuous Curve recorder on a Round cylinder—

fig 41[14]

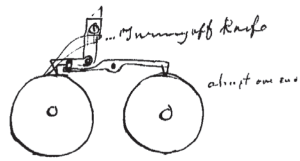


Fig 41 shews a duplicating device in which waves which on the master cylinder are not more abrupt at one end than the other are made so on the duplicate or if the master cylinder waves are abrupt at one End their abruptness is increased on the duplicate. <Heating waxed cylinder & rotating hot get rid bubbles>[15]

fig 42 <paper taper shell>

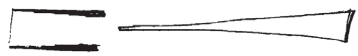


Fig 42 is a paper shell made taper on the inside but not on the outside and made[a] in one piece.

fig 43

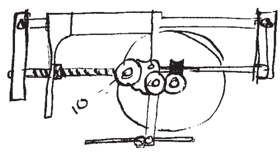


Fig 43 shews a plate phonograph The feed being obtained by a worm on the plate shaft & worm wheel on the Traveller armshaft.

fig 44

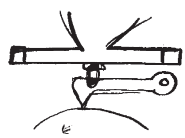


Fig 44 shews device for increasing speed of plate as Recorder approaches Center by Cone pulley & shifter

fig 45 <non cutting>

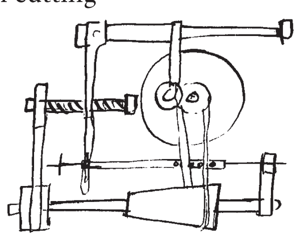


fig 46 <on graphone>

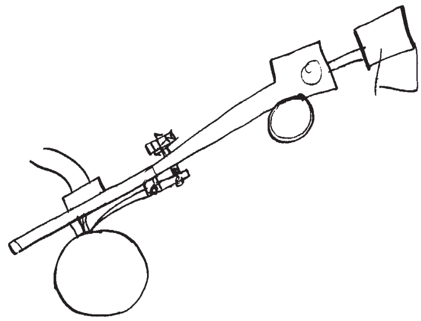


Fig 46 shews Recording with pressure foot the whole resting on the cylinder but an adjustable shaving knife also travells with it which serves to smooth the cylinder in advance off the recording point

fig 47

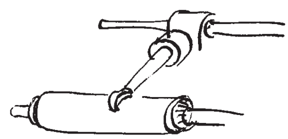


Fig 47 ~~s~~& 48 shews graphophone[a] phonograph with false shell over which cylinders or Collapsable ~~cylinder~~ phonogram can be shoved

fig 48 <taper shell on graphone>

fig 49

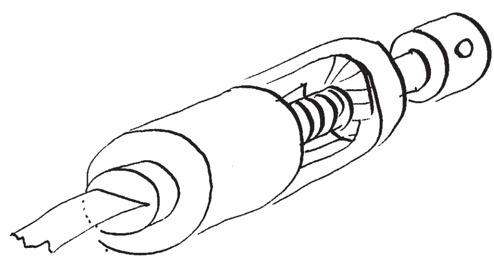


fig 49 shews a squirter for squirting out flexible sheets of material to coat the collapsable paper cylinders of Collapsable mailing phonograms

fig 50

Fig 50 shows a solid Cylinder all of recording material
Fig 51

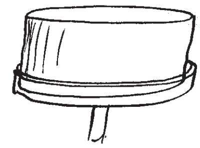


fig 51 shews a solid plate of recording material for use on plate phonograph. A turning off tool is of Course used to shave the records off. In this form a plate phonograph would last a year ie[g] one cylinder would be sufficient.

I am engaged on a great number of Experiments to obtain a suitable material for colapsable phonogram blanks.

Asphalt melted and mixed with Japan wax.

This used directly or coated with a film of Chicle, Balata, Gelatin softened with Molasses or a film of flexible Collodion or plastic sulphur or Oleate of Aluminium magnesium in

Paper shells coated with tin foil & then dipped in various molten recording material serves to prevent air bubbles due to water in paper & gives beautiful surface by dipping paper direct in hot solution considerable air bubbles appear; by turning off smooth & redipping these generally disappear but the best method is to dip in solution & secure it to a machine which gives it a movement of rotation in two opposite directions & if this is done in a hot place the distribution of the material is perfect, in fact I have used this to cause Asphalt in Benzol solution to be evenly spread over dynamo armature plates & I propose to use the machine for Evenly distributing Japan Varnish over irregular iron parts of the phonograph I shall make application for a patent for this

for a flexible cylinder Oleate of Lead may be used this dipped in Linseed oil or olive oil & the Linseed oil Exposed to fumes of Chloride sulphur or a Chlorinating[a] Liquid Like pentchloride antimony Causes a very thin film to coat it. The olive oil Exposed to Hyponitric acid does same thing

Soft material such as Oleate Lead, Japan wax, sterine pitch, or fatty oil pitch etc on paper turned off & then dipped in a[e] resin in alcohol, Bitumen or Bisulphide Carbon or Benzol, Japan Varnish etc to give polished Elastic film indent without Cutting

For mailing Cylinders

Oleate Aluminum mixed with hard Oleates

Chlorooleates of Aluminia also Magnesia

Gelatin mixed with Albumen & various other amorphous substances

Finely divided powder like Kaolin mixed with Oleate Lead & squirted & sheets cut & put on paper cylinder in two halves.

or Trihydrate Alumina mixed with Oleates or Chlorooleates of Alumina or Magnesium

Stearate of sulphur, flexible sulphur.

A very good surface for Colapsable Phonogram is Yellow[a] ozokerite melted & mixed with Camphor which serves to render it less sticky & yet retains flexibility. The sticky function of all the flexible waxes etc causes the Recording point to become Clogged

T A Edison

ADfS, NjWOE, PS (*TAED* PT031AAC1). Drawings (with marginal notations) on seven separate sheets. [a]Obscured overwritten text. [b]"turning off tool" interlined above. [c]"in figs 6 & 7" interlined above. [d]"show other forms." interlined above. [e]Interlined above. [f]Canceled. [g]Circled.

1. Edison likely wrote this relatively clean draft from an earlier version or rough notes. In the next day or two, before sending it to his patent attorneys (where it was marked as received on 19 October), he apparently went through the text again, adding words or phrases between the lines; the editors have incorporated these interlined phrases into the transcription and marked them accordingly. Evidently using the same writing instrument, Edison also made figure labels and brief reference notes on the sheets of drawings; these remarks are distinguished in the transcription as marginalia.

2. The final typed version of this document was based closely on Edison's corrected draft. Designated his Caveat 112, it was signed on 29 October and filed the next day. The Patent Office examiner, however, refused to accept it until the document was "limited to a single invention as required by the Rules of Practice." The editors have no knowledge of what, if anything, Edison subsequently did with it. Patent Office receipt of filing, 30 Oct. 1888; Patent Office to TAE, 3 Nov. 1888; Caveat 112 [typescript]; all Caveat 112 case file, PS (*TAED* PT031AAC [images 2–3, 22–29]).

3. Figure label is "cond[ensor]s."

4. Figure label is "Link."

5. Edison referred to his Case No. 786, in the Patent Office since July; there was also a companion application, Case No. 791 (see App. 5).

6. Figure label is "Leverage."

7. Faint figure label at upper left is "Vane"; another label at right, too faint to reproduce, is "to stop traveler."

8. Cf. Doc. 3188 n. 4.

9. This device closely resembles one sketched by Edison a month earlier and may be related to a suggestion made by George Gouraud in January. See Docs. 3156 n. 4 and 3260.

10. Perhaps Edison meant "band."

11. Figure label is "Threaded wheel."

12. Figure labels are "Rubber" and "glass."

13. In the right margin adjacent to figures 40 and 41, Edison wrote "Fig 1" in the same light pencil he used for the figure labels.

14. Figure labels are "Turning off knife" and "abrupt [one?] end."

15. Edison wrote this marginal note between figures 41 and 42, although this idea does not have a clear relationship to either drawing.

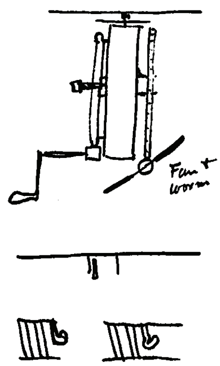
–3273–

Charles Batchelor Notebook Entry: Talking Doll

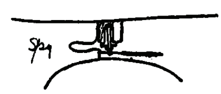
[Orange,] Oct 19th 1888.

Toy.[1]

[A][2]

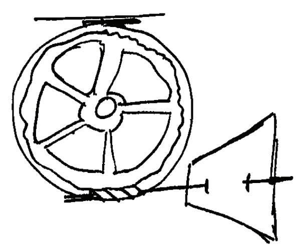


[B][3]

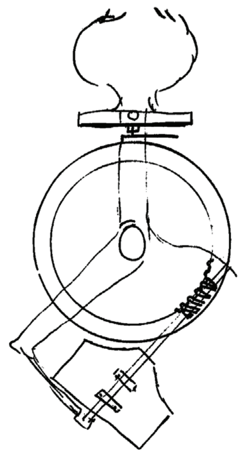


Try talking in the top of groove— Cut deep groove & then polish off top & talk with a wide Knife[a] then receive[4a] also with wide needle

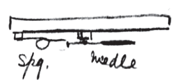
Have English[5] get cheapest clock movement made— Spring one wheel, & worm, & fan—[b]



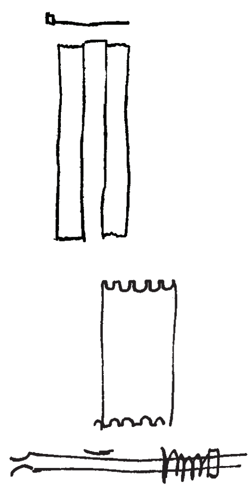
Make Small diaphragm with[a] flapper needle— diaphragm same size as ordinary phono



[C][6]



Make top .008" & cut talking in that— Then buff off to edge to use for guide—using swivel flapper[7]



C[harles] B[atchelor]

X, NjWOE, N-88-03-20.1 (*TAED* NB029029). Document multiply signed and dated. [a]Obscured overwritten text. [b]Drawing below preceded and followed by dividing mark.

1. This notebook entry appears to be Batchelor's first on the toy phonograph or talking doll since Doc. 3262.

2. Figure label is "Fan & worm"; that is, a resistance fan driven by a worm gear.

3. Figure label is "Sp[rin]g."

4. That is, to reproduce or play back sound.

5. John English.

6. Figure labels are "Sp[rin]g." and "needle."

7. In his next dated entry in this notebook, on 23 October, Batchelor made several sketches related to those here. One of them represented a "spring for Reprod. needle fastened to collar that turns in swivel to put no friction on needle." N-88-03-20.1:39, Lab. (*TAED* NB029039).

–3274–

To Edward Johnson

[Orange,] Oct. 20, 88.

E.H.J.,

Re your note 17th instant.[1]

I don't think it necessary that you should discuss the Toy Contract with Jacques.[2]

According to my contract with the Speaking Phonograph Co. the toy business reverts to me.[3]

In regard to the check sent you, it is part of the proceeds from a portion of stock in the Edison Phonograph Company which I reserved for you in addition to the provision which I made for the old Phonograph Company stockholders.[4]

E[dison]

TLS (letterpress copy), NjWOE, Lbk. 25:218 (*TAED* LB025218).

1. Johnson recounted a visit from William Jacques, who wished "to learn the facts as to whom the Toy Phonograph business reverts to in the case of the Contract becoming void." Johnson apparently did not give an answer but, after consulting Uriah Painter, believed (correctly) that Edison would regain the rights should Jacques and his partner let them lapse. He indicated that Charles Cheever took the view that the old Edison Speaking Phonograph Co. would acquire them. Before acting further, Johnson sought Edison's opinion "as to the advisability of my giving Mr Jacques or Any one else any information" about the matter. Johnson to TAE, 17 Oct. 1888, DF (*TAED* D8848AEK).

2. William White Jacques (1855–1932) was the founding president of the Edison Phonograph Toy Manufacturing Co., which held rights to manufacture phonograph dolls and other toys under October and No-

vember 1887 contracts among Edison, Jacques, and the latter's business partner, Lowell Briggs. A Ph.D. physicist (Johns Hopkins University), electrician, and inventor, Jacques had headed the American Bell Telephone's "Experimental Shop" and was presently a lecturer at the Massachusetts Institute of Technology. Doc. 3076 nn. 3 and 7.

3. Although Edison was generally correct about the reversion of his rights, his 1878 contract with organizers of the Edison Speaking Phonograph Co. (Doc. 1190) specifically excluded phonograph toys, which were instead covered by an agreement with a different party (see Doc. 1168 n. 7). However, his 1887 contract with William Jacques and Lowell Briggs for the manufacture of phonograph dolls and toys specified that he would regain his rights if they allowed the agreement to lapse. TAE agreement with Jacques and Briggs (art. 3), 1 Oct. 1887, Misc. Legal (*TAED* HX87009).

4. Edison sent Johnson a check for $5,863 as "your proportion of the moneys paid in to date on account of the Sale of the Capital Stock of the Edison Phonograph Company," with the promise of more to come (another distribution came in January 1889). Evidently thinking of the old Edison Speaking Phonograph Co., Johnson responded (see note 1): "I was under the impression that the settlement Effected by Mr Painter relieved you of the payment of any moneys to the stockholders of the Old Co. If this is true why do you send me anything? After what you have said to my face as to previous Divisions' with me I cannot assume that this is simply Another of the same sort." TAE to Johnson, 15 Oct. 1888, Lbk. 26:357 (*TAED* LB026357).

In fact, the payment was a division of money from Jesse Lippincott toward completion of his purchase of phonograph rights from the Edison Phonograph Co., and Johnson was among a handful stockholders to whom Edison sent checks on 15 October. Edison wrote out their names and the amount owed each in proportion to their stock. He paid out $37,198.36 that day while reserving $233,697.28 for himself; the only other settlement larger than Johnson's was Charles Batchelor's ($19,480.50). Circled on the list and excluded from the total paid were amounts (totaling $10,554) next to the names of John Tomlinson and Ezra Gilliland (TAE memorandum for Edison Speaking Phonograph Co., 15 Oct. 1888, DF [*TAED* D8956AAB]; TAE to Johnson, 15 Oct. 1888, Lbk. 26:357 [*TAED* LB026357]; see also letters of same date to Josiah Reiff, Batchelor, Richard Dyer, Albert Keller, John Ott, Frank Toppan, and Samuel Insull, all Lbk. LB026356–63 [*TAED* LB026356–63]). Edison noted on the memorandum that Lippincott had paid to date $325,000, or 13⁄20ths of the total owed. Some portion of that amount likely came from the recent formation of two sub-companies (Metropolitan Phonograph Co. and New England Phonograph Co.) to sell phonographs under license from the North American Phonograph Co. in and around New York City and the New England region (Lippincott to Uriah Painter, 28 Nov. 1888, UHP [*TAED* X154A7EV]; Edison Speaking Phonograph Co. agreement with North American Phonograph Co., 10 Oct. 1888, Misc. Legal [*TAED* HX88032]). Meanwhile, Lippincott had reached a separate agreement with Uriah Painter to purchase nearly 11,000 (of 24,000 total) stock shares in the old Edison Speaking Phonograph Co. for $225,000 payable in monthly installments from October 1888 to January 1889. That arrangement further stretched the resources of Lippincott, who had already deferred scheduled payments to Edison after remitting $65,000 on 10 September; at the end of October, he and Edison agreed to renegotiate the terms of $175,000 outstanding on their original contract (Lippincott agreement with Painter, 24 Sept. 1888; Edison Speaking Phonograph Co. list of shareholders, 30 Apr. 1887; both UHP [*TAED* X154A7EL, X154A6AG]; TAE receipt to Lippincott, 10 Sept. 1888, Heitz [*TAED* X225AF]; TAE agreement with Lippincott and North American Phonograph Co., 30 Oct. 1888, Misc. Legal [*TAED* HX88034B]); cf. Alfred Tate memorandum of payments, 7 Jan. 1889, DF [*TAED* D8956AAA]; see also Doc. 3261 n. 2).

–3275–

From Gaston & Marsh

DETROIT, Oct. 24, 1888.[a]

Dear Sir:—[b]

Thank you very much for the multiplex pieces and "y's" received to-day.[1]

Geo. Greims[2] is here, and will turn over to him the teaching of typewriters which writer has had so much of to do last few days that has had no time to devote elsewhere.

We started out by insisting that every stockholder in our Co.[3] should personally come to our office and learn how to manage the Phonograph in every detail. This they have assented to and are not only doing this but are sending their stenographers; but will each place from one to 4[c] machines[d] ~~up~~ in their own offices. This is going to be a great help. Among our stockholders are Geo. S. Davis[4] of the firm of Parke, Davis & Co.,[5] who employ 14 stenographers and typewriters and C. C. Bowen[6] of D. M. Ferry & Co.[7] (the big seed house) who have nearly as many.

Think have already gained several bits of useful information. Among them is the fact that until both the recorder and repeater are made self-adjusting, the thick cylinders are not going to be used by business men (we don't believe) except in a limited way. They dont like to bother with it. A cylinder (thin) on paper would seem to fill their requirements, as there would then be no adjusting, or [--------][e] very little. Of course, if there was only one cylinder at a time, the typewriter might adjust the machine; but if a man sat down to the machine himself and wanted to write say 25 letters, dont believe you can try to make him bother with a slightly new adjustment every time, which, if we understand it, would be required even though the cylinders had all been planed off the same thickness.[8] Then again, even though they did adjust it, occasionally, a careless man would forget to set his knife down ~~occasionally~~ and consequently would not get a record, and in the infancy of the business one or two such failures would make him damn the machine.

Another point that has come up is that the stenographers that our stockholders send are full of objections, as they are afraid that they are not going to be worth so much to their various houses in the near future; but, luckily, we provided for this by cautioning the employers before they sent their men.

We believe, all things considered, that with the non-adjusting feature settled, there is no further difficulty in the way of the Phonograph being received with unprecedented favor in the business world, conceding the wax problem settled.

Will to-morrow, if it is possible, get the newspaper men together and send on that cylinder, which you kindly offered to duplicate.[9]

Please drop us a line telling us about the duplicating and also concerning the increased volume of tone in the duplicates. Yours truly,

Gaston & Marsh[10] By Marsh[11]

<Letter Recd—thanks keep me posted=

Answer this question Suppose man has two machines—and 2 doz thick cylinders— The business man puts on a cylinder throws spectacle down & dictates when full takes it off & sends to Type writer who Copies & turns off cylinder returning smooth Cylinder to business man— This allows use of thick cylinder & yet business man dont do any adjusting E[dison]>[12]

TL, NjWOE, DF (*TAED* D8847ACW1). Letterhead of Gaston & Marsh. [a]"Detroit," preprinted. [b]"Over" written above the salutation to indicate marginalia written on the back of the first sheet. [c]"to 4" interlined by hand above. [d]"s" added by hand. [e]Canceled.

1. The editors have found no information on this shipment. The "y's" likely were akin to the "Hearing tube 'Y' connection" listed in an 1889 parts catalog of the North American Phonograph Co. Each listening tube branched in two for the listener's left and right ears (part no. 335, PPC [*TAED* CA027B]). The "multiplex" arrangement presumably was to accommodate several listeners at once by attaching multiple listening tubes to the main tube arising from the reproducer, as shown in Edison's exhibit at the 1889 Exposition Universelle in Paris ("Visitors to the Paris Exhibition Listening to the Phonograph," *Illustrated London News*, 26 Oct. 1889, 536).

The phonograph at the Exposition Universelle.

2. George Greim (b. 1869) worked as a machinist specializing in the phonograph at the Edison laboratory from May until late October 1888, when he was hired by the new Michigan Phonograph Co. After training at the Orange laboratory, the firm employed him at a salary of $60 per month to instruct its stockholders and their employees in using the phonograph for business. He was still employed by the Michigan Phonograph Co. as a recording engineer as late as June 1890. U.S. Census Bureau 1982? (1900), roll 1016, p. 1A (Elmira Ward 5, Chemung, N.Y); Time Sheets, 17 May to 18 Oct. 1888, WOL; Gaston & Marsh to TAE, 22 Oct. and 2 Nov. 1888; TAE to Gaston & Marsh, 22 Oct. 1888; all DF (*TAED* D8847ACV, D8847ADD, D8847ACW); "Making Records," *Detroit Free Press,* 1 June 1890, 3.

3. The Michigan Phonograph Co. was organized in September 1888 with a capital stock of $300,000 (increased to $500,000 by the end of October) to sell the new Edison phonograph and the Bell-Tainter "phonograph-graphophone." Among its principal stockholders were prominent Detroit businessmen Charles Clark Bowen, Levi Barbour, and A. H. Wilkinson. The firm's officers in early 1889 were George Davis, president; George Russell, vice president; Charles Swift, secretary and treasurer; and John Butterfield, manager. "Detroit, Mich.," *Western Electrician* 3 (27 Oct. 1888): 215; "Talks Back," *Detroit Free Press,* 21 Sept. 1888, Clippings (*TAED* SC88107A); "Sayings and Doings," *Detroit Free Press,* 6 Oct. 1888, 5; Butterfield to TAE, 15 Feb. 1889, DF (*TAED* D8963AAB).

4. George S. Davis (1845–1930), president of the Michigan Phonograph Co. and a Detroit native, made his money as a partner in the pharmaceutical firm of Parke, Davis & Co. He was also the vice president of the Imperial Life Insurance Co. and a large investor in real estate development in Grosse Pointe, Mich. Farmer 1889, 1185–86; Davis death certificate, *Michigan Death Records, 1867–1950,* online database accessed through Ancestry.com, 29 Nov. 2016.

5. Parke, Davis & Co., a Detroit-based pharmaceutical company, began as a drugstore owned by Samuel Duffield and Francis Conant that produced some surplus drugs for other pharmacies in the vicinity. The company turned more fully to drug manufacturing after businessman Hervey Parke bought out Conant in 1866 and sales specialist George Davis became a third partner the next year. The firm took the name Parke, Davis & Co. in 1871, after Duffield's retirement. It was

incorporated in 1875 and, by 1887, was capitalized at a million dollars. With Davis leading the way as general manager, it developed original medicinal compounds and became one of the largest pharmaceutical enterprises in the world. Hoefle 2000, 28–31; Welch 1902, 60; Gabriel 2009, 145–46.

6. Charles Clark Bowen (1831–1900), a native of Yates, N.Y., began his career as a salesman for a seed business in Rochester. In 1863, he moved to Detroit to join the seed company organized by Dexter Ferry, Milo Gardner, and Eber Church. When the firm was incorporated in 1879 as D. M. Ferry & Co., Bowen became its secretary, a position he held for the rest of his life. Bowen was president of the Michigan Phonograph Co. from 1890 to 1893. Late in life, he also served as an officer or trustee of a number of companies and boards, including the University of Chicago. Bowen 1893, 50, 261; Bowen death certificate, *Michigan Death Records, 1867–1950,* online database accessed through Ancestry.com, 30 Nov. 2016; "His Life was Lived Well," *Detroit Free Press,* 10 Aug. 1900, 5; *ERS,* s.v. "Michigan Phonograph Co."

7. D. M. Ferry & Co., a Detroit seed company, was first organized in 1856 as M. T. Gardner & Co. It was reorganized in 1865 as Ferry, Church & Co. and two years later adopted the name under which it was doing business in 1888. By then, the D. M. Ferry & Co. was said to be the largest seed distributor in the world with business throughout the United States, Canada, and Europe. Burton 1909, 174–76; Hogan 1898, 393; *People's Year Book* 1888, 214.

8. See Doc. 3209 (headnote) n. 30.

9. The editors have found no other information about this cylinder project.

10. Gaston & Marsh was, until recently, the Chicago-based partnership of George B. Gaston and Converse Marsh, agents for the Carbolic Smoke Ball Co. The two men sold their Chicago interest by April 1888 and opened an office in Detroit, where they hoped to promote the phonograph. Gaston, a native of Indianapolis, was a friend of Ezra and Lillian Gilliland and the brother of Grace "Daisy" Gaston, one of the Gillilands' other guests at Winthrop, Mass., when Edison vacationed there in 1885. Ezra Gilliland to TAE, 23 Apr. 1888, DF (*TAED* D8848ABC); see Doc. 2824 (headnote).

Converse Marsh visited Orange in early September where, as Charles Bruch reported, "Mr. Edison took unusual pains to fix him out with good phonograms" for exhibiting the phonograph. Gaston and Marsh together showed the phonograph (along with the graphophone), reportedly for the first time in the state, at the Detroit office of the Michigan Phonograph Co. on 20 September. The recordings they played included recitations by Edison and comedian Sol Smith Russell, barking dogs, performances by piano, violin, banjo, and cornet, and an extended interview with Edison at the laboratory. Gaston told Edison that the event "was a success in every way—so far as the Phonograph went, but on some points, as usual, the papers got mixed. We have sent you a bundle, and…you will see that the Phonograph was out in the sun, while the Graphophone occupied rather the shady side of the fence." Bruch to Ezra Gilliland, 14 Sept. 1888, LM 5:152 (*TAED* LM022151); "Talks Back," *Detroit Free Press,* 21 Sept. 1888, Clippings (*TAED* SC88107A); Gaston to TAE, 21 Sept. 1888, DF (*TAED* D8847ACI).

11. Converse Denny Marsh (b. 1865), George Gaston's business partner, was originally from Evansville, Ind., and had started in business as a newspaperman and advertising agent. He was later involved with the manufacture of electric incandescent lamps as president of the Bryan-Marsh Lamp Co.; still later, he returned to advertising as president of the Bates Advertising Co. in New York City. Ezra Gilliland to TAE, 23 Apr. 1888, DF (*TAED* D8848ABC); Mohr 1914, 494; "Personal Mention," *Electrical Review and Western Electrician* 58 (22 Apr. 1911): 820.

12. Edison's marginalia was the basis for a typed response a week later. His defense of the thick cylinder did not satisfy Gaston & Marsh, who pressed their point about the need for fully automatic adjustments in a further reply. TAE to Gaston & Marsh, 1 Nov. 1888, Lbk. 25:364 (*TAED* LB025364); Gaston & Marsh to TAE, 15 Nov. 1888, DF (*TAED* D8847ADG).

–3276–

To William Hammer[1]

Harrison, N.J., October 31st, *188*8[a]

Dear Sir:—

Thomas A. Edison, The Edison Machine Works, and the Edison Lamp Co., each bearing one third of the expenses incurred outside of Laboratory expenses, have united in making an Exhibition of the inventions of Mr. Edison and of the products of the Manufacturing Establishments controlled by him.[2]

You on the joint behalf are to have charge and be responsible for the Exhibit to be made. For this you will receive Six Hundred ($600.00—) Dollars per month from November 1st, to the end of the Exposition,[3] payable in advance monthly. You will be allowed your travelling expenses and while in Paris your living expenses at the rate of Thirty ($30.00) Dollars per week.[4]

You are not to allow your name to be used in any way in connection with the Exhibition.

Mr. Edison reserves the right to name any personal representative he may choose.

You will look to the Edison Lamp Co., for your pay. Yours truly,

EDISON LAMP CO. By Thos A Edison President.
Treasurer[5]

TLS, DSI-AC, WJH, Ser. 1, Box 1 (*TAED* X098A028). Letterhead of Edison Lamp Co. [a]"*Harrison, N.J.*" and "*188*" preprinted.

1. William Joseph Hammer (1858–1934) had been employed in a variety of engineering capacities by Edison since 1879 and, more recently, by Edison-related lighting companies. He assisted with Edison's

exhibit at the 1881 Paris electrical exhibition and then helped set up the Holborn Viaduct central station and Edison's exhibit at the Crystal Palace electrical exhibition, both in London. Hammer was responsible for the eye-catching display of Edison lamps at the Cincinnati centennial exposition (see Doc. 3249). After that, Francis Upton endorsed him to oversee the upcoming Paris exhibits "as there is no doubt that he has a genius for such displays." Docs. 1972 n. 7, 2128 n. 1; Upton to TAE, 1 Aug. 1888, DF (*TAED* D8842AAK).

2. Alfred Tate later sought clarification on details of this arrangement by asking Francis Upton if the Lamp Co. and Machine Works were each paying one-third of the total expenses or of Hammer's salary alone. Upton replied that the Lamp Co., Machine Works, and Edison personally were each to pay a third of the entire cost, including Hammer's salary. Edison, he added, would also "pay all of the expense of fitting up the Quadruplex and his various inventions, outside of the Electric Light, so far as the expense of doing so in the Laboratory was concerned" (Tate to Edison Lamp Co., 13 Dec. 1888, Lbk. 27:397 [*TAED* LB027397]; Upton to TAE, 18 Dec. 1888, DF [*TAED* D8842AAQ]). George Gouraud, Edison's foreign agent for the phonograph, was specifically excluded from plans for exhibiting the instrument in Paris (see Doc. 3298).

3. The Exposition Universelle was a world's fair held in Paris from 6 May to 6 November 1889, during which time it drew more than 32 million visitors and made a profit of some 8 million francs. Although the monarchical governments of Europe refused to participate formally, because the Exposition coincided with the centenary of the French Revolution and was sponsored by the republican government of France, thirty-five nations (including the United States) officially accepted the invitation and, in the end, almost all European nations were represented in some way. Notable for the iron tower designed as its centerpiece by Gustave Eiffel, the Exposition boasted 61,722 exhibitors (representing the arts, education, industry, agriculture, and social economy) in specially built buildings spread over about 237 acres spanning the Seine. Swift 2008.

4. At an unspecified later date, Hammer noted on this letter that he "subsequently arranged to go on a basis of $700 per month an additional allowance making in all about $10,000 per year salary & I was made Mr Edison's Official Representative by him." The editors have not corroborated that statement.

5. This letter was evidently to have been signed also by Upton in the space next to his title as treasurer. Upton sent a typed copy, with space only for Edison's signature as president, to him the same day. "I have already Signed one like this," Edison wrote on the cover letter. Upton to TAE (with TAE marginalia), 31 Oct. 1888; Edison Lamp Co. to Hammer, 31 Oct. 1888; both DF (*TAED* D8842AAO, D8842AAP).

–3277–

Alfred Tate to Jesse Lippincott

[Orange,] Nov. 2. 88.

Dear Sir:—

In reference to the attached correspondence,[1] Mr. Edison asks me to say that the defects in the cylinders sent to Boston[2] were caused through our having transferred our appliances for making same from the Laboratory to the Edison Phonograph Works.[3] We found it necessary in order to turn out large quantities to break in a number of new hands, who being unfamiliar with the method failed to make the first lot finished as perfect as those which were previously turned out by our own men. You need have no fear of receiving defective cylinders in the future. We are forwarding to-day by express to Mr. Jno. Williams,[4] #66 State St., Boston, one box containing seven cylinders and three musical records. The former were tested before they left the Laboratory and found to be satisfactory. We hope that your Boston people will report promptly any trouble they experience in connection with cylinders. Yours very truly,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 25:394 (*TAED* LB025394).

1. The editors have not identified the enclosures.

2. Tate meant the New England Phonograph Co., whose offices were in Boston at 66 State St. The company was incorporated in Maine in October and immediately became a licensee of the North American Phonograph Co. for marketing phonographs and "phonograph-graphophones" in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. Augustus Sampson was its general manager. Lippincott to TAE, 8 Oct. 1888, DF (*TAED* D8848AEH); New England Phonograph Co. agreement with North American Phonograph Co., 12 Oct. 1888, *New York Phonograph Co. v. National Phonograph Co.* (pp. 1794–1800), Lit. (*TAED* QP0101794); "Our Boston Letter," *Electrical Review* 13 (6 Oct. 1888): 4; Herndon and Bacon 1896, s.v. "Sampson, Colonel Augustus Newman."

3. The Edison Phonograph Works had been operating at least partially since 8 October, when it made castings for phonograph parts; Arthur Kennelly had recorded several milestones, such as engine tests, in its preparations for business. The first account book entry for wax cylinders is dated 31 October. Jonas Aylsworth later recalled that there was a room in one of the two main buildings of the Phonograph Works "where a number of iron pots were arranged in brick-work and heated by gas burners." This equipment had been installed "for the purpose of making the old composition of wax using ceresin and carnauba" but was first used for making the new standard compound based on No. 871 (see Doc. 3243 n. 3). In an undated notebook entry, probably from October, Aylsworth noted that composition No. 871 "is adapted as regular and lot made in phonograph works." It was subsequently found that this composition "would not turn smooth in the knife[s] we had, and when

they did get a good knife it would not keep in good condition long, making it impractical to work." The compound was modified in December to soften it, and Edison adopted the resulting No. 957 "as regular for the time being, or untill something better turned up." In this compound, oleic acid (also known as red oil) was added to the standard solution of stearic acid, caustic soda, and acetate of alumina. The phonograph works was regularly producing cylinders with this compound by early February. N-88-08-28:17; N-88-09-28:9, 25–26; N-88-08-23:93, 98–99; all Lab. (*TAED* NB051017, NB056009, NB056024, NB050095 [images 47 and 50]; Frank Toppan to Lippincott, 24 Oct. 1888, DF (*TAED* D8848AEM); Edison Phonograph Works General Ledger #1:12, CR (*TAED* CK102 [image 33]; "The Phonograph Works," *Orange (N.J.) Herald*, 1 Sept. 1888, Clippings (*TAED* SC88097C); Aylsworth's testimony, pp. 36–40, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046 [images 101–102]).

4. Not identified beyond his association with the address of the New England Phonograph Co.

–3278–

To Allgemeine Elektricitäts Gesellschaft[1]

[Orange,] Nov. 7, 88.

Dear Sirs:—

I have recently received from my agents in China and Japan, Messrs. Frazar and Company, a number of complaints to the effect that your Company has been making quotations upon incandescent lamps for sale in the above mentioned countries,[2] and as your action in this respect has resulted in very seriously retarding the work of Messrs. Frazar & Co., I take occasion to point out to you the injustice you are doing me, and which I am sure you will not continue after the matter has been placed before you.[3]

For a number of years past, Messrs. Frazar & Co., acting as my agents, have been engaged in building up a business in Japan and China which has necessitated the expenditure of large sums of money and a vast amount of time and energy on the part of all those connected therewith.

The difficulties of pioneering a new enterprise in such remote parts of the world and under such peculiar conditions as there exist, are, as you can well imagine, much greater than in countries which progress more rapidly, and for this reason our investment in China and Japan is unusually heavy. The natural obstacles with which we meet in those countries, together with the competition of rival electric lighting companies, require all our energy to overcome, and it is a source of great embarrassment to have our work retarded by further competition which should not exist.

I would call your attention to the fact that, every Edison Company has a specified territory within which to carry on business under my patents, and each Company respects the territory controlled by the other. Any other method would result in mutual disaster.

I have never parted with China and Japan, and while those countries afford no protection against the intestine piracy of my inventions—a state of affairs which we are endeavoring to correct—I feel that I am entitled to every consideration from those who control my inventions in other countries, and that the defective protection afforded by the laws of China and Japan should not be used as a pretext for my own companies to enter into competition with me there.

My claim to whatever profits may arise from the Chinese and Japanese trade is based upon that sense of justice which simply receives official recognition by any Government that grants a patent; a claim so well founded and so universally recognized as to require neither elaboration nor discussion; and those to whom I have delegated the active management of my electric lighting interests in China and Japan, are, together with myself, entitled to the same respect as is maintained between corporations operating under my patents in other countries.

I am satisfied that when you made your quotations before referred to, you were unfamiliar with existing circumstances, and I beg now to request you to withdraw these quotations and in future to refer to me or my agents, Messrs. Frazar & Co., New York City, any persons who desire to purchase my electric lighting inventions for use in China and Japan.[4] Yours truly,

Thomas A Edison

TLS (letterpress copy), NjWOE, Lbk. 25:427 (*TAED* LB025427).

1. The Allgemeine Elektricitäts Gesellschaft (AEG) was a Berlin manufacturing and utility company formed in May 1887 by the reorganization and recapitalization of Deutsche Edison Gesellschaft, which owned the rights to manufacture and install Edison lighting equipment (except lamps) in Germany. In its new iteration, AEG broke with Edison's umbrella European company and allied itself closely with Siemens & Halske, which provided a large infusion of capital and became its largest stockholder. The AEG board was headed by Georg von Siemens, a cousin of Werner von Siemens, venerable founder of Siemens & Halske. Hughes 1983, 76–77; Wilkins 1989, 433–34.

2. Everett Frazar had complained directly to the Edison Lamp Co. about reports that S. D. and S. G. Niwa found better prices on lamps made in Germany than he could offer on those made by Edison's fac-

tory. In reply, the Lamp Co. reaffirmed its commitment to giving Frazar its most favorable prices but said they had no control over other suppliers. Frazar's firm reportedly was also competing against goods manufactured illegally in Japan without regard to Edison's patents. Frazar's Yokohama colleagues followed up in mid-November about the activities of the Niwas, suggesting that Edison relay the information to Berlin. Frazar to Edison Lamp Co., 11 Oct. 1888; Edison Lamp Co. to Frazar, 12 Oct. 1888; Frazar to Upton, 27 Sept. 1888; Frazar to Thomas Bayard, 17 Oct. 1888; Frazar & Co. to Frazar, 14 Nov. 1888; all DF (*TAED* D8839ACA1, D8839ACB1, D8839ABW, D8839ACF, D8839ACZ).

3. Edison sent a copy of this letter to the Compagnie Continentale Edison (the umbrella Edison organization for Europe) the same day. Francis Upton, in response to Frazar's complaints, had drafted separate brief letters from Edison to the Compagnie Continentale and AEG, which he sent to Edison on 23 October to be signed or revised and then returned to him. Edison made one small addition to the latter and instructed his secretary: "Tate fix." Upton's drafts were substantially rewritten and, according to a notation on his letter, returned to him in early November. TAE to Compagnie Continentale Edison, 7 Nov. 1888, Lbk. 25:425 (*TAED* LB025425); Upton to TAE, 23 Oct. 1888, enclosing drafts of TAE to Compagnie Continentale, 23 Oct. 1888, and TAE to AEG, 23 Oct. 1888; all DF (*TAED* D8839ACG, D8839ACH, D8839ACI).

4. When Edison had no reply by the end of January, Alfred Tate sent another copy of this letter to AEG; see Doc. 3315 n. 12.

–3279–

Alfred Tate to Dorothy Roosevelt

[Orange,] Nov 9th [188]8

My dear Miss Dorothy:[1]

Mr Edison received your note 6th inst.[2] and has asked me to reply to it as he never has time to write letters himself.

Mr Edison has some dolls which are learning to talk and which we at one time hoped to have ready from Santa Claus at Christmas.

It has taken longer to teach them to speak correctly than we expected and they cannot be ready now before Easter.[3] You can however look forward to having a talking doll when that time comes—tho I cannot promise that it will walk as well. Yours very truly

A. O. Tate Private Secy

ALS (letterpress copy), NjWOE, Lbk. 25:446 (*TAED* LB025446).

1. Dorothy Quincy Roosevelt (1884–1978) was the daughter of Hilborne Roosevelt, a cousin of Theodore Roosevelt. Her late father had been an inventor, a pioneer in building pipe organs in New York City, an early investor in the telephone, and one of the original financial backers of Edison's phonograph. Baptismal record of Dorothy Roosevelt in *Pennsylvania and New Jersey, Church and Town Records, 1669–1999,*

online database accessed through Ancestry.com, 25 July 2017; "Death of Langdon Geer," *Shoe and Leather Reporter* 118 (24 June 1915): 41; Obituary (Dorothy Roosevelt Geer), *NYT,* 23 Feb. 1978, B2; Doc. 1190 n. 3.

2. Young Dorothy wrote from her home in Seabright, N.J.: "Won't you please send me a doll what walks and talks, with beautiful golden hair?" Her mother, Kate Shippen Roosevelt, appended an apologetic note to Edison explaining that Dorothy had been "begging" for such a doll and had fixed her hopes on the mother's offhand remark that "you were the only person in the world who could probably make such a thing" (Dorothy and Kate Roosevelt to TAE, 6 Nov. 1888, DF [*TAED* D8805AIS]). Edison received at least two other youthful entreaties about this time, to which Tate sent responses like this one (except for the closing phrase about walking ability). The editors have found only one of those inquiries, an artistic and highly literate letter on *New York World* stationery from a daughter of *World* editor John Paul Bocock that showed an awareness of Edison's work on toys (Tate to Maude Meyer, 7 Dec. 1888; Tate to Emilie Bocock, 7 Dec. 1888; Lbk. 27:315–16 [*TAED* LB027315, LB027316]; Bocock to TAE, n.d. [Dec. 1888], DF [*TAED* D8847AEG]).

3. See also Doc. 3280. In the first evidence of such employment found by the editors, laboratory time sheets show that Julia Miller began "Talking in Toy Phonographs" by 17 November. She worked full-time (six days a week) through mid-December, then continued on a lesser basis for at least several weeks in January 1889. Miller records, 22 Nov. 1888 to 24 Jan. 1889, Time Sheets, WOL.

–3280–

To Lowell Briggs[1]

[Orange,] November 14, 1888.

Dear Sir:—[2]

The Edison Phonograph Works, if they receive a proper order under contract [today][3a] could be ready on January 10th, 1889, to furnish you with toy phonographs for dolls, similar to sample shown to-day, at the rate of five hundred per day. This capacity can be doubled every six weeks.[4]

The estimated cost of the toy phonograph, put inside a properly made doll, is, as near as we can come at it at present, ninety-seven cents. Yours very truly,

Edison Phonograph Works.
By Thos. A. Edison President.

TLS (letterpress copy), NjWOE, Lbk. 27:30 (*TAED* LB027030); carbon copy in DF (*TAED* D8848AEP3). [a]Interlined above by hand and obscured by ink blot; text taken from carbon copy.

1. Lowell Chickering Briggs (1853–1917?) of Boston was treasurer of the Edison Phonograph Toy Manufacturing Co. Doc. 3076 n. 2.

2. This letter was in reply to a request the previous day from William Jacques, Lowell's business partner, to "kindly write us how soon

and what number of toy phonographs, similar to sample, you can be prepared to furnish us and also the estimated cost of the toy phonograph talked to and placed inside the doll." The editors have not found additional information about the "sample." On 15 November, Edison made several sketches of a miniature phonograph such as that used in the doll but their relation, if any, to this correspondence is unclear. Jacques to TAE, 13 Nov. 1888, DF (*TAED* D8848AEP2); N-88-09-13, Lab. (*TAED* NA027AAC).

3. That is, Edison's October 1887 contract with Briggs and Jacques regarding the manufacture of phonographs for toys and dolls. Doc. 3076 n. 7.

4. See also Docs. 3279 and 3296. Alfred Tate responded in mid-December to a request from a Rhode Island man by noting that the Phonograph Toy Manufacturing Co. planned "to hold the dolls back for the Easter trade. They were unable to get them ready for Christmas, as Mr. Edison has only just completed the experiments." In early January, Edison reported that the assembly room, with a capacity of fifty dolls per day, had "a great number of parts on hand, and ample machinery capacity" to more than meet demand from the Edison Phonograph Toy Manufacturing Co. Tate to Sigmund Bergmann, 10 Dec. 1888, Lbk. 27:340 (*TAED* LB027340); TAE to Edison Phonograph Toy Mfg. Co., 3 Jan. 1889, Lbk. 35:357 (*TAED* LB035357).

–3281–

To Abram Hewitt

[Orange,] Nov. [15,][1] 88.

Dear Mr. Hewitt,—[2]

I received your letter[3] in regard to your visit to the office of the North American Phonograph Co., #160 B'way., and I regret exceedingly that your time should have been taken up to no purpose. It was [———][a] the result of some misunderstanding. I have just received a telegram from Mr. Jesse H. Lippincott,[4] President of the North Am. Phonograph Co., asking me if he should send a phonograph to your office, with one of his men, so that you could make a record there. I have replied, requesting him to ask your permission.[5] It will take up only so much of your time as you may consume in speaking any message that you desire to send to the Lord Mayor of London.[6] I thank you very much for the trouble you have already taken, and hope I am not presuming to too great an extent upon your kindness in making this further request. Yours very truly,

Thos A Edison T[ate]

TL (letterpress copy), NjWOE, Lbk. 27:56 (*TAED* LB027056). Signed for Edison by Alfred Tate. [a]Illegible.

1. The date was not transferred legibly onto the letterpress copy; it has been supplied on the basis of correspondence between Edison and Jesse Lippincott on the same subject (see note 4).

2. Abram Stevens Hewitt (1822–1903), the mayor of New York City from 1887 to 1888, was an 1842 graduate of Columbia College. He and his friend Edward Cooper founded the Trenton (N.J.) Iron Works in 1845, with backing from Cooper's father, Peter. Hewitt is credited with introducing the open-hearth process of steelmaking into the United States in the 1860s. Prior to becoming mayor, Hewitt had served five terms in the U.S. House and been chairman of the Democratic National Committee. He and Edison were acquainted since at least 1883, when they had discussed establishing a school of electricity at New York City's Cooper Union, a free school established by Peter Cooper. *ANB,* s.v. "Hewitt, Abram Stevens"; Doc. 2428, esp. nn. 1 and 5.

3. Hewitt wrote that in response to Edison's request he had called at the phonograph company offices on 12 November "but the gentleman in charge was so much occupied that he could not give me any attention," nor did Hewitt have time to return there (Hewitt to TAE, 13 Nov. 1888, DF [*TAED* D8850AEA]). The request was in response to George Gouraud's wish to have an exchange of recorded greetings between prominent Americans, including Hewitt and Edison, and London's Lord Mayor James Whitehead at a banquet in early December (Gouraud to Hewitt, 20 Oct. 1888; Gouraud to TAE, 20 Nov. 1888; both DF [*TAED* D8850ADS, D8850AEE]). The editors have found no evidence that Edison made such a recording, and Whitehead, in a phonogram to Edison recorded on Christmas Eve, did not mention having received one (Whitehead to TAE, [24] Dec. 1888, DF [*TAED* D8850AEP]). The cylinder recorded by Whitehead, which Edison received in early January along with a number of others from London, is at NjWOE (acc. no. E-2439-3), and its contents were published by the London press ("Mr. Gladstone and the Phonograph," *Daily Telegraph* [London], 11 Jan. 1889, Clippings [*TAED* SC89022A]). The mayors did eventually exchange recorded greetings on New Year's Day ("By Phonograph. The Mayors of New York and London Exchange Greetings," *St. Louis Globe-Democrat,* 3 Jan. 1889, Clippings (*TAED* SC89003D).

4. Lippincott's telegram of 15 November is DF (*TAED* D8850AEC). In subsequent postal correspondence, he expressed regret about the treatment Hewitt had received and arranged to send a technician with a phonograph to make the recording at Hewitt's office (Lippincott to TAE, 15 and 16 Nov. 1888, both DF [*TAED* D8850AEB, D8850AED]).

5. Edison's 15 November reply is Lbk. 27:52 (*TAED* LB027052).

6. James Whitehead (1834–1917) had just been elected Lord Mayor of London. Whitehead made his name and fortune as a merchant before turning to politics, including service as sheriff of London (1884–1885). *Dod's Peerage* 1901, 871–72; "The Lord Mayor at the Royal Courts," *Times* (London), 10 Nov. 1888, 10; "Sir James Whitehead," #316772, thepeerage.com, website accessed 21 July 2017.

–3282–

Jesse Lippincott to Edison Phonograph Works

New York, November 17, 1888.

Gentlemen:—

In establishing sub-agents for the promotion of the Phonograph business,[1] it seems to me that each one of them will want to have a man in their employ who is thoroughly familiar with the construction of the Phonograph. One who will be able to remedy any slight defect in the workings of the instrument, to the end that when an instrument is not in perfect working order, it will not have to be returned to us, or to the factory.

I would therefore like to have the privilege of sending a man to your factory at Orange, from each one of my sub-agents, for the purpose indicated above, and to have permission for them to remain a sufficient length of time to accomplish the purpose in view. Very truly yours,

The North American Phonograph Co.
By Jesse H. Lippincott Prest.[a]

<Say all right that I can take them on in our assembling & test Room at factory inside of 15 days E[dison]>[2]

TLS, NjWOE, DF (TAED D8848AER). [a]Names of both signatories written by hand.

1. That is, the North American Phonograph Co.'s regional licensees or "sub-companies" such as the Metropolitan Phonograph Co. and New England Phonograph Co.

2. Edison's marginalia was the basis for a brief typed reply sent in his name a few days later. TAE to Lippincott, 17 Nov. 1888, Lbk. 27:110 (*TAED* LB027110).

–3283–

From Sigmund Bergmann[1]

New York, Nov 20th *18888*[a]

My Dear Edison

What I shall communicate to you in this letter I might say to you in person, but when my feelings are as deeply involved as they are in this matter, they might get the better of my Judgment and lead me to say what I might perhaps afterwards find some difficulty in explaining or substantiating.[2]

This will not be the case with the statements that I shall make in this letter.

On every hand I get the information that your whole wrath has been concentrated upon me. I am constrained to defend myself and though I do not seek Justification, still I shall state my defense to you, if no other result follows than that my communication will bring to you a few truths, to which you will do well to listen as you get them too seldom nowadays.

First You tell everyone that you have made me rich. Let us concisely review the history of our business connections and see how far you have done so. I shall be as brief as possible and will not go back to the time when, a skilled mechanic, I first worked for you in 1870 for $12.00 a week; but only to the time when I already had an established business of from $35,000.00 to $50,000.00 per annum and you first turned work into my shop.

You gave me your telephone work at that time, because, as you yourself told Pres'dt Orton of the Western Union Telegraph Co.[3] and others, you knew of no one who could do the work cheaper, quicker, and more satisfactorily and who generally was better acquainted with the details than I. Shortly after, or at about the same time, you sent Mr Johnson to me after he had been floundering around in shop after shop trying to get Phonographs made to suit him both in quality and price.

From that time on, I filled a large portion of your experimental orders. The books will show that I charged less profit on your work than I easily got on all others

My own time on it days, nights and Sundays, never was reckoned. Besides I had to wait for my money for most of it a year or more, which was no small hardship for me then. I even took payment of part of the a/c in E.E.L. Co.[4] stock at $1750.00 per share for which I could only get $900.00 per share a month later

Up to this time, did I do your work because you wanted to make me rich,? or because I did it as well and cheaply, or more so, than any one else?

In October 1882 I bought this property. I bought it at a big bargain and right from the enemy—your enemies who, three days later, when they saw who had bought it, offered me $10,000.00 to return the property and cancel the contract.[5] At this time I asked you to come in as a partner in Bergmann & Co which you did and paid 38,000.00 On this investment you have since drawn in profits and dividends up to Sept 1st $77,785.81 in cold cash. To this is now added the value placed on the property itself by the accountants viz:—133 per share making the ⅓ purchased by you for $38,000.00 worth $333,000. to which add what you have drawn as above and you get a grand total of over $410,000.00 as the result of your investment of $38,000.00 in partnership with me.

You moved your laboratory into the building and the rental which I charged you was much less than what it was worth or what anyone else would have had to pay. It was a pretty good bargain for you. Bergmann & Co did your experimental work at 45¢ per hour. For the same kind of work we got then and get now from 60 to 75 cents per hour

At this time also, you will recollect, I again worked, days nights and Sundays, on Telephone Experiments, and together with Mr Johnson made and secured patents not only for improvements, but even for entirely new telephones which you yourself thought sufficiently novel to start an opposition Company on, as you advised me to do. I know that I was not the one who reaped the benefit of these inventions. I had not even the Empty honor of being considered the real author of my own, when you negotiated with the American Bell Telephone Co[6] to dispose of them

I do not know to this day what Value they placed on them

The phonograph business was taken away from this establishment, and I consider that there was no Justification for doing it

We were given no chance whatever though you know that I was more thoroughly acquainted with it than anyone else Excepting yourself, and it was given into the hands of Strangers. You have made the accusation and spread it abroad that I sold my phonograph stock twice. I risked my own money when I went into that speculation and bought the stock and when I sold it again, you accused me of selling it twice.

You know as well as I do that this is not so. When you called me to Mr. Lippincotts office, you complained that Mr Painter was squeezing you and I told you that as far as I could prevent it, your own deal should not be interfered with, and that my stock would be at your service to prevent anything of the kind, if needed; and that I would be satisfied with 15.00 per share for it. When afterwards, the contract was signed and the whole stock sold for $21.50 per share, and Mr Painter insisted on having $25.00 for his, I sacrificed mine, and so that you could get your payments, I took $17.50 per share. Nor did I do this because you told me that you had me down for $5000.00

Of a piece with the taking away of the phonograph from here is the constant Encroachment that is being made on Bergmann & Co stock by the other shops,[7] and how far this encroachment has gone you know as well as I do. I think that you also know how much of Bergmann & Co. would be in Existence now if I had not fought all their attempts as hard as I have.

I must not forget my connection with the United Co[8] of which you are personally the largest owner. You may or may not know what I have done to help it along. In its councils and deliberations I have always to the best of my ability advised and acted for your best interests, recognizing all of the time, as I have stated above, that it practically belonged to T. A. Edison. I have acted as its Treasurer since its beginning without remuneration and whatever others might have done in the same position, I know that its treasury was carefully guarded in my hands. Not only that, but I lent it when it needed it, the assistance of my personal credit and influence with the directors of its banks and secured for it a line of discount which, at that time it would otherwise have been unable to get. I have not been and do not claim to have been any more responsible for the results which it accomplished than its other officers and directors but I have the gratification of knowing that my voice and vote are on record in its minutes on the side of whatever policies it has pursued with any measure of success and against many that would have probably resulted in the opposite.

So much for the manner in which we have treated each other in matters of business and money. I will go before any unprejudiced Jury with the above Statement, every word of which is true, and abide by their verdict as to whether you are Justified in the implication of unfair dealing on my part which contained in the statement that you made me rich and now find me ungrateful.

Second. Having dealt with what I have done that is on record and can be proved, I cannot complete this communication without stating what have been my motives and aims in my dealings with you.

It is no credit to anyone to be honest, but whatever virtue there is in such a course is all the pay that I now have for the way in which I have always dealt in all matters that involved your interests.

When the Sprague Company[9] was formed about 3 years ago, I had the opportunity of taking an active interest in the enterprise and by investing a few thousand, of making a hundred thousand. I did not stay out of it, because, as I told Mr Johnson, and others, I had no faith in it, but because in this, as in all other ventures of this kind, I did not want to take a hand until I knew that you were in accord with the scheme; a fact which at the time I had reasons to doubt.

It cannot be a secret to you, for the fact is known to many, that Bergmann & Co have been solicited time and again by Rival Electric Light Companies to make for them the same kind of apparatus and appliances as they were making for the Edison System. It would have been unnecessary for them to make anything that the Edison System was using. They were so anxious (and are now) to secure our facilities for making and perfecting their own devices, that they would have paid good prices and as time has shown their business would have been Enormously profitable. Was it a regard for your interests or my own that kept me from making a great deal of money in this way?

I do not hesitate to claim for the work that Bergmann & Co have done and the improvements which I made, and the fact that rival companies could not get our facilities, a large share of the success which has been the portion of the Edison business.

While on this topic, I also wish to remind you that half of the business that has been done by Bergmann & Co had no connection whatever with the Edison Electric Light and that half too has been by far the most profitable.

As for the money that I have made much of it has accrued to me as the result of Judicious investments in real estate and other speculations which involved much less work and care.

I have stood alone many times in the history of the Edison Electric Light business and defended your interests against wily plots and schemes and there are those who can now tell you that otherwise we would be paying Enormous royalties thereto had I not foreseen and defeated them

Last but not least by any means, I never failed to do for you whatever you asked of me. That you know this is proved by the fact that when you wanted assistance particularly in a financial way I believe I was the first one to whom you came; and how often my private purse appeared to you to be that of the concern you did not know and I daresay did not give the matter a thought. I am not sorry that you are no longer obliged to call on us. I am glad you are prosperous.

I made one great mistake however. It is true that I would make it over again under the impression that it was praiseworthy: but it was a mistake for all that, in my dealings with you. I ran the affairs of the concern which I managed on my own responsibility and according to my own judgment. The fact that they have met with some measure of success does not justify the course which I took. I was told that I did not see you often enough, but I thought that I had your good will if not your friendship and that I could run my own affairs and look after your interests in Bergmann & Co without continually divining into your Ear, nursing your little hobbies and blowing my own horn to you as I am told many others do. On the contrary rather than do this and carry complaints to you, I have stood slights and insults. But when you got Complaints against me, which was not seldom I am sure, I feel that the decision was against me before my case was heard.

What I thought you should see and know, as for instance new devices and improvements on old, whenever they were important Enough I sent to you, but I have good reason to believe that many of the important personal letters which I thus sent to you never reached your hands but were filed away, and many of my samples you never saw. They were mislaid (?) by subordinates, I suppose, whose ambitions were not helped by your recognition of any value in <u>my</u> work.

I can close fittingly by referring to the only evidence, or perhaps I should say want of evidence, that I have of any desire on your part to signify that you appreciated or thought well of anything that I did.

For two years I managed the affairs of Bergmann & Co for $50.00 a week and paid my Expenses out of my own pocket too, but you never troubled yourself to suggest any of the gradual additions that have been made to my salary since then. I was left, when forced by a sense of injustice to myself and my family, to ask for that compensation which was already my due

Now I have told you some of the things which I have done for you What have you done for me? Only this, that you gave me an opportunity to do some of your work. I think I can ask of you now, one thing more and that is that you will hereafter pocket your ill feeling to me, and call off your barkers.

I do not want this misunderstood—I do not want any favors—I never did and do not now, but I have the right to demand that I be let alone. All this of which I have now relieved my mind has worried me a long time and in the face of all that I have thus plainly recorded, I am puzzled to account for your always having taken such a stand against me. Perhaps even this letter may afford further opportunities for rideculing and pecking me to pieces, but whether it does so or not, the cold facts that I have therein recorded cannot thereby be wiped out.

Regarding the stock of Bergmann & Co that I have sold— No one can question my right to dispose of my own property, and it has not been sold, as is rumored, because I purposed going into an opposition concern, but simply because I have been squeezed so hard that the pressure became too much for my comfort and I was tired of playing the foot-ball for others.

You have been trying to get control of this business and I have not wished to hinder you from doing so. If I had, I would not have sold my stock to your own people at the price that I took for it; and you had better now find someone to look after your interests in this concern, whom you have no suspicions against, as a short time ago, you said you had against me, and who can do so better than I have done, for I do not intend to remain in charge of it any longer

I send you this statement of facts in the hope that it may contain some of which you have 'till now had no knowledge, and not for the purpose of starting a controversy and remain[10] Yours truly

S. Bergmann.

LS, NjWOE, DF (*TAED* D8802ABX). Letterhead of Bergmann & Co. [a]"*New York,*" and "*1888*" preprinted.

1. Bergmann's letter reflects on his long association with Edison. The editors identify individuals, companies, and places mentioned here but have not otherwise endeavored to annotate past events, many of which appeared in previous *TAEB* volumes, nor have they tried to corroborate Bergmann's accounts of more recent ones. Cf. Docs. 3198 and 3248.

2. The disagreements underlying this letter were almost certainly brought to the fore by Bergmann's role in Uriah Painter's campaign to gain full control of the old Edison Speaking Phonograph Co. and reach a settlement with Jesse Lippincott for its disputed patent rights (a process that Painter understood might well interfere with Lippincott's ability to pay Edison). Bergmann agreed in late September to sell Painter 3,205 shares in the firm for $17.50 each, despite Painter's recent boast that the stock was valued at $50 per share. Painter's optimism seems to have been founded at least in part on a variant form of phonograph devised by Bergmann over the summer. Bergmann thought his instrument would be worth $100,000 to the old company but was, according to Josiah Reiff, "very nervous" that working with Painter could jeopardize his lucrative manufacturing relationship with the Edison lighting interests. Painter to Josiah Reiff, 19 Aug. 1888; Painter to Bergmann, 28 Aug. 1888; Reiff to Painter, 30 Aug. and 19 Sept. 1888; Bergmann to Painter, 21 Sept. 1888; all UHP (*TAED* X154A7DL, X154A7DW, X154A7DX, X154A7EH, X154A7EK); cf. Doc. 3248 esp. n. 10.

3. William Orton (1826–1878) was president of the Western Union Telegraph Co. from 1867 until his death. Under his direction, Western Union consolidated the industry and brought the majority of the na-

tion's commercial telegraph traffic under its control. Orton also promoted technical innovations and became an early and formative patron of Edison's inventive and manufacturing enterprises. Doc. 139 n. 1; *ANB,* s.v. "Orton, William."

4. That is, the Edison Electric Light Co.

5. Bergmann bought the property at 292–298 Ave. B (corner of 17th St.) in New York City from the United States Electric Lighting Co.; cf. Doc. 2343 (and associated headnote).

6. The American Bell Telephone Co., of Boston, enjoyed an effective telephone monopoly in the United States. It owned the patents of Edison and Elisha Gray, acquired by its predecessor from Western Union in 1879, in addition to those of Alexander Graham Bell. Doc. 2420 n. 45.

7. That is, the Edison Machine Works and the Edison Lamp Co. See, for example, Doc. 3198 and, regarding a very recent dust-up about equipment for the Edison central station in Philadelphia, Samuel Insull to Edward Johnson, 19 Nov. 1888, DF (*TAED* D8802ABP).

8. The Edison United Manufacturing Co., formed in 1886 to coordinate the manufacture, sale, and installation of equipment by the Edison Machine Works, the Edison Lamp Co., and Bergmann & Co. Doc. 2958 n. 2.

9. The Sprague Electric Railway & Motor Co.

10. Edison's reply is Doc. 3286.

–3284–

To James Dredge

[Orange,] Nov. 22, 88.

Dear Mr. Dredge.—

There seems to have been a little misunderstanding as to the object I had in view when I sent Mr. Wiley to England with the Ore Milling machine. The arrangements which were entered into for making an exhibit at the Crystal Palace[1] were not at all in accord with the understanding I had with Mr. W. H. Wiley.[2] It was not my intention to make any public exhibition of the process, but to have it shown to yourself and only such friends of yours as you might desire to have see it.[3] I wrote to Mr. Osgood Wiley about two weeks ago, telling him that I did not wish to have the machine exhibited at the Crystal Palace and instructing him to consult you with regard to where you wish the exhibition to be made for the benefit of yourself and your friends.[4] Mr. Wiley was instructed further by me not to open the boxes containing the machinery until I gave the word that certain matters pertaining to patents, which are not now in proper shape, had been adjusted.[5] As soon as the obstacle in this connection has been removed I will advise Mr. Wiley and also yourself. Meanwhile, I presume you will arrange facilities for exhibiting the machine in accordance with my original understanding with Mr. W. H. Wiley.[6] Yours very truly,

Thos A Edison

TLS (letterpress copy), NjWOE, Lbk. 27:133 (*TAED* LB027133).

1. Originally built in London's Hyde Park for the Great Exhibition of 1851, this vast glass conservatory was afterwards relocated and enlarged across the Thames at Sydenham, where it was a major venue for concerts, performances, and exhibitions. *London Ency.,* s.v. "Crystal Palace."

2. William Halsted Wiley (1842–1925) was an older brother of Osgood Wiley. He was a partner in John Wiley & Sons, the current iteration of the family's New York publishing business known for its scientific and technical titles. He was also New York correspondent for the London journal *Engineering* (Doc. 2981 n. 1). Wiley may have become involved with ore milling as an intermediary for James Dredge (who agreed to advance money for Osgood Wiley's expenses on Edison's behalf); Edison promised him one-third of royalties resulting from any arrangement with "your English friends." In July, W. H. Wiley was "very sanguine" (according to Osgood) about his prospects and, later in the summer, was reported (again by his brother) to be "very anxious" to see Edison on the matter (TAE to W. H. Wiley, 15 June 1888; TAE to Dredge, 24 Sept. 1888; O. Wiley to TAE, 5 July and 22 Aug. 1888; all DF [*TAED* D8818AMT, D8818ATP, D8845ACA, D8845ACX]; TAE to George Gouraud, 22 Nov. 1888, Lbk. 27:131 [*TAED* LB027131]).

3. Osgood Wiley sailed for London on 26 September, carrying with him phonograph recordings for George Gouraud ("Playing for Europeans: Phonographic Cylinders Sent from Orange to Europe," *Orange [N.J.] Herald,* 29 Sept. 1888, Clippings [*TAED* SC88114B]). Edison's communication with Dredge did not specify the type of demonstration to be made, but soon after reaching London, Wiley planned to set up the separator at the works of gold and silver refiners Newbery-Vautin, which had rollers and crushers on site. A few days later, however, he announced a different plan. He had arranged through Dredge and Gouraud "to put it up at the Crystal Palace & am having Magic Lantern slides made to be shown at the same time as those of the phonograph All this has been arranged & recommended by Col G & Mr Dredge I shall not make any move without first consulting them— We shall give it a big boom & its success is gauranteed I am sure." Wiley did not have all separator's parts, including the hopper, before late October (TAE to Dredge, 24 Sept. 1888; O. Wiley to TAE, 8, 12, and 26 Oct. 1888; all DF [*TAED* D8818ATP, D8805AHF, D8845AEH, D8805AIH]). Wiley later attributed the Crystal Palace idea to Dredge, but the latter, having just returned from Paris, seemed to know little about the plan and instead endorsed Newbery-Vautin to Edison. It was Gouraud who enthused about the Crystal Palace, to whose operators he had already applied, though he advised that Wiley should take no action

without specific approval from the United States (O. Wiley to TAE, 9 Nov. 1888; Dredge to TAE, 15 Oct. and 10 Nov. 1888; Gouraud to TAE, 12 Oct. 1888; all DF [*TAED* D8845AFM, D8805AHQ1, D8845AFN, D8845AEI]).

4. Edison's 29 October typed letter to Osgood Wiley, likely written by Alfred Tate, was unequivocal: "you were sent over to show the Ore Milling program to Mr. Dredge and his friends, and not with the object of making any public exhibition which would call forth newspaper comment. It would be entirely against my wishes and very detrimental to my interests were the exhibition to occur at the Crystal Palace." Gouraud's connection with the phonograph, he continued, likely had led Wiley to assume he had some authority in ore milling as well but, he warned, "If such is the case, you are entirely in error." On 22 November, he also wrote to Gouraud expressing gratitude for help with ore milling and his solicitude to Wiley but firmly disapproving the Crystal Palace plan as "entirely out of accord with my desires and with the understanding" he had with William Wiley on Dredge's behalf. TAE to O. Wiley, 29 Oct. 1888; TAE to Gouraud, 22 Nov. 1888, Lbk. 25:401, 27:131 (*TAED* LB025401, LB027131).

5. Edison cabled on 26 October: "Machine must not be unpacked or exhibited to any one pending arrival patent papers about three weeks." That message, like others to Wiley, was addressed in care of Dredge's *Engineering* office, but Wiley often wrote on Gouraud's letterhead or that of the Edison's Phonograph Co. office in London, where he had his mail forwarded, and he was living at or near Gouraud's home in Upper Norwood. This evident familiarity led Alfred Tate to conclude that Gouraud had "completely captured young Wiley" for his own ends. For his part, Wiley termed Gouraud "a Daisy romancer" for disavowing his own part in the Crystal Palace scheme but promised that Gouraud had "never put me to sleep." TAE to O. Wiley, 26 Oct. 1888; Tate to Samuel Insull, 5 Nov. 1888, Lbk. 25:268, 404 (*TAED* LB025268, LB025404); O. Wiley to TAE, 9 and 23 Nov. 1888; both DF (*TAED* D8845AFM, D8845AGF).

6. Edison's laboratory staff coordinated the shipment of equipment in the latter part of September. Two packages, likely the dynamo and a one-ton magnet, originated at the Edison Machine Works in Schenectady. The laboratory also created several smaller parcels weighing together about another ton, probably containing parts for the hopper. The equipment was delivered to the Crystal Palace but remained in sealed crates pending transfer to the Newbery-Vautin Gold Extraction Co. on or about 24 November. Charles Batchelor to Edison Machine Works, 19 Sept. 1888; Dredge to TAE, 10 and 24 Nov. 1888; O. Wiley to TAE, 23 Nov. 1888; all DF (*TAED* D8818ATL, D8845AFN, D8845AGH, D8845AGF).

–3285– [Orange,] Nov. 22, 88.

Adelbert Wangemann to Arion Singing Society[1]

PHONOGRAPH DICTATION.[a]

Dear Sirs:—Your letter of recent date has been duly received.[2] Mr. Edison will be very pleased to see the members of your Society at the Laboratory on Sunday, December 2d, any time after two o'clock p.m. If it would be convenient, we would like very much to have a double solo quartet visit us before Dec. 2d., in order that we might have a small trial before taking the whole chorus.[3] We will send you some time next week a number of passes which will admit the members of your Society to the Laboratory. Kindly let us know the number of gentlemen you expect to[b] come here and we will issue passes in accordance therewith.

Yours very truly,

A. Theo E. Wangemann.[4]

TLS (letterpress copy), NjWOE, Lbk. 27:117 (*TAED* LB027117). [a]"PHONOGRAPH DICTATION." stamped on document. [b]Interlined above.

1. The Arion Singing Society of Newark, N.J., founded in 1859, was reportedly among the largest of the city's numerous German choral groups, with about sixty-five members. Wangemann addressed his letter to the group at Saenger Halle in Newark. Shaw 1884, 1:545; "Funnels Full of Songs," *New York Herald,* 3 Dec. 1888, Clippings (*TAED* SC88070B); "Kisses by Phonograph," *NYT,* 3 Dec. 1888, 3. SC88070B); "Kisses by Phonograph," *NYT,* 3 Dec. 1888, 3.

2. Not found.

3. The society evidently sent a quartet for a sound test on 27 November (L. Dettler to Wangemann, 27 Nov. 1888, DF [*TAED* D8847ADJ]; cf. "Singing for the Phonograph," *Newark Register,* [26 Nov.?] 1888, Clippings [*TAED* SC88039B]). The full chorus was recorded at the laboratory on 2 December, marking "the first experiment with so large a chorus," according to the *New York Times.* They sang into three large funnels (19, 9, and 5 feet long), each connected to separate phonographs operated by Wangemann and three assistants (Edison observed the proceedings). Afterward, the recorded concert was played back to 150 people, who listened five at a time through ear tubes. The *Times* reported that "The vocal parts were reproduced very distinctly indeed, and every effect of light and shade seemed as effective as when given under Mr. [Frank] Van der Stucken's direction ("Kisses by Phonograph," *NYT,* 3 Dec. 1888, 8; "Funnels Full of Songs," *New York Herald,* 3 Dec. 1888, Clippings [*TAED* SC88070B]).

4. Adelbert Theodor Eduard Wangemann (1855–1906) moved from Berlin to Boston with his brother in 1879. Their family had been both musical and industrial, making their living manufacturing envelopes and embossing stationary. By 1884, Wangemann became a naturalized citizen, married, and entered the paper trades in New York City. Said to be an accomplished pianist, he began working in Edison's laboratory on the phonograph by the first of June 1888. How he made a connection there is not known, but his experience with both music and em-

bossing would have recommended him. He was in charge of musical recordings by September 1888 and corresponded with a number of performers about recording at the laboratory. While in Europe in 1889, he recorded a number of prominent figures, including Johannes Brahms, Otto von Bismarck, William Ewart Gladstone, and the future King Edward VII of Great Britain. Wangemann baptismal record, 13 Apr. 1855, *Germany, Lutheran Baptisms, Marriages, and Burials, 1519–1969,* online database accessed through Ancestry.com, 21 Feb. 2017; "Had Death Presentiment," *NYT,* 4 June 1906, 2; Wangemann passport application, 7 Sept. 1889, *U.S. Passport Applications, 1795–1925,* online database accessed through Ancestry.com, 20 Feb. 2017; Wangemann naturalization record, 11 Oct. 1884, *U.S. Naturalization Record Indexes, 1791–1992,* online database accessed through Ancestry.com, 20 Feb. 2017; Feaster 2012a; Wangemann time sheets (esp. 7 June 1888), Time Sheets, WOL; Alfred Tate to John Turner, 6 Dec. 1888, Lbk. 27:307 (*TAED* LB027307); *TAED,* s.v. "Wangemann, Adelbert Theodor Edward"; "Death of A. T. E. Wangemann," *Edison Phonograph Monthly,* 4 (July 1906), 6; Klinger 1988, 1–2.

–3286–

To Sigmund Bergmann

Orange, N.J., Nov. 23, 88.[a]

Copy[b]

My Dear Bergmann,—

Your letter received.[1] I have never yet said anything that I would not say to your face. 1st. I never said that I had made you rich. I never used that sentence in connection with any of my associates who have got rich. The person who says I did tells you falsely. 2nd. I have told you what I thought of you to your face and never any addition to this statement has been made behind your back. 3rd. You never had any legal or moral right to the new phonograph or to manufacture it. I took up this subject in my own Laboratory, paid for all the experiments and now manufacture it myself. 4th. No encroachment on the understanding regarding division of work between the three shops has ever come to my knowledge. 5th. I have never tried to control your Company; have the same shares now that I had a year ago and no more; have not furnished a cent or helped by loan any other to get control. Dont want control—[c] I consider it the acme of cheek to tell me that I am or ever was [————]^d suspicious of you in running the Company, when I have never been there in two years or made any inquiry [———][d] whatsoever, although a ¼ owner; this <u>action</u> refutes any <u>statement</u> you make.

I have always done everything to help every one of the boys; I have always been glad they were getting wealthy; the more they made the better it pleased me; I am glad you are well fixed; would not do a thing to prevent you making money; all the money you have you made yourself by your ability; that you had a chance to exercise that ability was due to me; you have been worked up to a state of dam foolishness by your enemies, of which you have a very choice and extensive collection.

Your action with Lippincott cannot be defended on any known ground of commercial usage and is a thing which will in the future be a source of regret to you.[2] You are too fierce to make money. Whereas, your standing in the city where you live and die should have been your first consideration and money afterward.

E[dison].[e]

TL (copy), NjWOE, DF (*TAED* D8802ABY). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" preprinted. [b]Written in unidentified hand. [c]"Dont want control—" interlined above in unidentified hand. [d]Canceled. [e]Initialed for Edison in unidentified hand.

1. Doc. 3283.

2. Bergmann had an ongoing involvement with Uriah Painter's efforts to effect a settlement of phonograph rights with Jesse Lippincott. See Doc. 3283 esp. n. 2; Josiah Reiff to Painter, 17 Nov. 1888, UHP (*TAED* X154A7ET).

–3287–

Alfred Tate to Samuel Insull

[Orange,] Nov. 23, 88.

My Dear Insull,—[1]

In regard to financial condition of the Edison Phonograph Works. I have arranged with Mr. Edison to make them a loan, to carry them through the period that intervenes between the commencement of manufacture and the production of completed machines.[2] I estimate that the money so to be advanced will amount to about twenty thousand dollars. Mr. Edison does not desire to disturb his deposit at Drexel, Morgan's.[3] It is, therefore, necessary for me to consider the amount of $10,000 which the Machine Works owes Mr. Edison on those two notes which we met for you. If you cannot give us cash conveniently, I can use the Edison Machine Works notes. Can you let me have the latter within three or four days?[4] Yours very truly,

A. O. Tate

TLS (letterpress copy), NjWOE, Lbk. 27:144 (*TAED* LB027144).

1. This letter was addressed to Insull at 19 Dey St., the New York City office of the Edison Machine Works.

2. Edison advanced $19,450 to the Phonograph Works sometime between its inception and the end of 1888. In late December, Tate wrote to Edison in Akron, Ohio, about providing money to the laboratory and the factory, noting that he would "give the Phonograph Works just sufficient money to carry them until your return next week, when we will have to decide upon some means of providing them with funds, until they commence to turn out machines, our $15,000 credit at the Orange Natl Bank being exhausted." The factory seems to have begun limited operations—at least making motors—about the middle of January. Edison Phonograph Works statement, 1 Jan. 1889; Tate to TAE, 27 Dec. 1888; Insull to TAE, 18 Jan. 1889; all DF (*TAED* D8957AAA, D8805AKB, D8930AAD); Tate to Sprague Electric Railway & Motor Co., 21 Jan. 1889, Lbk. 27:855 (*TAED* LB027855).

3. Drexel, Morgan & Co., the well-known banking house in New York, had played a crucial role in launching Edison's electric lighting enterprises and also served as a personal bank for him. Doc. 2877 n. 10.

4. The Edison Machine Works had a long history of taking loans from Edison, usually for short periods (see, e.g., Doc. 3067 n. 3; Tate to Insull, 23 Nov. and 18 Dec. 1888, Lbk. 27:136, 482 [*TAED* LB027136, LB027482]). Here Tate referred to two $5,000 notes payable to Edison that Edison had paid when they matured in early November. To cover that indebtedness, the Machine Works issued new notes for the same amounts, due in April. Tate planned to send out for discount two Machine Works notes in mid-December, presumably the two that he sent to Edison in Akron after Christmas for endorsement, intending to use the proceeds to supply the laboratory and Phonograph Works with cash (Tate to Edison Machine Works, 27 Nov. 1888; Tate to German National Bank, 12 Dec. 1888; Lbk. 27:191, 372 [*TAED* LB027191, LB027372]; Tate to TAE, 27 Dec. 1888, DF [*TAED* D8805AKB]); see Doc. 3302.

–3288–

From Franck Maguire

Chicago, Novr 24th *1888*[a]

My Dear Sir:

I have intended writing you for several days past but the exhibitions have kept me extremely busy. We have had hundreds of visitors and without exception every one has been delighted. Among our guests were Ex President R B Hayes,[1] Hon Jos Medill Ed. Tribune,[2] Ex Postmaster=General Hatton,[3] Mr. Raster Ed. Staats Zeitung,[4] Gov. Beveridge[5] &c & all these gentlemen express themselves satisfied of the business utility of the machine   All the newspapers commented favorably, with one exception upon the machine. The Inter Ocean made a decided attack on the machine.[6] This was done by a new and fresh reporter. The editors of the paper express regret at the article but have not the manliness to correct. I have authorized a friend to offer this impecuneous editor $500 for the discharge of the reporter and correction of the article. I do not think the article has done any harm but it embarrasses me to know that this attack was made right under my nose

We have had more trouble about batteries than anything else. No batteries were sent Neither was a mouth=piece sent. Can you have sent a half dozen blank cylinders and some good musical records.

When will we be able to get a phonograph for President-elect Harrison[7] I presume Mr Dale[8] has spoken to you about this We are desirous of making a fine exhibition for him. Yours Very Truly

F Z Maguire

ALS, NjWOE, DF (*TAED* D8847ADI). Letterhead of Grand Pacific Hotel. [a]"*Chicago,*" and "*188*" preprinted.

1. Rutherford B. Hayes (1822–1893), nineteenth president of the United States, retired from office in 1881 and devoted himself to educational causes and penal reform. In 1878, Edison had personally demonstrated his new phonograph to President and Mrs. Hayes in Washington. *ANB,* s.v. "Hayes, Rutherford Birchard"; see Doc. 1299.

2. Joseph Medill (1823–1899) helped rescue the *Chicago Daily Tribune* from insolvency in 1855, becoming its general manager and managing editor. Active in the new Republican Party, he was instrumental in nominating Abraham Lincoln for president in 1860 and served a single two-year term as Chicago's mayor in the aftermath of the 1871 fire. At the close of his term in 1874, he acquired full financial and editorial control of the *Tribune* and became inseparably identified with the paper and its pro-business views. Medill had corresponded with Edison about his own deafness, and Edison looked to the *Tribune* on at least one occasion for editorial support of his priority claims in electric lighting. *ANB,* s.v. "Medill, Joseph"; Medill to TAE, 22 Apr., 7 May, and 16 Aug. 1878; all DF (*TAED* D7801A8, D7801B, D7801G); see Doc. 1929.

3. Ohio-born Frank Hatton (1846–1894) was formerly a newspaper editor and publisher in Iowa, where his activities on behalf of national Republicans (and James Garfield in particular) resulted in his appointment as assistant postmaster general in 1881 and, three years later, as postmaster general. Displaced by the new administration of Grover Cleveland, Hatton moved to Chicago in 1885 and re-entered the newspaper business as editor of the *Chicago Mail. DAB,* s.v. "Hatton, Frank."

4. Hermann Raster (1827–1891) was the editor and driving force behind the *Illinois Staats Zeitung* of Chicago, founded in 1848 and by now among the largest and most influential German-language newspapers in the United States. Born in Germany, he studied at the universities in Leipzig and Berlin and began a career in journalism. Following the political unrest of 1848, he emigrated to New York, where he resumed

both his editorial and political work as a proponent of the Republican Party. Raster moved to Chicago about 1866 and soon became an editor of the *Staats Zeitung*; President Grant also named him the Internal Revenue collector for Chicago in 1871. Raster resigned that post after a short tenure and broke with the Republican party, thereafter devoting all his time to the newspaper. Obituary, *NYT,* 26 July 1891, 8; Andreas 1886, 704; Hofmeister 1976, 29, 152–53, 156, 162–63; Townsend 1932 [1927], 23–24; "German Weavers and Their Mode of Living," *American Economist* 8 (14 Aug. 1891): 87.

5. John Lourie Beveridge (1824–1910), a lawyer by training, was a former Union officer, Cook County (Ill.) sheriff, and Republican member of the U.S. House of Representatives. He resigned from the House in January 1873 after being elected lieutenant governor of Illinois; a few weeks later, he filled the just-vacated governorship and served nearly a full unelected term in that office. Beveridge was the U.S. subtreasurer in Chicago from 1877 to 1881. *BDUSC,* s.v. "Beveridge, John Lourie."

6. The *Chicago Inter-Ocean* was created in 1872 around the Associated Press rights of the *Chicago Republican,* whose physical property had been destroyed in the calamitous fire the year before. The new paper remained as reliably partisan as its predecessor's name and was considered just as solidly respectable in cultural matters (Andreas 1886, 698–700; Mott 1962, 463; *Ency. Chgo.*, s.v. "Newspapers"). In an unsigned article, the *Inter-Ocean* puckishly reported on a 20 November exhibition of the phonograph and graphophone for members of the press, made in support of the sale of stock in the new Illinois and Indiana Phonograph Co. "The phonograph recital," it said, "was for free advertising purposes only, and the audience was not large, but it was highly interested." Given a chance to speak into the recording funnel, the writer declaimed, "'Free advertisement is the life of the phonograph trade.' A chill then seemed to fall on all the holders of phonograph stock present." A cylinder of recorded music was played, but "What it was when originally stabbed into the machine would be hard to tell. It really sounded like a cat fight in a hogshead with the cover on. The phonograph will have to be perfected some more before Patti will consent to perpetuate her vocal charms by its agency" (Maguire to TAE, 29 Nov. 1888, DF [*TAED* D8847ADK]; "An Evening with Edison," *Chicago Inter-Ocean,* 21 Nov. 1888, 4).

7. Benjamin Harrison (1833–1901), a Republican and former senator from Indiana, had recently been elected twenty-third president of the United States with a decisive electoral college victory despite trailing incumbent Grover Cleveland in the popular vote. *ANB,* s.v. "Harrison, Benjamin."

8.Not identified.

Draft Caveat: Phonograph

Orange Nov 24 1888

Caveat[1a]

The object of th~~is~~e inventions in this[b] Caveat is to improve the phonograph especially in those devices which relate to the automatic determination of the exact position of the recording & reproducing points on the Recording Cylinder whether thick or thin and without the necessity of adjusting the relation Each time a new or a diferent size recording phonogram blank is used[2]

fig 1[3]

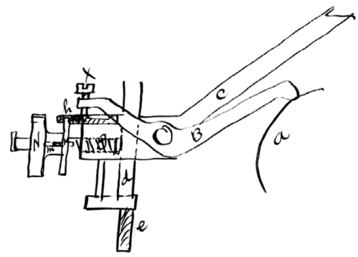


Fig 1 Illustrates one method A the phonogram C the Spectacle arm d the foot which runs on the straight Edge B is a lever provided with a position screw .X. This is adjusted so that when the point on the lever B. touches the face of the phonogram it almost immediately comes in contact with the high surface of a slide bar .h. & this by previous setting is the Exact point where the recording or Reproducing points are in relation to A a further downward moment of C is prevented Now having established the position, N is turned & this being fitted on a smooth End of the clamping screw g serves to clamp d in the proper position. now to prevent the End of B from riding on the surface of the phonogram, The Nut N is ~~shoved~~ pulled[c] outward[d] it being held on the smooth part of g by a Key & seat in Nut, the flange K causes[d] h to be drawn outward the screw X falls in the depression & the lever B is loose & is thus prevented from destroying or rather mutilating a phonogram

fig 2

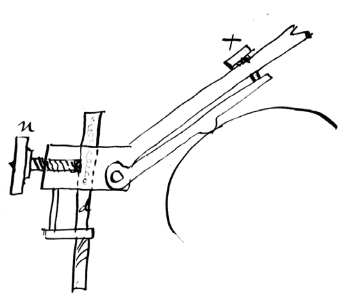


Fig 2 shews a lever for determining the position and after determination & d is clamped by N the screw X is turned[d] back thus relieving the lever[4]

fig 3[5d] Top View

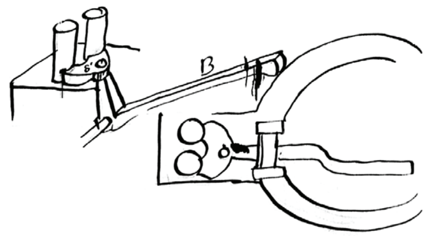


Fig 3 shows two sliding bars which are the Equivalent of d in fig 1 These bars have a thread cut on their surface ½ the number of threads as would be used on a single one. The determining lever serves to throw in a rock lever S having threads on the Extremes of each End of Same[d] number as on the slides The threads of one end are not paralell with Each other or if paralell, the threads on the slide bars are ½ thread out in position, so when the lever B tries to throw rock piece S into threads one will go in while the other will not in Either case the further movement downward of the spectacle arm will be arrested & automatically secured in the proper position. The threads are deep enough to permit after locking of such an Excess of movement in B and to relieve it from riding on the phonogram blank with any pressure.

fig 4[6]

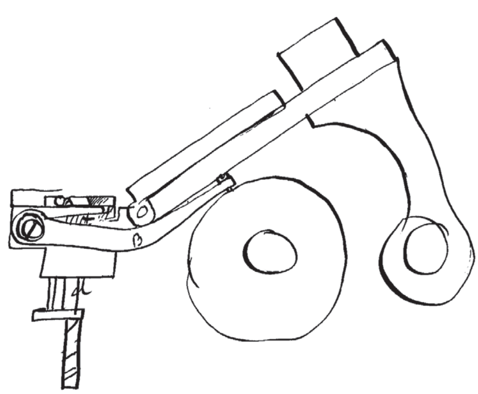


Fig 4 shews instead of a screw to arrest the movement & automatically clamp a clamp ring similar to that used in a Brush arc lamp[7]

The Lever X connects to B by a friction so the moment the slide bar d is Clamped the Lever B is relieved & does[d] not touch the cylinder Except at some minute high point which quickly wears away

fig 5

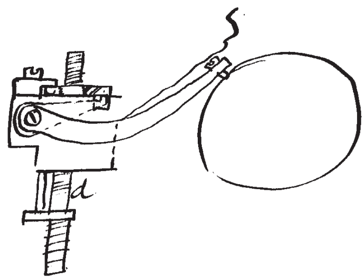


fig 5 shews the clamp nut but with threads Cut on d & on clamp

fig 6

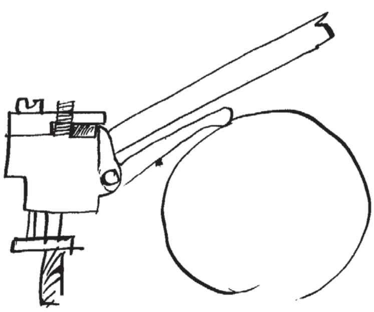


fig 6 shews a single instead of double slide bars as in fig 3

fig 7

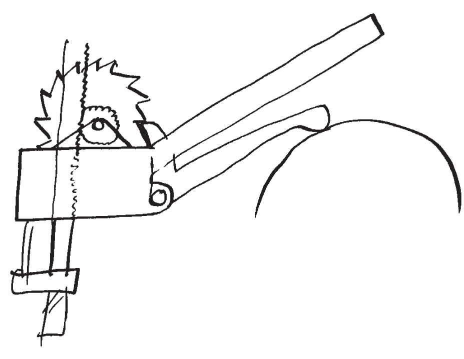


Fig 7 shews slide bar which[c] has a rack with teeth on it which engages[e] with a[c] pinion which rotates a ratchet wheel the lock tak~~es~~ing[f] places at definite points.

fig 8

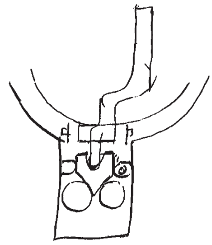


fig 8 is same as fig 3 except that instead of rock bar cluth it has a V shaped cluch which clutches on Either one ~~of~~ or[c] the other of the slide bars acording to which thread is in position.

fig 9

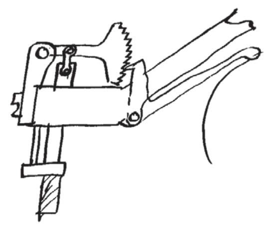


fig 10

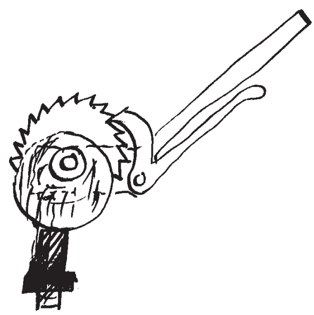


fig 10 shews a Cam as the Equivalent of a d slide bar

fig 11

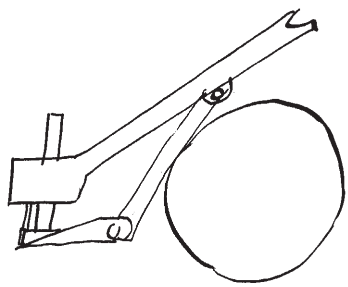


fig 11 shews a different lever for determining
fig 12

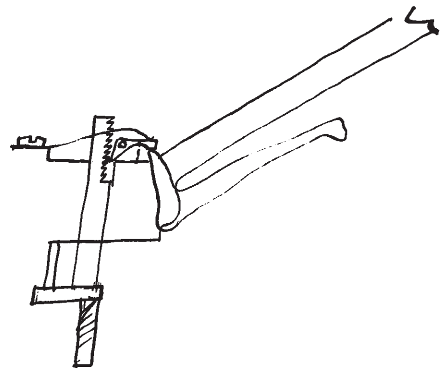


fig 13

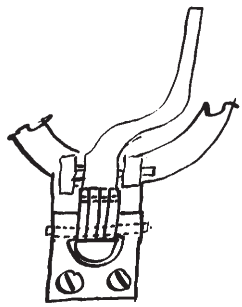


fig 14

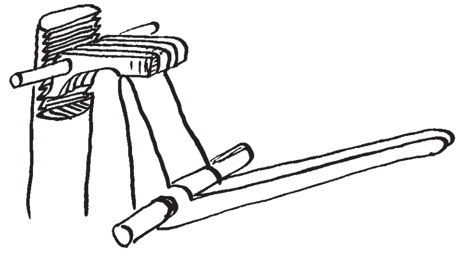
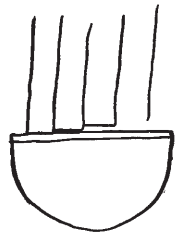


fig 15



figs 12 13 14 & 15 shews a ratchet slide with very Coarse teeth but with four clutches the Ends of the clutch click being graduated in length so that if the rack is 25 threads to the inch the downward movement of the spectacle arm can still being clutched by 1⁄100ths—of an inch—

fig 16

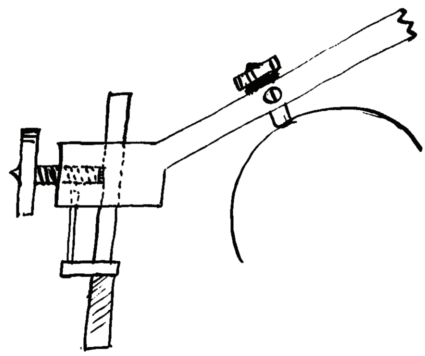


fig 16½

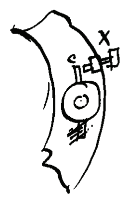


fig 16 shews a determining screw which after clamping is Unscrewed[d] slightly to take[d] it from the cylinder ~~but~~ fig 16½ shews how position for determination can be adjusted by c. & .x.[8]

fig 17

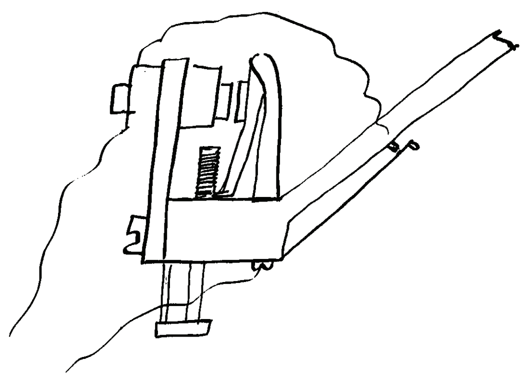


fig 17 shews an Electrical method of determining the locking point, any form of clamp may be used

fig 18

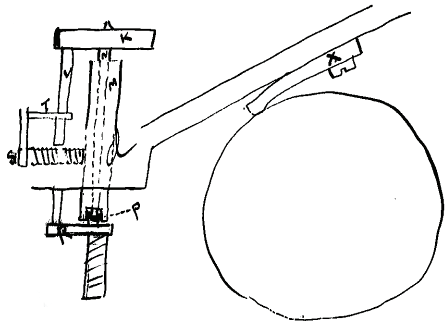


fig 18 shews a fixed determining point X. d is the general slide bar but it is double N being within M at P there is a screw connection between them N is connected to foot .R. while M is not Except through screw p when the point X is on the phongram the downward movement of the spectacle is arrested, on turning .K. the rod V rotates S. T. clamps M. N. but after clamping the friction is not sufficient to prevent N from being rotated & this forces N & R downwards thus raising the spectacle & point of X just off the surface

fig 19

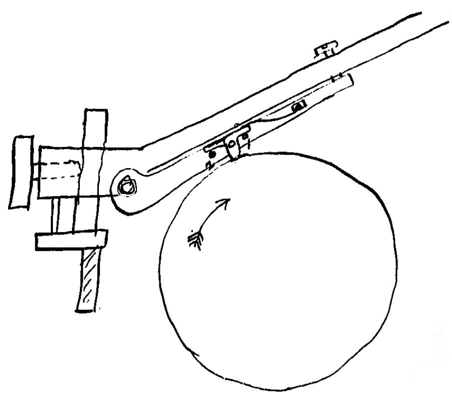


fig 19 shews a determining lever with a pivoted point which rocks if the rotation of the Cylinder is stopped[d] the point with stand out straight & rest on 1 the spectacle is Locked by clamp & on rotation of cylinder the point is canted & as the spring is a delicate hair like one no appreciable rubbing or mutilation of the surface of the cylinder takes place.

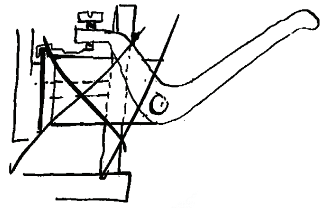


fig 20

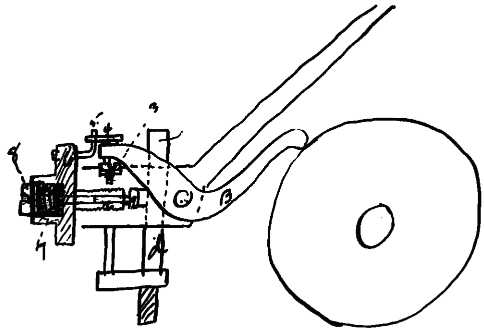


fig 20 shews a determining lever B The clamping nut 6 has another shaft within the screw So that after the spectacle is arrested the rotation of the nut 6 first causes the clamping by 1 & friction 7 adjutable by 8 & after clamping a further rotation of 6 is permissible & this causes a pin 5 to rotate the determining screw 4 to relieve the lever B[9] See fig 21 fig 21 is top view

fig 21

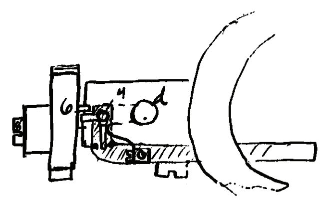


fig 22

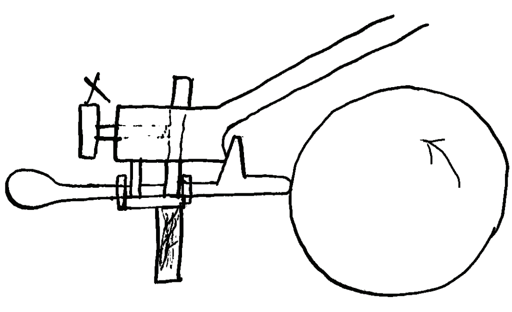


fig 22 shows a hand sliding bar for determining. it is shoved[d] in the spectacle lowered until it will go no further on incline & the clamped by X. The slide bar is rotated & drawn back from cylinder—

fig 23

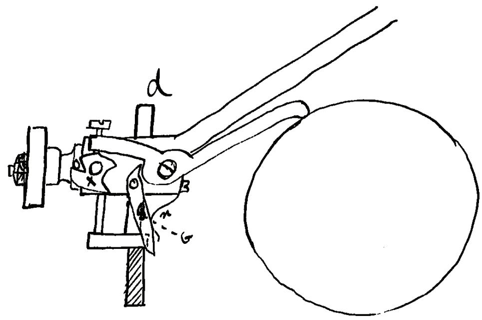


fig 23 shews a determining lever[d] & Lock The clamp nut after clamping d can still have a forward rotation ~~on~~ the clamp screw as it is secured there by friction a pin rotates X & relieves the lever the lever g with spring N is used for the purpose of causing a friction to be placed on d after its pressure foot comes on the straight edge, but the moment the spectacle is lifted the friction is taken off by the spring N shoving it back— This lever touches d on the sides where it produces a friction. No shoving back the slide d by hand is therefore necessary which would be the case were the friction a permanent one—

fig 24

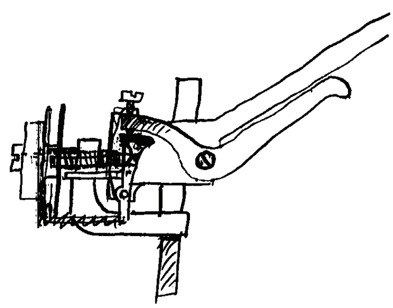


fig 24 shews a device for clamping with a nut on the pressure foot & not on the spectacle arm where awkwardness disturbs the accuracy of the determining point. The ~~claw~~ finger nut can in addition to rotating the clamp screw has a to & fro motion which serves to lock or release the determining lever

fig 25

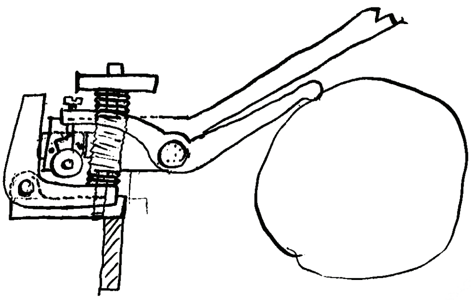


fig 25 shews a similar device but with the hand nut for locking & relieving the lever
fig[d] 26

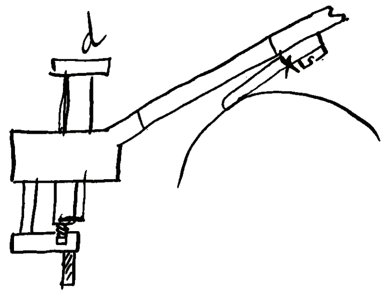


fig 27

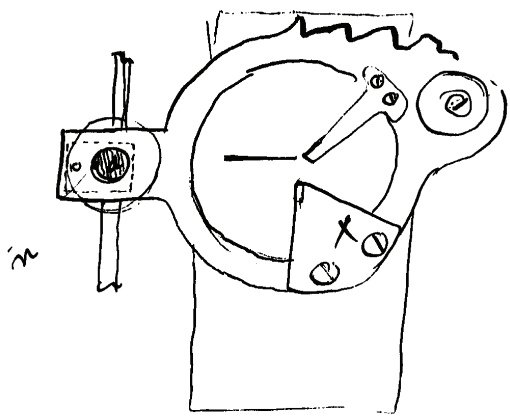


fig 26 shews fixed determining point. Top view fig 27 .X. When spectacle is arrested by it the slide rod d is rotated. in the hole where it slides is a strip n the whole length of the hole. The rod has[d] has a [placed?][g] filed on it as shewn on rotation d is clamped cam like against .n. at the same time the pressure foot on the straight Edge which is connected to d by a screw is forced downward & this raises the spectacle upwards & relieves X from the Cylinder

fig 28

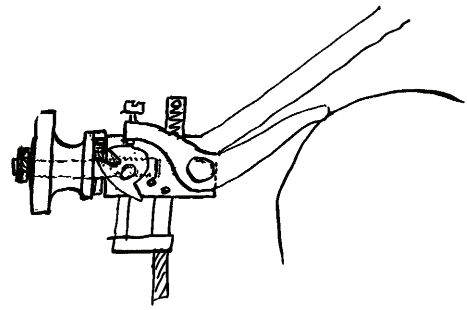


fig 28 a very perfect determining device similar to one already described.

fig 29

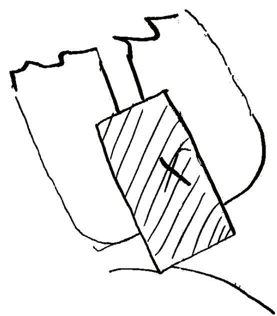


fig 30

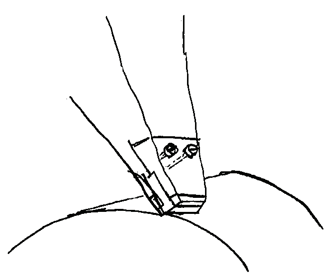


fig 29 shews a saphire turning off tool, The saphire X being clamped in steel. Most materials which are used for recording

Sound waves do not act like Metals in turning. I have found that although much power is required the angle of the Edge[d] of the tool for turning off the [----][h] the phonogram material is that shewn in the fig 29 30 & this is contrary to all Experience in mechanics but it is only in conjunction with the Recording point that this occurs. Tools made in the usual manner give to the Eye a much finer & more[c] polished surface but when the recording & receiving points run over the surface a great amount of noise is heard whereas if the described ~~poi~~ tool is used the surface will not be so smooth or fine looking being rather dull in appearance yet the Recorder or reproducer running over it gives scarcely any sound   it may be due to the fact that at this angle the tool cannot Vibrate on account of the surface & the angle it presents while with a very fine edged tool it can be Easily Vibrated. Another diference which may Explain it is that the maximum backing off as mechanics say[10] occurs at this angle with a sharp edge like Saphire[d] hence no burnishing action takes place as with the regular tool[11]

I prefer to use saphire as I have determined by experiment that perfect Edges can be obtained that will give no streaks on cutting which is impossible with steel & substances which have ductility also that these points do not wear away by grit in the phonograms & that the strength of the material is such that it will stand a great deal of hard usage surprisingly so, and I have determined to make the recording & reproducing points of saphire[12]

fig 31[13]

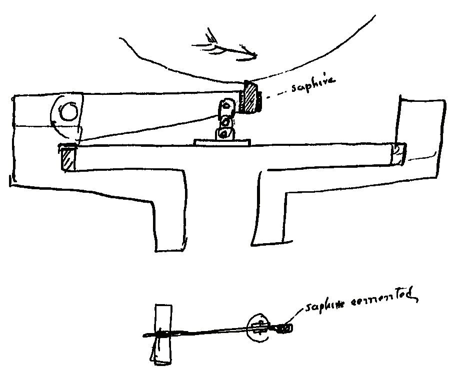


fig 32

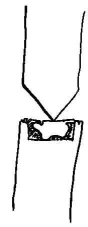


fig 31 shews how I shall secure it to the recording lever Cement[d] being used in addition. the angle at which the point is ground is very important so as to give it maximum strength & yet not have the heel interfere with the record. In the motor of the phonograph I have been using agate bottom bearings secured in a round brass piece Several weeks running of the motor shows a tiny indentation worn in the agate, hence I was Compelled to use a harder material & I adopted saphire ground in shape as the agate the cost was prohibitory but by breaking the crystals in two or more parts as they usually come on the market & cementing the rough piece in the Cup by cement as used by Lapidaries & shown by shaded lines in figure 32[i] I render the use of saphire Commercially available [in?][d] this Connection as but a single surface is required to be ground

In phonographic dolls it is very desirable to make the illusion of speaking perfect that the lips of the Automaton should follow the spoken words as in life—

fig 33

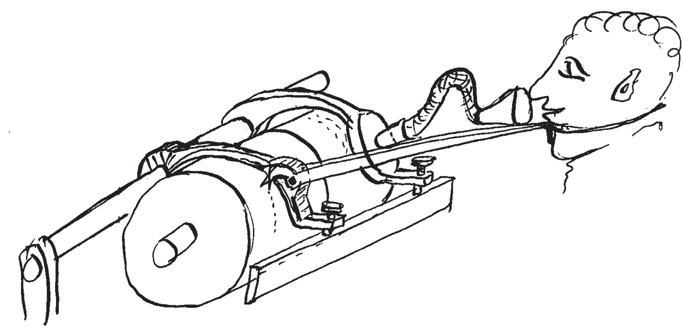


fig 33 shews the preparatory machine for forming the phonogram to be put in the doll. One End with the mouth piece records the speech and on the other End is a supplemental lever with recording point having great leverage the long End of which is secured to the lower jaw of the speaker a head-rest for the speaker serves to Keep the adjustment right.[14] The movement of the lips ~~which~~ is acurately recorded but greatly reduced by the great leverage, simultaneously with the sound record The cylinder is put in the Automaton as in fig 34 The lip lever connects by a link to the moveable section of the jar—[15]

fig 34

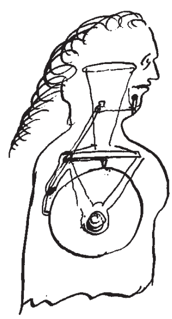


fig 35

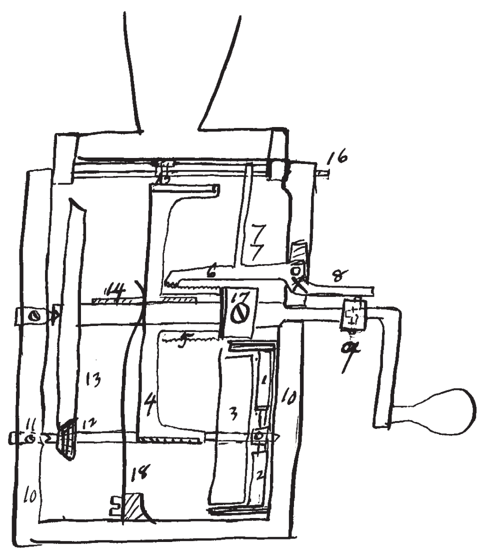
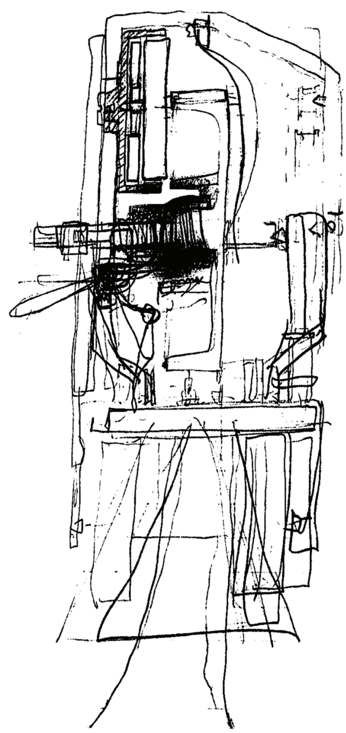


Fig 35 shews a good form of Doll phonograph[d] not however provided with the lip mechanism 10 is the frame— 4 the drum over which the tin recording is placed 15 the reproducing point. 16 the hinge for diaphragm holder. 15[16] a sleeve slipped over flanges on 4 with guide threads 6 is the fixed arm fixed by friction against its bearing 8 is an Extension outside doll to raise it from screw 7 7 an Extension upwards which lifts diaphragm mechanism up before 6 is thrown out of thread thus preventing rubbing of reproducing point on return of 4—[d] 4 returns by action of spring 18. 12 & 13 a Either belt or friction driven wheels. the shaft of 12 is pivoted at 11 on smooth threadless center. 3[d] is a lead fly wheel & 1 & 2 are the usual flaps of the Centrifugal governor[17] running in the box the regulation taking place by friction of 1 & 2 on sides of box. by this mechanism no winding back of the phonogram is necessary—

[A][18]



Thos A Edison

ADfS, NjWOE, PS (*TAED* PT031AAD1). Drawings made on separate sheets, some with checkmarks and figure numbers written in an unknown hand; miscellaneous incomplete sketches not reproduced. [a]Followed by dividing mark. [b]"inventions in this" interlined above. [c]Interlined above. [d]Obscured overwritten text. [e]"which engage" interlined above. [f]"ing" interlined below. [g]Illegible. [h]Canceled. [i]"in figure 32" interlined above.

1. This draft was the basis for Edison's Caveat 113, filed at the Patent Office on 17 December. Sometime after writing the initial draft, Edison made modest changes which the editors have incorporated into the transcription and noted accordingly.

2. This caveat included a multitude of mechanisms, some of which Edison put into a broad patent application that he executed on 12 January 1889 and filed three days later (U.S. Pat. 430,276). That specification ultimately had thirteen drawings and sixteen claims covering a variety of features, including the cutting knife and a cover for protecting the phonogram from wax chips. Mostly, however, it concerned "devices for determining automatically the exact position of the recording and reproducing points on the phonogram-cylinders" without adjustment "each time a new or different size recording blank is used." Edison acknowledged that the number of variations was more than could be accommodated in a single patent:

> I have tried many different constructions of devices for this purpose, some of which were provided with a fixed determining-point, which would strike the surface of the phonogram-blank as the spectacle-frame is lowered, holding it in that position until a lock was operated by hand to fix the relation of the parts, when the determining-point would be moved away from the surface of the wax to prevent it from wearing such surface.... I have also used devices having a moveable determining-point, as one mounted upon a pivoted lever, the movement of which determining-point would either lock the presser-foot by its direct movement or release a spring-lock. Upon a number of these forms I propose to make separate applications for patents.

Edison executed five subsidiary applications on 1 February 1889. Three concerned manual locking mechanisms (U.S. Pats. 406,572; 406,573; 406,574); one a determining device that could be "rocked or canted by the rotation of the phonogram" (U.S. Pat. 406,575); and one a self-locking device (U.S. Pat. 406,577). All five were filed at the Patent Office on 11 February and issued on 9 July 1889. A sixth application, executed and filed with the others, concerned the cutting knife (see note 11).

3. The spectacle arm extends diagonally to the upper right; the pivoted foot below it rests on the cylindrical phonogram. The adjusting nut is at far left and the threaded clamping screw at center.

4. Screw N is at far left; thumb screw X is at upper right.

5. The "rock lever" S is at left; lever B is at the center.

6. Lever X is just above the left end of lever B.

7. Electric lighting pioneer Charles Brush patented in 1878 a form of arc lamp that included a simple but effective mechanism for maintaining the proper gap between the tips of the two carbon rods. It consisted of a loose ring or collar around the upper rod which, when raised at a particular angle, would impinge on the rod and effectively clamp it to the ring. Brush's patent was voided by a federal court in 1884, essentially throwing his so-called "ring-clutch" into the public domain. U.S. Pat. 203,411; "The Defeat of the Brush Patents," *Electrician and Electrical Engineer* 3 (Aug.): 157; Pope 1884, 181–82.

8. In figure 16½, the mechanism marked c in the center is acted on by screw X at right.

9. Adjusting nut 6 is at left; pin 5 is at its top.

10. Edison used a machinist's term for the angle given to the edge of a cutting tool. Rose 1876 142, 154–55, 196.

11. In a patent application for a sapphire turning-off knife that Edison executed alongside the others on 1 February and filed with them ten days later (see note 2), he stated that "a steel turning off tool cannot be depended upon to retain its cutting edge" for producing smooth cuts. He further explained that a cutting knife "having the ordinary cutting edge, i.e., one forming an acute angle," would produce "a rough surface…since the edge of the knife enters under the surface of the material and breaks it up into chips which in breaking away from the surface carry with them a portion of the material below the line of cutting and thus produce a rough surface." He proposed instead to use a jewel such as sapphire cut to form a right angle so the knife would not gouge material below the intended cutting line. Edison's application was swiftly rejected and ultimately abandoned in 1890. Patent Application Case 821, 1 Feb. 1889, PS (*TAED* PT032ABO).

12. Sapphire seems to have become the standard material for phonograph points before the end of 1890. A. Abbott 1890, 502; Fiske 1890, 856.

13. Figure labels are "saphire" and "saphire cemented."

14. The idea of creating a visual illusion of speech had been around for centuries, sometimes allied with efforts to construct automata or to mechanically simulate the human voice. A useful overview is Hankins and Silverman 1995 (chap. 8).

15. Edison presumably meant "jaw."

16. Edison appears to have used the same index number for two parts. The reproducing point is near the top center, below the diaphragm; the location of the sleeve is not obvious.

17. Edison referred to a fan-governor, a standard device for retarding or smoothing the motion of rotary machinery such as music boxes, or for regulating the throttle position of a steam engine. Ogilvie 1863 (*Supplement*), s.v. "fan"; cf. Docs 2418 esp. n. 4 (fan in liquid) and 2800 esp. n. 13 (fan in air).

18. The final drawing, parts of which appear to have been erased, was marked "Fig 36" in an unidentified hand.

–3290–

Henry Villard to Samuel Insull

[New York,] Nov. 30 [188]8

Dear Mr. Insull:

I want to say to you, and through you, to Mr. Edison, that I find, contrary to my expectations, which were founded upon previous conversations with Mr. Coster,[1] D. M. & Co. unwilling to agree to the basis I submitted to them since our conference.[2]

The principal difference is, they ask $1,000,000 more of Deferred stock for the Parent Co.[3] than the amount we talked of. I don't know how Mr. Edison would feel about it, but I feel that it will not be possible for me to recommend to my friends to accept that basis. Yours, very trul[y][a]

H Villard S[pofford].

L (letterpress copy), Villard, Letterbook 60:307. Signed for Villard by Charles Spofford. [a]Incompletely copied.

1. Charles Henry Coster (1853?–1900), a partner in Drexel Morgan & Co., had represented the Morgan interests in a reorganization of Edison lighting interests in 1884. Docs. 2690 esp. n. 7.

2. Villard had asked Edison to come to his office during the week of 18 November. Edison apparently was ill on the appointed day, however, and it is not clear when—or if—the two had met since then. Villard to TAE, 18 Nov. (with TAE marginalia), 19 and 20 Nov. 1888; all DF (*TAED* D8805AIY, D8805AIZ, D8805AJA); Tate to Villard, 19 Nov. 1888, Lbk. 27:96 (*TAED* LB027096).

Edward Johnson, writing to an associate on 3 December, implied that some meeting had recently taken place at Drexel, Morgan & Co.'s offices. He reported that the bank had insisted on "a price for the Light Co that will probably be rejected by both Villard & Edison— V. on a/c of the disinclination of his Berlin people to pay much for Patents and Edison on a/c of the fact that his manufacturing properties will thereby be too greatly diluted." Apparently referring to another conference taking place that day (3 December), he continued: "Whether they will come together today or not is an open question— At all events they are at it—and both Sammy [Insull] and I are using our best efforts to bring about an Agreement." Johnson to Uriah Painter, 3 Dec. 1888, UHP (*TAED* X154A7EW); see Doc. 3291.

3. That is, the Edison Electric Light Co.

—3291—

Memorandum: Electric Light Consolidation

[Orange, c. December 5, 1888][1]

Income: Machine Works	233,000	
Income after Light Cos work all out.		10,000
" From increase of stations already errected & which have the right to buy independent of Light Co of which we cannot be deprived		50,000
Increase profits on extending wire & shafting depts which cannot now be done for want room & funds for the purpose		20,000[a]
New Work Edison has ready but which cannot now be made as all machinery used on Light Cos work. [~~Cons~~-------]—[b]		50,000
		130,000

Manufctg[a] other things not electrical[c] now ready— Sufficient to keep all machinery going[d]		100,000
		130,000[e]
Lamp Co. estimate income next year.		175,000
Bergmann & Co not deprived of by abrogation contract[2]		75,000
		550,000
		380,000
Loss by Light Co notification[f]		$170,000
or interest on say		4,750,000
B & Co		19,000[a]
Lamp Co		91,000
		110,000[a]
M[achine] W[orks] worst—		86,000
		196,000[g]
Villard deal gives E income:	530,000 cash 6 pct	31,800
	1,060,000 stock	84,800
		116,600[a]
Edison's Income if Villard Deal dont go through		
	Lamp	91,000
	B & Co	35,000
	MW	152,000
		278,000
Edison Income if Light Co does own mfg except Lamp Co—		
	Mac Wks	86,000
	B & Co	19,000
	Lamp Co—	91,000
		196,000

AD, NjWOE, Miller (*TAED* HM88ABB). Long division and other miscellaneous calculations not reproduced; monetary expressions standardized for clarity. [a]Obscured overwritten text. [b]Canceled. [c]"not electrical" interlined above. [d]This line and the preceding one enclosed by right brace. [e]Connected by a line from the 130,000 subtotal above. [f]Followed by index pointer toward total at end of line. [g]Followed by "Over" as page turn.

1. This document was filed with a note identifying it with the "Villard Deal"— the proposed consolidation of the Edison electric light and manufacturing interests. Also filed with it was a 6 December directive from Samuel Insull, typed on the New York letterhead of the Edison Machine Works, instructing Alfred Tate to "put the enclosed in an envelope and put it away in Mr. Edison's safe. I want to keep the document as it may be of interest some time in the future" (Miller [*TAED* HM88ABA]). Edison may by this time have seen results of the

examination of the manufacturing shops' books by John McClement and John Dougherty, who were paid for their work on 10 December (Edison General Electric Co. statements of account with Henry Villard, 10 and 14 June 1889, Letterbook 62:398, 462; Villard).

The memorandum outlines possible financial consequences for Edison of the proposed consolidation. The editors have not tried to verify or explicate his figures, nor have they learned details of the specific "deal" under discussion other than those in Doc. 3290, but see also Docs. 3293, 3294, and 3302. Edison's undated notes and calculations about a related proposal were filed with a memorandum about a proposal for a subsequent consolidation (DF [*TAED* D8938AAI1, images 4–6]).

2. Edison presumably referred to the September 1884 licensing agreement by which Bergmann & Co. manufactured for the Edison Electric Light Co. Article fifteen provided for cancellation of the contract by the Light Co. (with twelve months notice) or Bergmann (with eighteen months notice). Doc. 2725 n. 6.

—3292—

Notebook Entry: Electrocution

[Orange, December 6, 1888][1]

Physiological Experiments contd.[2] Copy of Mr H. P. Brown's notes of the experiments on the 5th Dec.[3]

Calf No. 1. weighing 124½ lbs. was found to have an electrical resistance of 3200 ohms. A sponge-covered disc electrode 2" in diameter was applied to the forehead between the eyes, the hair being first clipped. The second electrode was made of wire netting 4" long and 2" wide covered with sponge and applied to the left of the spine back of shoulders. The sponges were saturated with a solution of $ZnSO_4$ having a density of 1.054 at 60°F

A Siemens alternating current dynamo was used, its fields being charged from a standard Edison dynamo, and its EMF regulated by variable res. in the field circuits.

In the first experiment the main current was passed through the low resistance coil of a large converter made by an electric light co. and the calf was placed in the circuit of the high resistance coil for 30 sec. Before closing the circuit at 3:50 pm, on the subject the Cardew voltmeter[4] showed 1100 volts in the secondary but as soon as closed the potential at once fell to 100 volts and remained stationary. The animal dropped but was uninjured as it rose to its feet 9 mins. later.

The converter was then disconnected and the main current at 770 volts was applied for 8 seconds. Death was instantaneous. The animal was at once dissected by Drs Bleyer[5] and

Ingram.[6] In the[a] brain the[a] vessels were found filled with blood but there were no hemorrhages. The brain remained very warm even after being exposed for ten minutes to the air and immersed in cold water. The heart and lungs were found to be perfectly normal. The hair on the forehead projected beyond the sponge and touched the metal plate of the electrode and was scorched, but the skin was uninjured.

The second calf weighed 145 lbs and had an electrical resistance of 1300 ῳ[7] between the electrodes which were placed as before, the metal of the disks being further protected by wrapping the edge with cotton waste. At 4:26 pm the alternating current at 750 volts was applied for five seconds. Death was instantaneous and the heart action ceased at once but reflex movements upon excitation were observed for 1½ mins.

The calves were purchased from a butcher and were in good condition. The meat was pronounced fit for food, the fact being certified by him in writing.

A horse weighing 1230 lbs with halter was the next subject. His hip was dislocated but otherwise he was in good condition. Connection was made by wrapping cotton waste saturated in water round each fore leg and holding held?[b] in[a] place with bare copper wire. It was suggested by the physicians present that with this connection the current would pass through the muscles of the chest and not reach the spine or heart. This proved to be the case. The resistance was found to be 11,000 ohms. It was attempted to pass an alternating current of 1200 volts through the animal for a fraction of a second by closing the circuit with the rapid blow of a hammer on a metal plate but in preparing for the experiment the Cardew voltmeter was disabled. A file of lamps was then substituted and the EMF calculated. The current from the dynamo was passed through the converter above mentioned but with unsatisfactory results in obtaining the desired EMF in the secondary circuit. A ring converter[8] was then tried and abandoned. A smaller ring converter was then substituted and the field circuit resistance was adjusted until ~~the~~ a series of 18 lamps of the Edison type were brought up to redness in the secondary circuit. The current was then applied by a single tap from the hammer at 5:20 pm but the animal was uninjured. The converter which was deemed of insufficient capacity for the purpose was abandoned and the dynamo circuit used. A series of 7 lamps was connected to the primary wire and brought up to redness. At 5:25 pm Contact with the horse was made for 5 seconds but the animal was uninjured. At 5:27 the same current was applied for 15 seconds with no apparent injury. The file of 7 lamps was then brought up to bright incandescence and the current was applied for 25[a] seconds at 5:28 pm. during which time the water in the cotton waste steamed. The result was fatal.

These experiments proved the head and spinal column to be the best points of application of the current for the purpose and disposed of the suggestion to used wristlets as electrodes.

Those present were Eldridge T Gerry,[9] Professors R. Ogden Doremus,[10] Chas. A. Doremus,[11] Dr Frederick Peterson, Dr Frank A. Ingram, Dr J. Mount Bleyer, M. Bourgonon,[12] Mr John Murray Mitchell,[13] Mr Galvin,[14] Mr Thos A Edison Mr A. E. Kennelly, and Harold P. Brown.

X, NjWOE, Lab. (*TAED* NM023049). Written by Arthur Kennelly. [a]Obscured overwritten text. [b]"held?" interlined above.

1. On 6 December, Harold Brown sent Arthur Kennelly his "notes of yesterday's experiments as requested." Kennelly copied them into his notebook immediately following a record of his own unrelated laboratory work on 5 December. After copying Brown's notes, Kennelly continued the previous day's entry on the next page, initially dating it 6 December but changing it to the fifth for the sake of continuity. His next entry in the book is dated 6 December. Brown to Kennelly, 6 Dec. 1888, DF (*TAED* D8828ADP).

2. See Doc. 3224 (headnote).

3. Five of the witnesses to these new experiments were members of the Medico-Legal Society's committee for investigating electrocution as a form of capital punishment. The committee had been appointed in September with Dr. Frederick Peterson as its head. The other members included Elbridge Gerry, who had chaired the commission that recommended electrocution to the legislature earlier in the year, and Drs. Robert Doremus, Frank Ingram, and Julius Bleyer. In mid-November, the committee recommended that electrocutions be carried out by securing the condemned either on a table or in a chair and attaching one electrode to the top of the head and another to the spinal column between the shoulders. By this means, 3,000 volts of either alternating or direct current would be administered for thirty seconds, though the committee recommended AC. The Society voted to postpone discussion of that report until its December meeting. "Inebriety and Crime," *NYT,* 13 Sept. 1888, 5; "Dr. Doremus, Chemist and Inventor, Dead," *NYT,* 23 Mar. 1906, 9; "Deaths," *Journal of the American Medical Association* 17 (Apr. 1917): 1342.; "A Death Helmet for Them," *New York World,* 15 Nov. 1888, Clippings (*TAED* SC88129A).

In the interval between the Society's meetings, the committee arranged for new tests. Their object was to counter objections that the animals used in earlier experiments at Edison's laboratory and by Brown at Columbia were too small to prove the efficacy of electrocution for humans. According to the *New York Times,* the common supposition was that "more current would be required to kill a human being." The committee approached the Edison Electric Light Co., through Brown, to secure the use of Edison's laboratory. Frank Hastings, company secretary, inquired if Kennelly could "conveniently afford us the facilities for conducting this experiment, which will be practically in the interests of the Medical Society." Although he considered the matter "of very great importance," Hastings declined to approach Edison directly because "I know just how busy he is." Kennelly, though, obtained Edison's consent to use the laboratory on 5 December for what amounted to a new demonstration with alternating current, this time on two calves and a horse. Brown provided the calves. The experiment on the horse was done at the request of Peterson and Doremus, though the Edison Electric Light Company eventually paid for obtaining the animal. Kennelly and Brown once again conducted the demonstration, with Edison also in attendance. "Surer than the Rope," *NYT,* 6 Dec. 1888, 5; Hastings to Kennelly, 20, 24, and 26 Nov. 1888, all DF (*TAED* D8828ADI, D8828ADK, D8828ADL).

Edison took the opportunity to address the committee directly, and Brown noted to Kennelly that "Mr. Edison's talk with Mr. Gerry and the members of the committee of course carried great weight" (Brown to Kennelly, 6 Dec. 1888, DF [*TAED* D8828ADP]; "Surer than the Rope," *NYT,* 6 Dec. 1888, 5). Edison's remarks went unrecorded but likely reflected the views he had expressed a month earlier in an interview with the *Brooklyn Citizen* in which he declared electrocution for capital crimes "a good idea" and which, if properly performed, would be painless or at least far less painful than alternative methods:

> The man will be killed with a current of the proper number of volts in the tenth of a second. There won't be time for the sense-bearing nerves to telegraph the news that he is hurt to his brain before he will be dead from the shock. And it will be so lightning like quick that the criminal can't suffer much. ["Edison's New Ideas," *Brooklyn Citizen,* 4 Nov. 1888, Cat. 1038:71, Scraps. (*TAED* SM038071d)]

The *New York Times* concluded that the December tests "proved the alternating current to be the most deadly force known to science, and that less than half the pressure used in the city for electric lighting by this system is sufficient to cause instant death." This statement served the larger polemical purpose of the Edison interests. As Brown revealed the following day in a note to Kennelly, "Beyond a doubt the alternating current will be adopted for execution purposes which will make my fight against its use for house lighting a much easier one." The attack on alternating current was not lost on George Westinghouse, who, in an open letter to the New York newspapers, argued that it was absurd to connect the experiments with "the commercial use of electric currents." He maintained that the experiments were not done "in the interests of science or safety, but to endeavor to create in the minds of the public a prejudice against the use of the alternating current" and had been carried out by Brown "in the interest and pay of the Edison Electric Light Company." In a published rejoinder, Brown strongly denied that he was or ever had been "in the employ of Mr. Edison or any of the Edison companies," a claim that was technically true, though he had coordinated his activities with the Edison Electric Light Co. and would continue to do so. He then challenged Westinghouse to "take through his body the alternating current while I take through mine a continuous current," gradually increasing the voltage until "one or the other has cried enough." Soon thereafter, Brown composed a six-page circular letter to be sent to municipal officials and "public-spirited" men across the country, urging them "to oppose with all means in your power the extending of the high-tension alternating system in any city or town where you have influence; to lend me your aid in securing legislation which will keep this EXECUTIONER'S CURRENT out of our homes and streets." "Surer than the Rope," *NYT,* 6 Dec. 1888, 5; Brown to Kennelly, 6 Dec. 1888, DF (*TAED* D8828ADP); "No Special Danger," *NYT,* 13 Dec. 1888, 5; "Electric Currents," *NYT,* 18 Dec. 1888, 5, reprinted in *Kemmler v. Durston,* p. 109, Lit. (*TAED* QE003A1016E); Brown circular letter, n.d., [Dec. 1888], DF (*TAED* D8828AEA).

The Medico-Legal Society held its final meeting of the year a week after the December demonstration. At the end of what the *World* reported to be "an animated discussion…on the relative merits of the continuous and alternating currents," the Society voted to accept the committee's recommendation and advise the state authorities to adopt the AC system for executing convicts. Peterson's committee referred to these experiments in its 1889 report to the Society. Harold Brown also published his own first-person account in the Society's journal and incorporated the committee's final report into his own broadside booklet against AC systems, which in turn was entered as an exhibit in the Kemmler case. "Bound to the Death Chair," *New York World,* 13 Dec. 1888, Clippings (*TAED* SC88135A); Peterson, Doremus, Ingram, and Bleyer 1889, 280; Brown 1889b; Relator's Exhibit A (pp. xix–xxiv), *Kemmler v. Durston,* Lit. (*TAED* QE003A1016A [images 181–84]).

The December experiments were not the last at the laboratory. Early in 1889, Austin Lathrop, the superintendent of prisons in New York State, appointed a new commission to determine what machinery should be used to administer the death penalty by electricity and the best method of connecting the electrodes to the condemned. The commission, headed by Dr. Carlos F. MacDonald, chairman of the state Lunacy Commission, contacted the Edison Electric Light Co. through Brown for permission to conduct experiments at the laboratory. Frank Hastings in turn contacted Kennelly, who secured Edison's permission. The experiments on four dogs, four calves, and a horse were conducted on 12 March with alternating current only. Charles Baker to Brown, 20 Feb. 1889; Hastings to Kennelly, 25 Feb. 1889; both DF (*TAED* D8933AAT D8933AAS); Kennelly to Hastings, 25 Feb. 1889, Kennelly Letterbook LM-1:350, WOL (*TAED* LM111350); Kennelly notebook #1:90–91, Lab. (*TAED* NM023090); "Ready for the Last Tests," *NYT,* 9 Mar. 1889, 1.

4. The voltmeter invented a few years earlier by Capt. Philip Cardew of the Royal Engineers was at this time the only instrument available to measure voltage of strong alternating currents. A thin platinum wire, stretched by a weight or spring, would be heated by the current and become elongated in proportion to the square of the potential difference in the circuit. Its change in length was visible against an index, though not instantaneously. Ayrton and Perry 1888; Atkinson 1893, 1011; *Oxford DNB,* s.v. "Cardew, Philip."

5. An Austrian-born physician, Julius Mount Bleyer (1859–1915) came to the United States in 1868. After studying at the University of Prague, he obtained his medical degree in 1883 from Bellevue Hospital Medical College. Bleyer was a specialist in electrotherapy and diseases of the nose, throat, and lungs. Beginning in 1888, he also served as a consulting physician for the Metropolitan Opera. "Inebriety and Crime," *NYT,* 13 Sept. 1888, 5; "Deaths," *Journal of the American Medical Association* 64 (17 Apr. 1915): 1342; Kelly and Burrage 1920, 114.

6. Frank Harold Ingram (1860–1893), born in Logansport, Ind., was an 1883 graduate of Bellevue Hospital Medical College. Ingram interned at the Insane Asylum on Blackwell's Island where, after an interval at a similar institution, he became assistant superintendent of the medical department. He was in that position when reporter Nellie Bly, posing as a patient, investigated the hospital for the *New York World.* Though Bly was complimentary to Ingram himself, he resigned shortly after her exposé appeared in 1887. He entered private practice and often testified in court cases as an expert witness. Ingram also served as president of the Board of Pathologists of the City Asylums for the Insane in New York and, at the time of his death, was a visiting physician at the Hospital for Nervous Diseases. "Frank H. Ingram, M.D.," *The Medico-Legal Journal* 10 (1892): 445–46; Bly 1887; "Dr. Ingram Leaves Blackwell's Island," *The Doctor* 1 (16 Nov. 1887): 9.

7. Kennelly used the lowercase Greek letter omega as a symbol for electrical resistance. The symbol was proposed by William Henry Preece in 1867 and standardized in the twentieth century as a capital omega. Preece 1867, 397.

8. That is, a transformer with coils wound around or inside a metal ring (such as a Pacinotti armature) to take advantage of its closed magnetic circuit. Many transformers coming into use at this time were based on this general design. R. Kennedy 1887, 12–15.

9. Elbridge Thomas Gerry (1837–1927), a native of New York, was the grandson of Elbridge Gerry (1744–1814), who signed the Declaration of Independence and Articles of Confederation and served as a delegate to the Constitutional Convention and as vice president of the United States. An 1853 graduate of Columbia College, Gerry was admitted to the New York bar after reading law with William Curtis Noyes. Gerry played an important role in the New York State constitutional convention of 1867. He was also a leading member of the ASPCA and served briefly as its interim president in March 1888 after the death of Henry Bergh. With Bergh, he founded (in 1874) the New York Society for the Prevention of Cruelty to Children, to which Gerry afterward devoted much of his time, becoming president in 1879. In 1886, the New York legislature appointed him to chair the State Commission to Investigate and Report the Most Humane and Practical Method of Carrying into Effect the Sentence of Death in Capital Cases. An avid yachtsman, he was known as "Commodore Gerry," having served as the commodore of the New York Yacht Club from 1886 to 1893. *DAB,* s.v. "Gerry, Elbridge Thomas"; Gerry, Southwick, and Hale 1888, 91; "Elbridge T. Gerry Dies in 90th Year," *NYT,* 19 Feb. 1927, 15; "In Mr. Bergh's Place," *NYT,* 24 Mar. 1888, 8.

10. Robert Ogden Doremus (1824–1906) served as president of the Medico-Legal Society of New York from 1885 to 1886. A chemist, teacher, inventor, and physician, Doremus was born in New York City and earned his medical degree from New York University in 1850. He was assistant to John Draper in the N.Y.U. medical department (1843–1850) and professor of chemistry at the New York College of Pharmacy (1848–1861). He became a professor at the New York Free Academy (later City College) in 1852, first in natural history and then (from 1863) in chemistry and physics, a post he held until his retirement in 1903. Doremus had longtime involvements with public health issues in New York City. *ANB,* s.v. "Doremus, Robert Ogden"; "Dr. Doremus, Chemist and Inventor, Dead," *NYT,* 23 Mar. 1906, 9.

11. Charles Avery Doremus (1851–1925) of New York City was, like his father Robert Ogden Doremus, a chemist, teacher, and inventor. He also belonged to the New York Medico-Legal Society though not to its committee on capital punishment. Doremus graduated from City College in 1870 and earned M.A. and Ph.D. degrees at the University of Heidelberg. He had been a professor of chemistry and toxicology at the University of Buffalo, and at this time he belonged to the faculties of the Bellevue Hospital Medical College, the American Veterinary College, and the College of the City of New York. "Dr. C. A. Doremus Found Dead in Bed," *NYT,* 3 Dec. 1925, 25; "Charles Avery Doremus," *Industrial and Engineering Chemistry* 18 (Feb. 1926): 214.

12. Possibly one A. Bourgognon, who in 1876 attended the first meeting of the American Chemical Society with Charles Doremus. The editors have found no further information about him. "The American Chemical Society," *American Chemist* 6 (May 1876): 401.

13. John Murray Mitchell (1858–1905), a lawyer, was a native of New York City and the son of distinguished jurist William Mitchell. He graduated from Columbia College in 1877, where he earned an LL.B. two years later. He began his career in 1881 as a clerk in his father's New York law firm and opened his own office in 1883. Mitchell became a member of the Medico-Legal Society in September 1888. The following June, he spoke on "Legislative Control of Dangerous Electric Currents" before the International Medico-Legal Congress in New York. His address (published with Harold Brown's essay on "A Medico-Legal View of Electrical Distribution") included the text of a proposed law for New York State to prohibit, with exceptions for execution of criminals and scientific experiments, any individual or corporation from generating or using "any electric current with electromotive force sufficient to produce death in a human being, by leakage to earth from the conductors carrying such current." Mitchell later represented part of New York City in the U.S. House as a Republican (1896–1899); he was also active in the electric railway business and owned several Pennsylvania coal mines. Coolidge 1897, 89; "John Murray Mitchell Dead," *NYT,* 1 June 1905, 11; New York Bar Association 1906, 163; "Transactions," *Medico-Legal Journal* 7 (1890): 541; Brown and Mitchell 1889, 37–48; "Political and General," *Public Opinion* 25 (17 Nov. 1898): 1.

14. Possibly Michael Galvin, an employee of the Edison Illuminating Co. of New York. Galvin's testimony, p. 26, *Chinnock v. Edison v. Wheeler,* MdCpNA (*TAED* W100DN026).

—3293—

Samuel Insull Memorandum: Electric Light Consolidation

Orange, N.J., [December 10, 1888?][1a]

Memorandum of Interview between Mr Henry Villard and Mr Edison (Mr Insull being present) at Mr Villards office[2] on Monday December 10th 1888 in relation to the capital required by the proposed new Company which is to own the Edison Light Company and the three manufacturing Establishments.[3]

Mr Edison explained to Mr Villard that he was not at all satisfied with the amount of money that the Syndicate[4] proposed to put in the business. He considered that when the new company required money they might have very great trouble to raise it and he absolutely objected to their being placed in any such position more Especially if the house of Drexel Morgan & Company would be the parties who would control the financial policy of the Company; his experience being that when money was required for the business it was next to impossible to get it so long as Drexel Morgan & Co controlled the business, or if obtainable at all the money could only be got at ruinous rates. In the course of conversation he impressed upon Mr Villard that he would consider it absolutely unsafe to go into such a deal if the power of control were in the hands of Drexel Morgan & Co—; that in the event of their being able to exercise control the value of his property would be very seriously affected as he considered them incapable of exercising proper judgement in relation to such business matters as the Company would have to deal with, and moreover that he would on no account want to place himself in a position where Drexel Morgan & Co could squeeze any interest that he owned.

In reply Mr Villard explained that in the last two years he had invested upwards of Thirty Millions of Dollars in this Country for his European friends[5]—that in no[b] single case had he gone to Drexel Morgan & Co. for money; that in this case he had no intention of going to Drexel Morgan & Co for money—; that while Drexel Morgan & Co had frequently asked him to join American Syndicates, and put up the money of his European friends in such syndicates, that he had not in any previous case asked them to join him in any syndicate which he had gotten up.

In the case of the Syndicate to deal with the Edison Light business Drexel Morgan & Co had only one seventh interest—; that all they were going to put up was ($250,000) Two hundred[b] and Fifty Thousand Dollars; that his friends were going to put up ($1,750,000) One Million Seven Hundred and Fifty Thousand Dollars; that it was a well known rule on Wall Street and in all financial centres that the parties who put up the money were the parties who controlled; that he pledged himself to raise all necessary money for the business. He drew Mr. Edison's attention to the fact that his friends were putting in a very large amount of money; that it could not be supposed for one moment that they would put in that large amount of money and pledge their names to the concern and then leave it to take care of itself, or leave it to the mercy of people putting in a small amount of money. He reminded Mr Edison that he himself had had considerable experience with Drexel Morgan & Co—that he had suffered far more from their methods than Mr Edison could ever possibly suffer;[6] that while he would consider it a business mistake to raise the question of control at the moment, that if Mr Edison would figure out the future holdings in the new Company he would find that the control rested with him, (Mr Villard), and his friends and Mr Edison; that in the management of the new Company he relied upon working with Mr Edison and that Mr Edison would work with him and his friends.

Mr Villard further explained that inasmuch as this new Company would have extremely good credit he would have no trouble whatever in raising whatever money would be required @ four or five percent and that such being the case he thought it much better from a business point of view to pay low rates of interest rather than place a permanent charge on the Company by[b] paying a dividend of Eight 8[c] percent as would be the case if stock were issued and the money taken in as permanent capital.

Mr Villard pledged himself to raise any money required by the business as a loan at rates not exceeding four 4[c] or five 5[c] percent as above mentioned. He further explained that he was in ~~the~~ a particularly advantageous position to raise money being independent of the local money market as in the event of money being tight in New York he could draw on Europe and would thus get the advantage of low rates of interest, paying only the extra expense of Exchange.

<Correct report of interview>

Edison Insull

DS, NjWOE, Miller (*TAED* HM88ABC). Letterhead of Edison laboratory. [a]"*Orange, N.J.,*" preprinted. [b]Obscured overwritten text. [a]Circled.

1. The editors have not determined the time of day that Edison and Villard met on 10 December but presume that Samuel Insull summa-

rized their discussion soon afterward. His memorandum was filed with a note marked "Thos A. Edison Re Villard Deal" (see also Doc. 3294). Insull had requested the meeting on Edison's behalf several days earlier and it was scheduled immediately upon Villard's return to New York. Charles Spofford to TAE, 9 Dec. 1888, DF (*TAED* D8832AAJ).

2. Villard's office was in the Mills Building, a 10-story structure (with Edison lights) recently completed on Broad St. near Exchange Pl. in New York City. Villard to William Marks, 13 Dec. 1888, Letterbook 60:369, Villard; Doc. 2318 n. 2.

3. The new Edison General Electric Co. (sometimes called simply the "general company") combined the patent ownership rights of the Edison Electric Light Co. with the manufacturing capacity of the Edison Lamp Co., Edison Machine Works, and Bergmann & Co. It was incorporated in New York State on 23 April 1889 with a capital stock of $12,000,000 (Edison General Electric circular letter, 26 Apr. 1889, DF [*TAED* D8938AAN], "A Large Incorporation Fee," *NYT,* 24 Apr. 1889, 3). Complementary accounts by numerous historians and biographers emphasize different circumstances and consequences of this signal event (see e.g., Josephson 1959, 350–61; McDonald 1962, 39–47; Passer 1972 [1953], 102–4; Buss 1978 [1977], Carosso and Carosso 1987, 270–73; Wilkins 1989, 433–35, 440–41; Carlson 1991a, 279–86; Israel 1998, 321–24; De Borchgrave and Cullen 2001, 354–56; Kobrak 2008, 47–59, and Dalzell 2010, 101–4). In late 1889 and early 1890, Edison General Electric absorbed the Sprague Electric Railway & Motor Co., the United Edison Manufacturing Co., the Canadian Edison Manufacturing Co., and Leonard & Izard (a Chicago electrical contractor). All the different entities continued to operate in their own names until August 1890, after which only the Edison Electric Light Co. and the Sprague firm retained their identities (Dalzell 2010, 116; Edison General Electric Co. minutes, 27 Nov. 1889; Frank Sprague to Henry Villard, 8 Jan. 1890; both Sprague [*TAED* X120CAV, X120CAY]; "The Edison General Electric Company's Annual Meeting," *Electrical Engineer* 9 [Feb. 1890]: 73; "The General Electric Company in Chicago," *Western Electrician* 11 [12 Nov. 1892]: 247; Edison General Electric 1891, 4).

4. See Doc. 3302.

5. As an agent for Deutsche Bank since September 1886, Villard sold American securities (mostly railroads) to German investors. Historian Christopher Kobrak has described him as "ideally suited to convince German investors to invest funds in the United States." Kobrak 2008, 37; Green 2014, table 1 (p. 17, derived from Buss 1978 [1977], p. 183).

6. Villard may have alluded to having been drawn, by Drexel, Morgan & Co.'s actions, into the affairs of the Northern Pacific Railroad in 1881. He became the line's president and—with Drexel, Morgan—one of its major investors. The episode ended in 1883 with Villard's bankruptcy amid the collapse of his transportation empire in the Pacific Northwest, control of which went to Drexel, Morgan & Co. De Borchegrave and Cullen 2001, 315–17; Carosso and Carosso 1987, 251–54.

—3294— [Orange, December 10–11, 1888][1]

Memorandum of Terms: Electric Light Consolidation

<~~Edison's draft corrected by H Villard~~>[a]

Memorandum of terms for Consolidation of the Edison Light Co., and the three Manufacturing Establishments agreed upon by Mr. Edison and Mr. Villard.

Edison Electric Light Co. to receive <Stock of new Co>

8% Preferred Stock	$2,625,000	
Deferred Stock (25% of total Stock received by them)	875,000	
		~~$3,500,000~~[a]
<2nd Def. stock	500,000	4,000,000>

~~Shops~~[a] <Mfg Cos.> to receive
$1,166,667 Cash, and Stock as follows:

8% Preferred	$1,458,333	
Deferred Stock (25% of the total Stock received by them)	875,000	
		$2,333,333.
Cash to be subscribed at par by Syndicate		~~$1,750,000~~.[a] <2,000,000>
Stock to be allotted to Syndicate		500,000
		~~$8,083,333~~.[a] <750> <8,833,333.>

Total Deferred Stock.

Light Company	$875,000.	
Shops	875,000.	
<2d Defd Stock Lit. Co	500,000>	
		~~$1,750,000~~[a] <2,250,000>
Total Preferred Stock		~~$6,333,333~~.[a] <6,650,000>

The Stock and Cash coming to the Shops to be allotted as follows:

Henry Villard (5% Com.)	$175,000
The Edison Machine Works	1,400,000.
Edison Lamp Co.	1,025,000.
Bergmann & Co.	900,000
	$3,500,000.

The Light Company to receive Trust Certificates to represent 50% of Stocks of Local Companies received by the New Company up to the amount of $500,000.[2]

~~Syndicate to guarantee a further subscription of $1,000,000~~

~~at par to be paid in as soon as needed by the New Company~~.[b]

If the New Company decided to issue further Stock to raise money within two years, Syndicate to have the right to take Stock at par up to the amount of $~~2~~3,000,000.[c]

After the present deal is completed, Mr. Edison to be relieved from present Lamp Co. contract and he is then to enter into a five years' ~~option~~[b] Contract as to future Electric Light inventions ~~on terms to be paid upon from~~[d] ~~his being paid~~[b] in consideration of his receiving[e] one-fifth of the savings or benefits obtained by the New Company from such inventions.[3]

<members of Syndicate, taking $2,000,000. new stock in equal parts>

TD and AD, Villard, Box 78, Folder 551. Monetary figures standardized for clarity. [a]Canceled in pencil by Edison. [b]Canceled in pen by Villard. [c]Corrected by Villard. [d]Interlined above by Villard. [e]"in consideration of his receiving" interlined above by Villard.

1. This complex document is the result of a preliminary understanding between Edison and Henry Villard for the formation of the prospective Edison General Electric Co. and includes the alterations made serially by each man. Based on careful readings of variant versions and related correspondence, the editors have made a number of surmises about the document and its creation. First: it began as Samuel Insull's typed summary of terms discussed at the 10 December meeting (described in Doc. 3293), which he sent to Villard. Second: Villard made changes with an ink pen; on 11 December, his secretary returned to Insull "your memorandum of terms…as corrected by Mr. Villard, and also copy of your original, in order that you may readily follow the alterations" (Charles Spofford to Insull, 11 Dec. 1888, Letterbook 60:353, Villard). Third: what Insull received was this document—"Edison's draft corrected by H Villard." Fourth: clean typed copies incorporating Villard's changes were made separately, one landing in Edison's files and one kept by Villard, who also sent a copy to New York attorney Everett Wheeler (memorandum, DF [*TAED* D8832AAO]); memorandum, Box 78, Folder 551, Villard; Charles Spofford to Wheeler, 11 Dec. 1888, Letterbook 60:353, Villard). Fifth: Edison used a pencil to make further changes to the document corrected by Villard and then sent it back. Sixth: Villard then negotiated those new terms with Drexel, Morgan & Co. and verbally ratified them on 27 December with Insull, who confirmed them in Doc. 3302. The ink emendations, made by Villard on 10 or 11 December, are incorporated into the transcription and marked accordingly with textnotes. The penciled additions by Edison, from a somewhat later date, are transcribed as marginalia. In the further interest of clarity, the editors have used textnotes to distinguish cross-outs of text done by Villard from those by Edison. At some later time, the document was also marked by faint pencil lines and an attempt to assign an approximate date to it, all of which the editors have disregarded.

2. The Edison Electric Light Co. had a policy of taking equity interests in local lighting companies in partial payment of patent licensing fees, as Edison himself had sometimes done to cover some costs

of constructing "village plant" central stations (see, e.g., Docs. 2437 [headnote] n. 20, 2498 n. 3, 2603 n. 3, and 2737). The face value of the Light Co.'s holdings may have ranged from one million to four million dollars (see Docs. 2454 and 3332; McDonald 1962, 40). Dalzell 2010 (102) suggests that this practice may have helped draw bankers like Drexel, Morgan & Co. further into the light and power industry, where capital-hungry firms needed help converting the securities into cash.

3. The proposed agreement regarding Edison's future inventions may have been the subject of one part of a retrospective summary of "[Charles] Coster's main suggestions & objections" about the formation of Edison General Electric. According to that precis of a 27 December 1888 letter, Coster thought the contract should be effective for fifteen years. A contract prepared (but not signed) in March 1889 was to run for seven and one-half years; a comprehensive five-year agreement was negotiated in 1890. Coster memorandum, n.d., Box 78, Folder 551, Villard; TAE agreements with Edison General Electric Co., Mar. and 1 Oct. 1889, both Miller (*TAED* HM89AAS, HM90AAT); see Doc. 3348 n. 2.

—3295—

To Henry Villard

Orange, N.J. Dec. 11, 1888.[a]

Dear Mr. Villard,—[1]

I have to-day sent to Prof. W. D. Marks[2] a letter of introduction to you.[3] His address is "c/o Edison Electric Light Co.,[4] Nos. 908 & 909 Sanson Street, Philadelphia." I would suggest that you wire Prof. Marks, making appointment for Friday. I have communicated with him, explaining that I have mentioned his name to you, and have also told him, generally, the class of work which you would expect of him.

Mr. Insull has handed me the revised memorandum,[5] setting forth the terms of consolidation of the Edison Electric Light Co. and the three manufacturing establishments, as prepared by you, and I find the same to be in accordance with our understanding.

Whilst not making it a condition of my agreement to the consolidation, I would be glad if you can possibly arrange it, to have an opportunity to take some portion of three million dollars worth of stock, at par, which the Syndicate has the right to acquire in the event of the New Company deciding to issue stock for further capital. If the exploitation of the business is attended with that success which we have the right to expect, it is my desire, if such a thing is possible, that my personal interest should not be reduced owing to necessity to raise further capital. This is a matter, however, which I will leave entirely to you, and shall trust to your arranging it for me if you find it at all practicable.

I think it of the utmost importance that the consolidation should be pushed as rapidly as possible. I understand that the Edison Light Co. has, at last, obtained the right to argue before the Supreme Court of the United States the principal point in dispute in connection with their patent litigation.[6] As this argument will take place within the next few weeks, it is very desirable that all our matters should be arranged before a decision is made by the Supreme Court. Should that decision, as we have every reason to hope, be favorable to the Edison Electric Light Company, it is just possible that the stockholders of that Company might get an inflated idea of the value of their property. Under these circumstances you will doubtless recognize the desirability of expediting matters to the fullest possible extent. Very sincerely yours,

Thomas A Edison

TLS, Villard, Box 78, Folder 551; a carbon copy is in Miller (*TAED* HM88ABD) and another typed copy is in DF (*TAED* D8832AAK). Letterhead of Edison's laboratory. [a]"*Orange, N.J.*" preprinted.

1. The carbon copy of this letter was placed in Edison's files with an envelope on which was written (by Alfred Tate): "Details of Consolidation and Letter from T.A.E. to H Villard" and a further note (probably by Charles Batchelor): "Mr Insull took enclosure to hand to Maj Eaton." The editors have not identified the enclosure; possibly it was a variant of Doc. 3294. Miller (*TAED* HM88ABD).

2. William Dennis Marks (1849–1914) was chief engineer of the Edison Electric Light Co. of Philadelphia. Prior to taking that position in 1887, he had been the Whitney Professor of Dynamic Engineering at the University of Pennsylvania. Marks became chief engineer of the Edison General Electric Light Co. on or about 1 June 1889, though he remained connected with the Philadelphia utility on a consulting basis. Doc. 2954 n. 1; Marks to Villard, 15 May 1889, DF (*TAED* D8938ABE).

3. Upon Villard's solicitation of suggestions for a suitable engineer, Edison recommended Marks as "a good man to act as your technical adviser or chief engineer of our new consolidated Edison Light Company." Villard planned to meet Marks a few days later, to the apparent displeasure of Edward Johnson. Villard to Marks, 13 Dec. 1888; Villard to Johnson, 13 Dec. 1888; both Letterbook 60:369–70, Villard; TAE to Villard, 11 Dec. 1888, Lbk. 27:354 (*TAED* LB027354).

4. That is, the Edison Electric Light Co. of Philadelphia. The company was incorporated in December 1886 and spent the latter part of 1888 and early 1889 equipping its central station under Marks's direction and laying conductors through Philadelphia's Center City area. When the central station (designed by Marks) began commercial operation in early March, it reportedly had the largest generating capacity of any station in the world. Marks reports to Edison Electric Light Co. of Philadelphia, 8 Oct., 20 Nov., n.d. [Dec.] 1888, and 15 Apr. 1889, all DF (*TAED* D8831ABW, D8831ACE, D8831ACN, D8937AAH); Wainwright 1961, 37–41.

5. See Doc. 3294 n. 1.

6. Edison referred to *Bate Refrigerating Co. v. Hammond,* a patent law case in which the Edison Electric Light Co. (and its rivals) took a keen interest. The U.S. Supreme Court announced on 17 December that it would hear arguments immediately after its Christmas recess. "The Courts," *New York Tribune,* 18 Dec. 1888, 3; see Doc. 3313 n. 2.

—3296—

Alfred Tate to Jesse Lippincott

[Orange,] Dec 11, [1888][1]

Dear Mr. Lippincott,—

In reference to your letters of 8th instant,[2] Mr. Edison will be very glad to send Mr. Wangemann (The Professor) over to you on the afternoon of the 18th, to make an exhibition before the Mendelssohn Club.[3] I will have him report at your office.

In regard to phonograph dolls, Mr. Edison has just perfected his model, which is the only standard apparatus that has yet been constructed. He says that he could get three dolls out for you by giving piece work to a couple of men. Before saying to you definitely that these can be gotten ready, I want to see Mr. Briggs, whom I expect will be at the Laboratory to-day. We have several dolls here which talk very well. The trouble with them is that they get out of order very easily.[4] I had a conversation with Mr. Briggs the other day, and he said that if the new model will do what they expect of it, he will be very glad to give his consent to your having the dolls; but he is afraid to let any go out that he is not absolutely sure of. I think that I can arrange the matter with him this afternoon, and will write you further.[5] Yours truly,

A. O. Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 27:359 (*TAED* LB027359).

1. The typed year was not copied legibly, but this letter was transferred into the letterpress book in proper sequence for December 1888.

2. Lippincott wrote directly to Edison and sent a reminder to Tate on the same day about securing the loan of a phonograph to record forty voices at an exhibition of the Mendelssohn Club in New York City on 18 December. The club offered to pay related expenses, and one of its representatives soon visited the laboratory and made arrangements directly with Adelbert Wangemann. Lippincott to TAE, 8 Dec. 1888; Lippincott to Tate, 8 and 14 Dec. 1888; all DF (*TAED* D8848AFB, D8848AFC, D8848AFF).

3. New York City's Mendelssohn Glee Club, formally organized in 1866 or 1867, was among the most prominent of a large number of groups, many named for famous European composers, formed after the Civil War for English-language choral performance. "Mendelssohn

Glee Club," *Harper's Weekly* 35 (24 Oct. 1891): 816, 833; Ogasapian and Orr 2007, 113.

4. In late December, Alfred Tate admitted privately to an editor of the *New York World* (for whom a reporter tried to get a doll after having written about it for the paper) that the "phonographic portion of this doll is all right, but the details of the mechanism have not yet been satisfactorily arranged. Mr. Edison has made a number of models and is now making others" after earlier versions failed to withstand "the shaking which they received in transit." Monroe Rosenfeld to TAE, 1 Dec. 1888, DF (*TAED* D8807ADA); Tate to James Graham, 31 Dec. 1888; Lbk. 27:561 (*TAED* LB027561).

5. Tate confirmed the next day that work on Lippincott's dolls "was given out yesterday," presumably by means of inside contracts with laboratory workers. While promising that the toys would be ready before Christmas, Tate also cautioned that they might not be as "complete in all respects" as those to be sold commercially and should be used "simply for 'family purposes'" (Tate to Lippincott, 12 Dec. 1888, Lbk. 27:377 [*TAED* LB027377]). The week's time sheet for machinist William Heise noted that he spent 12 and 13 December working on the toy phonograph "contract" under a new laboratory job number (241) used since early December for "Toy Phonograph (TAE)." Among those also working on the project through month's end, machinist Julius Harburger put in notably long hours (December time sheets, esp. for Heise and Harburger, Time Sheets, WOL; N-87-11-27, Lab. [*TAED* NL002AAA, image 12]).

—3297—

To George Gouraud[1]

[Orange,] Dec. 15, 88.

Dear Sir:—

I am in receipt of your letter of 22d ult., in regard to Mexican patents, which matter is receiving attention in this office.[2] You state that you have sent to your Mexican agent, Mr. Luis Mendez,[3] cases 84 and 85, and I therefore suppose that the decree of President Diaz,[4] dated the 29th day of September 1888, granting a ten year patent, relates to these cases,[5] though I have nothing more reliable than inference to go by, as you have not yet sent my attorneys, Dyer and Seely, a list of applications &c., which they have frequently asked for, and which I have also requested you to send. I cabled you this morning to mail the data immediately.[6] I cannot understand why it has been delayed so long.

After all the correspondence which we have had on the subject, and after the earnest effort which has been made to assist you to an intelligent understanding of the law of the United States, it is very disheartening to read in your letter under reply the erroneous statement that, "Applications in short term countries may be made in perfect safety to the long term country patents, provided the application for short term countries is made subsequent to the filing of the long term applications."[7]

Further discussion of this matter I consider useless, and I am therefore going to give you in this letter definite and absolute instructions, and I shall hold you strictly accountable for a faithful and rigid adherence to the rules that I desire followed in your work of taking out patents.

From the powers of attorney which have been sent me for signature, I find that you have been taking or desire to take patents in the following countries:—[8]

England	Queensland	Tasmania
Victoria	New Zealand	New South Wales
Cape of Good Hope	South Australia	Brazil
Austria	Germany	France
Italy	Spain	Norway
Sweden	Belgium	Turkey
Portugal	Mexico	Peru
Hawaii	Denmark	Argentine Republic
Russia		

For convenience of reference I will number the rules by which you are to be governed from this time forward.

(1) In countries which grant patents only for fourteen years or longer, you may make application for and take out patents as soon as the cases reach your hands, without awaiting any instructions from me or my attorneys, Dyer & Seely. I understand such countries to be as follows, though you will, of course, correct the list if any of the countries named do not come under the above rules:

England	Queensland	Victoria
New Zealand	New South Wales	Cape of Good Hope
South Australia	Brazil	Germany
Spain	France	Norway
Sweden	Belgium	

(2) In countries which grant patents only for terms of less than fourteen years, you are not to make applications for any patents until you have been advised by me or my attorneys, Dyer and Seely, that the corresponding United States patents have been issued and that there is no further objection to your applying for and obtaining patents in such countries. The following is a list of said countries so far indicated by the powers of attorney sent me by you for signature:

Mexico	Peru	Hawaii
Denmark	Russia	

(3) <u>In countries which grant patents for various terms up to fifteen years</u>, you are not to make application for or take out any patents without paying the fees for the entire term of fifteen years, unless you wait until the corresponding United States patents are issued, and you are notified by me or my attorneys, Dyer and Seely, as provided in rule No. 2. Following is a list of such countries so far indicated by the powers of attorney sent me by you for signature:[9]

Portugal	Turkey	Argentine Republic
Austria	Italy	

(4) Full detailed information must be promptly sent by you to my attorneys, Dyer and Seely, of all applications which you make and of all patents granted as the result of your applications.

I desire you to follow both the spirit and the letter of these instructions without any further discussion or contention.

There is not the least doubt that certain of my U.S. patents corresponding with your cases 84 and 85, have been limited by some of the short term patents which you have taken out, but in the absence of the information which, according to your letter of 24th November,[10] was to have been sent at once, I am unable to tell which of my U.S. patents have been so limited.

The Mexican patent referred to in the commencement of this letter may, if recognized by the payment of the fee due thereon, limit others of my U.S. patents, but as I am ignorant of the cases covered by this Mexican patent, I cannot make an investigation and will not therefore permit the fee to be paid and the patent recognized until I am placed by you in a position to scrutinize its effect upon my U.S. patents.

I will myself attend to the taking out of future patents in Mexico.

You, of course, have not filed applications in short term countries in connection with Cases 86 and 87 and 88. I say, of course, because I instructed you not to do so.

I am particularly desirous that the report for which I have to-day cabled you will show the number of years for which fees have been paid in countries which grant patents for various terms up to fifteen years.

In conclusion, I wish to say that I cannot afford to have my interests in this country jeapordized by your persistent neglect to recognize the way in which the law pertaining to patents is interpreted by the Courts of the United States, and I shall therefore take full advantage of the right which is given me under my agreement with you, to cancel the said agreement, if by your act, the lives of my United States patents are shortened.[11] Yours truly,

Thos A Edison

TLS (carbon copy), NjWOE, Lbk. 27:416 (*TAED* LB027416).

1. Alfred Tate sent a copy of this letter to Edison's patent attorneys for their comment two days later, they having already expressed their concerns directly to Gouraud. Much of Edison's correspondence on this matter was conducted through Tate. Tate to Dyer & Seely, 17 Dec. 1888, Lbk. 27:428 (*TAED* LB027428); Dyer & Seely to Gouraud, 13 Dec. 1888, DF (*TAED* D8846ACR1).

2. Gouraud advised that he had sent Edison's foreign sets 84 and 85 to Mexico City to secure patents for his and Edison's interests there generally, and for the benefit of Thomas Connery's prospective phonograph business in particular. He urged that his agent, Luis Mendez, "should be communicated with at once, as my apparent neglect of his letter puts me in a rather prejudicial light in his eyes, and will make him feel less interest in the future to give prompt attention to my business," but Edison had already written to Mendez on Connery's behalf. Gouraud to TAE, 22 Nov. 1888, DF (*TAED* D8849ACS); TAE to Mendez, 21 Nov. 1888, Lbk. 27:130 (*TAED* LB027130).

3. The editors have not identified Mendez beyond Tate's description of him as "our patent attorney" in Mexico City for phonograph matters. Tate to Samuel Insull, 17 Dec. 1888, Lbk. 27:441 (*TAED* LB027441).

4. As president of Mexico from 1876 to 1880 and again from 1884 to 1911, general José de la Cruz Porfirio Díaz (1830–1915) sought to industrialize and modernize the country by increasing foreign investment and the role of foreigners in the Mexican economy. When Díaz visited New York in 1883, Edison led him and his party through the Pearl St. generating station, the Edison Machine Works, and his laboratory. Doc. 2421 nn. 1, 3.

5. According to a translation of the decree (a typed copy of which Alfred Tate sent to Edison's patent attorneys), Edison received a broad ten-year monopoly on the phonograph and its improvements. The grant reportedly took the form of two patents derived from Edison's foreign sets 84 and 85. Porfirio Díaz decree, 29 Sept. 1889; Dyer & Seely to Tate, 8 Jan. 1889; both DF (*TAED* D8849ADF2, D8954AAB); Tate to Dyer & Seely, 31 Dec. 1889, Lbk. 27:580 (*TAED* LB027580).

6. Cable not found. After Edison had asked for patent information in November, Gouraud expressed surprise that it had not been sent from the office of Edison's Phonograph Co. in London and promised to attend to it personally. Gouraud's list of phonograph patents applied for reached Dyer & Seely by late December. TAE to Gouraud, 13 Nov. 1888, Lbk. 27:28 (*TAED* LB027028); Gouraud to TAE, 24 Nov. 1888; Dyer & Seely to Tate, 27 Dec. 1888; both DF (*TAED* D8846ACK, D8846ACW).

7. See, e.g., Docs. 3239 and 3267 n. 5. Gouraud did not identify the

source of the legal assurance he offered, but it likely came from G. G. M. Hardingham, whom he previously described as "a London Patent Agent strongly recommended to me by Mr. Fletcher Moulton, Q.C. as the most careful Patent Agent he knew." Gouraud had previously cited him as an authority, but Edison, guided by the cautious views of Dyer & Seely, rejected Hardingham's more generous interpretation of U.S. court decisions regarding the effects of short-term foreign patents. Gouraud to TAE, 16 Oct. 1888; Dyer & Seely to Gouraud, 13 Dec. 1888; both DF (*TAED* D8849ACD, D8846ACR1); TAE to Gouraud, 13 Nov. 1888, Lbk. 27:28 (*TAED* LB027028).

8. The editors have not found the powers of attorney. Gouraud also sent those documents to Dyer & Seely, who wrote Tate about the matter on 13 December after a personal conversation. The attorneys included a master list of countries in which they inferred Gouraud's intentions; it is identical to the one below. They also created sub-lists, identical to those below, based on national patent laws. Dyer & Seely to Tate, 13 Dec. 1888, DF (*TAED* D8846ACR).

9. Tate later wrote on the carbon copy: "This rule No. 3 has been modified. See Letter to Gouraud under date Jany 30/89." That letter is Doc. 3313.

10. Regarding Gouraud's letter, see note 6. In drafting this paragraph, Tate seems to have embellished statements made by Dyer & Seely in their 13 December letter to him (see note 8) in which they urged Tate to

> impress on Col. Gouraud the necessity of sending us full information as to what foreign patents he has already taken or applied for. Until we have such information we have no idea of how our United States patents stand. It is not at all impossible that some of the important patents which have been recently granted here have been limited to 5 years by some Portugese or Russian short term patent which Gouraud has taken.

After receiving a list of patents and applications from Gouraud, Dyer & Seely determined that only a single U.S. specification was seriously compromised. That one, however, was an important one (U.S. Pat. 386,974); it was apparently limited to the life of a five-year patent taken out in Portugal, although the Supreme Court decision in the Bate case handed down a few weeks later may have lifted that restriction. Dyer & Seely to Tate, 27 Dec. 1888, DF (*TAED* D8846ACW).

11. When Gouraud replied in early January, he conceded that his legal advice was insufficient but laid the fault to "the fact that it was supposed the American patents were already secured before the foreign Specifications were sent to me. This was my impression also, but it appears not to have been correct." He provided specific information about various countries and generally acceded to Edison's demands, though he did assert his right to make his own decisions about what patents to take. Specifically, he asked Edison's reasons for requiring payment of the full fifteen years of fees in several countries—a demand that laid on him "conditions that are more onerous than those imposed by the laws themselves." Gouraud to TAE, 5 Jan. 1889, DF (*TAED* D8959AAB); see also Doc. 3313.

—3298—

To George Gouraud

[Orange,] Dec. 19, 88.

Dear Sir:—

In regard to the coming Paris Exposition, I have made arrangements for an exhibit of all my inventions, which are to be placed in the American section.[1] A very large space has been set apart for my use, and for the use of the Machine Works and the Lamp Company. The exhibit which is to be made will, I believe, be the most complete of any yet attempted.[2] These arrangements, of course, include the phonograph. I will send instruments from here for the purpose and attend to all the details in connection therewith. I have placed Mr. W. J. Hammer in charge of the whole exhibit[a] and he is actively engaged in getting together everything which we propose showing.[3] I mention this matter to you in case you may have been considering an exhibit of the phonograph yourself, which, of course, is not necessary.[4] Very truly yours,

Thos A. Edison T[ate]

I will be glad to consider any suggestions you may desire to make— T.A.E. T[b]

TL (letterpress copy), NjWOE, Lbk. 27:491 (*TAED* LB027491). Signed for Edison by Alfred Tate. [a]"of the whole exhibit" interlined above by Edison. [b]Postscript written by Tate.

1. The American exhibit was organized by the United States Commission to the Paris Exposition, which included superintendents of divisions for fine arts, education, industry, machinery, agriculture, electricity, and minerals. Congress authorized the commission by a joint resolution on 10 May 1889, but its appropriation of up to $250,000 came too late for the construction of a free-standing American pavilion. U.S. Commissioners 1890–91, 1:ix–xi, xiii–xv; Swift 2008, 105.

2. Edison exhibited 493 machines or models, taking up about one-fifth of the space allocated to the American commission. Swift 2008, 103, 105; see also Doc. 3392 (headnote).

3. The editors have not found correspondence from Hammer about his activities to this date, though he very soon began writing to companies and individuals about the exhibit. In February, Francis Upton had suggested that all of Edison's exhibits be grouped together, and particularly that the phonograph be placed so as to "attract attention" to the displays of the Lamp Co. and Edison's other manufacturing interests. He urged "the necessity of not being bound to other parties by promises to exhibit the Phonograph entirely in their charge." Edison replied, "Gouraud has the right— Have [Philip] Dyer see Gouraud." Upton to TAE (with TAE marginalia), 14 Feb. 1888; TAE to Upton, 16 Feb. 1888; both DF [*TAED* D8842AAB, D8818AEG).

4. Cf. Doc. 3306. Gouraud replied that he thought Edison was "fortunate" to be represented by Hammer, "whose efficiency was fully demonstrated in connection with the Crystal Palace Exhibition" in 1882. He also advised that he would "expect that as regards the Phonograph

he [Hammer] will take no initiative in any way in Paris without consulting me, and presume that this will accord with your own views, as by that time I shall have my arrangements in hand in Paris." Gouraud to TAE, 5 Jan. 1889, DF (*TAED* D8946AAA).

—3299—

Samuel Insull to Alfred Tate

Schenectady, N.Y. December 19th. 1888[a]

My dear Tate:

I enclose you herewith a letter addressed to Mr. Edison, which should be replied to immediately.[1] The reply should be sent here to Schenectady, addressed to Mr. Kruesi.[2] Please take the letter to Mr. Edison and see that each point raised in the letter receives an immediate reply. If re-iteration will result in an immediate reply, I may again state that an immediate reply is absolutely essential. I really do not think that Mr. Edison is aware of the kind of stuff that those fellows who are experimenting on compound sent us.[3] We have got to do something in order to get a good house wire. Unless we go ahead within the next month or so we shall lose next season's trade. There is upwards of 1,300,000 yards of this class of wire used a month, and we are practically getting nothing of the trade. Yours very truly,

Saml Insull

<Shall be in New York Thursday evening.>[4b]

TLS, NjWOE, DF (*TAED* D8835AEZ). Letterhead of Edison Machine Works. [a]"*Schenectady, N.Y.*" preprinted. [b]Marginalia by Insull.

1. The enclosure probably was Insull's letter to Edison of the same day, sent in tandem with a telegram (Insull to TAE, 19 Dec. 1888, DF [*TAED* D8835AFC]). Both concerned a sample of insulating compound received from the laboratory, which as Insull explained in the letter, "contains <u>a great deal of rubber</u>, which as you know cannot be mixed mechanically with any other substance." He hoped to "put a fire-proof and water-proof wire on the market immediately" using instead a material that Edison had promised would be "no trouble" to supply. His suggestions about that "semi-fluid compound" illuminate some of the general materials and processes of insulation. It would, he thought

> become sufficiently fluid to penetrate the cotton. Or, if this is not practicable, if you can name a solvent that will liquify the compound sufficiently to penetrate the cotton, we can go ahead and use the "coke-like" substance that we have received from you recently. Mr. Kruesi has tried the solvent Di-sulphate of Carbon, and it worked admirably. Is there any objection to our using this as a solvent right along? If so we can take the wire, put a thin coating of rubber on it, then cotton cover it, then pass it through the liquid compound, and

if we require white wire, braid it with glazed cotton. [Insull to TAE, 19 Dec. 1888, DF (*TAED* D8835AFA)]

2. An acknowledgment of Insull's telegram (see note 1) was promptly sent in Edison's name (TAE to Insull, 19 Dec. 1888, Lbk. 27:471 [*TAED* LB027471]). A full reply to the letter, however, was drafted by David Marshall, one of the principal experimenters on insulation, on 19 December and sent in Edison's name the next day. Marshall identified several batches of material sent from the laboratory, one of which, shipped in late November, seemed to be the one referenced by Insull. That compound "was not supposed to be melted," he indicated, "but to be masticated & squirted on wire.... If it is worthless you have been a long while letting us know" (Marshall to Insull, 19 Dec. 1888, DF [*TAED* D8835AFB]; TAE to Insull, 20 Dec. 1888, Lbk. 27:492 [*TAED* LB027492]). On 31 December, a telegram was directed to John Kruesi from the laboratory, advising that "We can make insulation of any consistency. Please send us sample of ordinary insulation which you use with underwriter wire and we will return quantity our insulation same consistency." Tate soon followed up with a letter to Kruesi, reiterating the request for "a quantity of your ordinary insulation, which can be used here as a standard" for the proper texture of an insulation "which, when heated, can be squirted on a wire, and which will soak into the cotton covering and maintain its toughness when cold." When a sample sent to Orange on 2 January did not meet those requirements, Tate repeated his request. Correspondence about various samples continued through January (West Orange laboratory to Kruesi, 31 Dec. 1888; Tate to Kruesi, 2 and 4 Jan. 1889; Lbk. 27:597, 601, 609 [*TAED* LB027597, LB027601, LB027609]).

3. In addition to David Marshall, principal experimenters on insulation at this time were Henry Wurtz, who gave the whole of his time to the project, and Frank Van Buren. Both Wurtz and Van Buren started working at the laboratory in October, according to time sheet records. Time Sheets, WOL; Van Buren to Tate, 17 Oct. 1888, DF (*TAED* D8814AES).

4. That is, 20 December. Insull had been working primarily at the Dey St. office of the Edison Machine Works in New York City but made a brief trip to Schenectady; cf. Doc. 3300.

—3300—

Samuel Insull to Uriah Painter

New York, N.Y. December 21, 1888.[a]

My Dear Painter:

I have your letter of the 12th.[1] I was suddenly called out of New York and omitted to write you.[2]

Mr. Lippincott owes Mr. Edison under the deal for the sale of the Phonograph $152,500.[3] I think if you can conveniently arrange to make an extension you will not only be helping Mr. Lippincott, but you will be helping Mr. Edison. The two interests are now so thoroughly bound up that any trouble to the North American Phonograph Company would of necessity cause Mr. Edison trouble, as it would affect, if not his own payments, certainly the investments of himself and friends in the Phonograph works. Yours truly,

Saml Insull

TLS, PHi, UHP (*TAED* X154A7FH). Letterhead of Edison Machine Works; Samuel Insull, treasurer and general manager. [a]"*New York, N.Y.*" preprinted.

1. This date was evidently a faulty reading of the Washington dateline of Painter's confidential letter of "12, 16, 1888." Painter wrote about a request from Jesse Lippincott, who he believed was "entirely out of funds," to delay payments to him. He asked if it would serve Edison's interests to accede to the request and also sought "a list of the payments still due to E, so I can govern myself accordingly as I want to promote his interests if possible" (Painter to Insull, 16 Dec. 1888, UHP [*TAED* X154A7FD]; cf. Doc. 3261 n. 2). Lippincott had been corresponding with Painter for more than a week in hope of postponing a scheduled 15 December payment for stock of the old Edison Speaking Phonograph Co. (Painter to Edward Johnson, 9 Dec. 1888; Painter to Lippincott, 10 and 15 Dec. 1888; Lippincott to Painter, 11 Dec. 1888; Painter to Woerishoffer & Co., 19 Dec. 1888; all UHP [*TAED* X154A7EY, X154A7EZ, X154A7FC, X154A7FA, X154A7FF]). Josiah Reiff advised Painter that Lippincott "has Evidently been badly bled, which of course is not your fault, but still I guess you will be better of[f] not to have him fail." Painter deferred part of the payment, but Lippincott received no such consideration from Ezra Gilliland, who refused a request to delay Lippincott's buy-back of his North American Phonograph Stock (Reiff to Painter, 12 Dec. 1888, UHP [*TAED* X154A7FB]; Gilliland to Lippincott, 10 Dec. 1888, LM 22:252 [*TAED* LM022252]).

2. Insull had short-term plans to go to Schenectady on 19 December but, in fact, reached there the night of the 18th. Insull to Alfred Tate, 18 Dec. 1888; Insull to TAE, 20 Dec. 1888; both DF (*TAED* D8820ABM, D8805AJZ).

3. Cf. Doc. 3274 n. 4.

—3301—

From Queen & Co.

Philadelphia, Dec. 22nd, 1888.[a]

Dear Sir:

We are glad to be able to advise you regarding the Photo~~graph~~ micrographic apparatus[1] that we have received the following advice from the manufacture,[2] under date of the 4th inst.

"I am just in receipt of your kind favor of the 23rd ult. and in reply hasten to state, that the photographic[3] apparatus will be finished in the course of a fortnight from the present date. I am only afraid the electric lamp belonging to it, will not be delivered to me at that time, however, should it happen to be ready by then you may rely upon receiving the complete apparatus at the above appointed time."

The above is in answer to a letter of ours urging an early shipment. Trusting the above will be satisfactory, we remain Yours truly,

Queen & Co.[4] E. P.[5b]

TL, NjWOE, DF (*TAED* D8856ADW). Letterhead of James W. Queen & Co. [a]"*Philadelphia*," and "188" preprinted. [b]Initialed by hand.

1. This photomicrographic outfit was manufactured by the Carl Zeiss Optical Works in Germany and imported by Queen & Co. It was among a large order of apparatus that Edison placed with Queen & Co. in September 1887 as he was equipping his new laboratory. When the instrument finally arrived in March 1889, William K. L. Dickson reported that wooden parts were warped and cracked because they had been made with unseasoned wood; repairs were made over the summer. TAE order for Queen & Co., n.d. [c. 1887; p. 14]; Dickson to Alfred Tate, 18 Mar. 1889; Queen & Co. to TAE, 21 Sept. 1887; all DF (*TAED* D8756AHX, D8970ABB, D8756ACG); TAE to Queen & Co., 21 Feb. 1889, Lbk. 28:326 (*TAED* LB028326); see Doc. 3416.

Although described in Edison's order to Queen & Co. as a "Micro-Photographic Apparatus," the instrument was a photo-micrographic device. The former creates very small images of larger subjects as, for example, in the cases of microfilm. The latter produces photographs and projections of microscopic subjects, such as for studies of pathological agents like the one described in an illustrated *New York World* article published in October above a reprint of Doc. 3265 ("Micro-photographs," *American Monthly Microscopical Journal* 10 [Dec. 1889]: 276–77]; "A Great Discovery," *New York World,* 7 Oct. 1889, Cat. 1077, Scraps. [*TAED* SB018037a]). The nature of the Zeiss instrument was further confused by the later recollections of William Dickson, Edison's photographer and primary assistant in the motion picture experiments. In describing the photographic building at the laboratory, Dickson and his coauthor noted that it contained "one of the celebrated Zeiss micro-photographic outfits," and they included a photograph of Edison experimenting with an instrument that is clearly the same as the photomicrographic apparatus in Zeiss catalogs from this time (Dickson and Dickson 1894a, 299, 302; Zeiss 1888; Zeiss 1891). The confusion over the name and purpose of this apparatus led a noted film historian to mistakenly associate it with Edison's early efforts to produce a series of microphotographs on cylinders, which when rotated and viewed through a microscope eyepiece would produce the effect of motion pictures (Hendricks 1961, 24, 77–78). Dickson and Dickson 1894a (198, 299) describe the use of a photo-micrographic device in connection with "Edison lamp suits" (and they published a photomicrographic image of a bamboo section) and for "bacterial researches" (see Doc. 3265; Spehr 2008, 81). Dickson later experimented with producing movies of microscopic subjects, probably using the Zeiss photomicrographic apparatus (Dickson and Dickson 1894a, 41–42 and Spehr

2008, 181; for a history of photomicrography see Bracegirdle 2010, esp. chaps. 4–5).

2. That is, the Zeiss Optical Works of Jena, Thuringia (Germany). Carl Zeiss opened a workshop for making microscopes in 1846 and, with the active scientific collaboration of Ernst Abbe after 1866, developed new techniques for designing and constructing microscopes that pushed Zeiss instruments in advance of any made by traditional methods. By the time Zeiss died in 1888, the business was a major manufacturer of optical instruments, including photomicrographic apparatus (introduced in 1885) for projecting greatly enlarged images. At this time the works employed about 300 people. Auerbach 1904, 3–18, 39–41, 89, 136, 141–42; Paetrow and Wimmer 2016, 51–114; Deutsche Gesellschaft für Mechanik und Optik 1893, 146.

3. This word was mis-typed as "protographic," which is a type of printing process.

4. Founded in 1853, James W. Queen & Co. of Philadelphia were manufacturers, importers, and dealers of optical and scientific instruments. Following the retirement of James W. Queen in 1870, his partner Samuel Fox took charge of the company's management and expansion, which included notable displays at the Centennial Exhibition and subsequent industrial expositions. The company began publishing the *Microscopical Journal* in 1883, prominently featuring its own advertisements, and by 1888 its prominence in American industry was sufficient to have captured a cover story in *Scientific American* ("The Manufacture of Scientific Apparatus," *Sci. Am.* 58 [28 Apr. 1888]: 258). Edison had relied upon the firm for more than a decade as a supplier and, briefly, as an agent for the Edison Speaking Phonograph (Warner 1993, vii, viii, x, xii; Queen & Co. to TAE, 7 Oct. 1875; TAE order for Queen & Co., n.d. [c. 1887]; both DF [*TAED* D7518I, D8756AHX]; Edison Speaking Phonograph Co. circular, n.d. [c. 1878] [*TAED* CA013B]; Queen & Co. to Uriah Painter, 11 Aug. 1880; Queen & Co. to Edward Johnson, 18 Nov. 1880; both Painter [*TAED* X154CCX, X154CDF]).

5. Not identified.

—3302—

From Samuel Insull

New York, N.Y. 27th Dec 1888[a]

My Dear Edison,

I came back from Schenectady this morning & at once called on Mr Villard.[1] He told me that he had seen D. M & Cos people twice & had got their absolute agreement to the deal. The extra $500,000 demanded by D. M. & Co is to be paid in Deferred Stock. Mr Villard said that no papers had actually been signed but that there was no possibility of D M & Co backing down[2]

He told me that he had increased the Syndicate from $1 750,000~~0~~ to $2,000,000 cash & that Winslow Lanier & Co[3] will take $100,000 in the Syndicate so the Interests in the Syndicate will stand as follows

Drexel Morgan & Co	250,000
Winslow Lanier & Co	100,000
Thos. A. Edison	150,000
Villards German friends[4]	1,500,000
	$2,000,000[b]

Perry tells me that German Banking Houses here have bought about 175 shares of Light stock between 187 & 191. The~~se~~ people buying have dealings with Villard & from their relations with him they would not be buying unless the deal was closed & Villard so advised them.[5]

Tate came in today & said he was busted so I gave him $10,000 of our paper for your account which he has sent to you to endorse.

I shall be here (New York) tomorrow (Friday) in Schenectady Saturday, in Chicago Monday (in all probability) & if so back in New York again on Tuesday evening. Yours very Sincerely

Saml Insull

ALS, NjWOE, DF (*TAED* D8832AAL). Letterhead of Edison Machine Works. [a]"*New York, N.Y.*" preprinted. [b]Followed by dividing mark.

1. Henry Villard had hoped to see Edison in New York on 17 December but the editors have not determined what, if any, meetings occurred since the decisive conference on 10 December. To William Marks, whose appointment depended on the new company being formed, Villard reported on 23 December "good progress…all obstacles being now removed." Charles Spofford to Samuel Insull, 15 Dec. 1888; Villard to Marks, 23 Dec. 1888; both Letterbook 60:389, 428, Villard.

2. Participation of John Pierpont Morgan or his firm hung in abeyance until the latter part of January, when Charles Spofford, in response to Insull's inquiry, reassured him that "Morgan's signature is secured." Despite that, there was an unspecified "Difficulty with Morgan" to be overcome in February. Spofford to Insull, 23 Jan. 1889; Henry Villard to TAE, 18 Feb. 1889; both DF (*TAED* D8938AAA, D8938AAE); cf. note 5.

3. A New York investment bank since 1849, Winslow Lanier & Co. had close ties to the Edison electric lighting interests and to Drexel, Morgan & Co. Doc. 3092 n. 3.

4. The investors led by Villard included Deutsche Bank and Jacob Stern of Frankfurt (according to a signed but undated stockholders' agreement). In addition to those parties and those listed by Insull, founding members of the syndicate included (according to an undated and unattributed memorandum) Siemens & Halske and Allgemeine Elektrizitäts-Gesellschaft (AEG). The latter memorandum was prepared soon after incorporation of the new entity (identified as "General Edison Electric," a name altered by hand in the typed document) but before the full consolidation of the various old firms (Bergmann & Co.

stockholders' circular and agreement, n.d. [Jan. 1889?], Misc. Legal [*TAED* HX89057]; Edison General Electric Co. memorandum, n.d. [Jan. 1889?], DF [*TAED* D8938AAA1]). In late March 1889, Villard noted that the total had been increased to $2,400,000 with the addition of several other investors, including Kuhn, Loeb & Co. (Villard to Spencer Trask, 28 Mar. 1889, Letterbook 61:454, Villard; for a detailed breakdown of the stakeholding in the new firm, see Edison General Electric Co. report, 28 Mar. 1889, Miller [*TAED* HM89AAP]). Discussing tensions inherent among these partners, Kobrak 2008 (52) points out that the involvement of Siemens & Halske "was contingent on a contract for the consolidated company to build cable, though oddly there was no commitment to purchase the cable for the U.S. company's own needs." Buss 1978 [1977] (202–3) suggests that Villard included Siemens & Halske in hopes of gaining access to their other U.S. patents, a suggestion supported by summaries of Charles Coster's comments on subsequent negotiations (memorandum on Coster letters of 27 Dec. 1887, 23 May and 15 Aug. 1889, n.d., Box 78, Folder 551, Villard). Historian Mira Wilkins, drawing on the research of Villard biographer Dietrich Buss, suggests that the entire Edison General Electric consolidation flowed from Villard's desire, as a representative of Siemens & Halske, to license the manufacture of their armored cable in the United States (Wilkins 1989, 434–35; cf. Doc. 3378).

5. Advising Edison on 22 December of recent stock prices and sales, broker William Perry passed on a report from Sigmund Bergmann that "D. M & Co had signed a paper for Villard going into the Consolidation. It may be so and perhaps not." Perry to TAE, 22 Dec. 1888, DF (*TAED* D8832AAK1); cf. note 2.

—3303—

From Charles Spofford

New York, December 31, 1888.[a]

Dear Mr. Edison:

Mr. Villard deems it very desirable that the new Electric Company should be incorporated as soon as possible, and asks that you will kindly consent to be one of the incorporators.[1] This involves no responsibility on your part. The other incorporators are Messrs. Francis R. Upton, Samuel Insull, Charles Batchelor and E. H. Johnson,—and each of these gentlemen has been requested to be present at noon, on Wednesday next, January 2, at the law offices of Messrs. Wheeler, Cortis & Godkin,[2] 45 William Street, for the purpose of signing the[b] articles of incorporation. Will you please also be present at the time and place stated, and greatly oblige Mr. Villard?[3] Yours truly,

C A Spofford Private Secretary.

TLS, NjWOE, DF (*TAED* D8832AAM). Letterhead of the Mills Building. [a]"New York," and "188" preprinted. [b]Repeated at bottom of one page and top of the next.

1. Edison General Electric was incorporated in early January in New Jersey where, according to biographer Jean Strouse, state law had recently been changed to allow control of corporations by other corporations. Its incorporation was carried out again in April in New York State (*Orange (N.J.) Herald,* 3 Jan. 1889, Clippings [*TAED* SC89002D]; "The Edison Consolidation," *Electrical World* 13 (12 Jan. 1889): 15; Strouse 1999, 312; see Doc. 3348). At the end of January, Edison nominated Samuel Insull to the board of directors "because of his acquaintance with practically every branch of our lighting business. He, moreover, possesses my entire confidence, and is in full accord with my views" (TAE to Henry Villard, 30 Jan. 1889, Lbk. 28:1 [*TAED* LB028001]).

2. Lawrence Godkin (son of journalist and editor E. L. Godkin) joined the law partnership of Everett Wheeler, an ardent legal and civil service reformer, and Harold Cortis in 1885. Villard paid the firm for handling the incorporation of the Edison General Electric Co. *ANB,* s.v. "Wheeler, Everett Pepperell"; Harvard College 1906, 46; Martindale 1900, 972, 1026; Villard to Wheeler, Cortis & Godkin, 3 Jan. 1889; Villard to Wheeler, 3 Jan. 1889; both Letterbook 60:488, Villard.

3. Edison was still visiting Mina's family in Akron, Ohio, on the appointed day. Alfred Tate to George Hartwell, 2 Jan. 1889, Lbk. 27:605 (*TAED* LB027605).

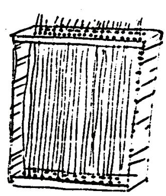
—3304—

To David Hickman

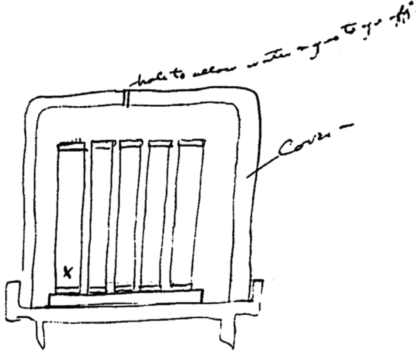
[Orange, December 1888][1]

Hickman[2]

I found a new rinkle. If the fibres ~~of b~~ or rather big splints of bamboo are put in a steam chest, They get the dark red color in couple of days & can be powdered up by the finger which shows they are just in that porous state we want, but in the same chamber I placed a closed gas tube containing a lot of the same splints & I find these are very irregular some a black some brown. They are cracked & distorted, while those in main chamber as straight. This goes to prove that in preliminarizing at least the fibres should all be seperated from each other so as to allow of free circulation. you better try this Experiment.



[A][3]



As you use a low temperature I think you can bring the fibres out dead straight. I dont think they will bend at the temperature you use—

You might rig up a single one like X that will hold say 100 fibres put them in a mould & preliminarize couple days ~~If you~~ [g?][a] for fear they will bend you could cement the tops with sugar Dextrin or some cement so they will [hang?][b] in fact you might rig up 2 of the holders one in which the filiments a cemented at the top but guided at the bottom[c] & one guided at top & bottom without Cement.

Perhaps you might make simple metal racks cementing & guiding the fibres then preliminiarizing them take out rack & use it in the bath[4] This would save recementing—

Your O.N.F. No[5]—I forget but it is the treated one, (The other was NG) is doing fairly its life is nearly as good as factory lamps but it drops in CP worse— Yours Nos 3, 4, 5, were set up today 20 in each at 240 C per hp—[6] ~~Let me~~ I send you herewith, in a box some filiments made by squirting a Compound through a die,[7] ~~prelim~~ bend them in form of a ∩ same as old regular lamps— preliminarize them same as usual & then treat in No 6 as 17 will effect the stuff— Then Carbonize & send me back 2 or 3 doz to go in Lamps— You can run these through with your other runs— you will not need to put them in forms as they do not appreciably shrink, & I dont think will stick together— The reason I want them bent in ∩ form is that I think they will be too brittle to bend after carbonization. you better make a few straight to test this question. Yours

Edison

ALS, Teeple (*TAED* X219A). [a]Canceled. [b]Illegible. [c]“but guided at the bottom” interlined above.

1. This date is taken from a faint notation of "Dec 88" written under Edison's signature.

2. David Kelsey Hickman (1861–1935) was born in Washington, D.C., but grew up in New Brunswick and Metuchen, N.J. He applied for work at Edison's nearby Menlo Park laboratory in 1880, beginning a long association with Edison electric lighting. Hickman had charge of the pump room at the original lamp factory in Menlo Park. When the plant moved to Harrison (East Newark) in 1882, he went with it and superintended, in succession, the socket, clamping, and plating departments. Hickman and Martin Force were designated in 1886 to carry out extensive research on carbonizing lamp filaments. Some time after, the two men relocated to a new and apparently secret carbonizing factory in Jersey City near the Marion (Junction) station of the Pennsylvania Railroad; in the early 1890s, before its operations were moved to the main factory at Harrison, it was overseen by Edison chemist Jonas Aylsworth, who later referred to it as the "Filament Department" (Howell 1923, 17; Aylsworth's testimony, 7 Oct. 1903 [p. 111] and 12 Dec. 1905 [p. 46], both *National Phonograph Co. v. American Graphophone Co.*, Lit. [*TAED* QP006111, QP003046]). Francis Upton hoped to put lamp filaments through the "entire preliminary" carbonizing process there and the final steps at the main factory in Harrison. Hickman and Force continued experimental work at Edison's direction and also carbonized filaments under an inside contracting arrangement with the Edison Lamp Co. Doc. 1961 n. 2; "Hickman, David Kelsey," Pioneers Bio.; Cat. 1337:40 (item 536, 28 Jan. 1888), Batchelor (*TAED* MBJ004040A); TAE to Francis Upton, 20 July 1888, WJH (*TAED* X098A027); Upton to TAE, 1 Aug. 1888, Upton (*TAED* MU122).

3. Figure labels are "hole to allow water & gas to go off—," "Cover—," and "X."

4. Edison meant a sand bath, a common piece of laboratory equipment used for evenly applying heat to a material. Edison had used it frequently in carbonizing experiments in recent years (Doc. 2898 n. 1 and see, e.g., Docs. 2873, 2914, 2921, and 2922). He referred often in experimental records to "preliminarizing" filiments by giving them an initial heating, perhaps in the presence of a hydrocarbon vapor, before final carbonization (Doc. 2921 n. 5). That process seems to have been used in commercial production at the satellite lamp factory (see note 2), and two-stage carbonization was an accepted practice in the industry by the early twentieth century (Solomon 1908, 101).

5. The editors have not identified the meaning of "O.N.F." but speculate that the abbreviation may refer to a sequence of "orders" of carbon filaments from the "new factory" (see note 2). Since January, Joe Force had been recording receipt of numbered "ONF" batches, marking for each one the number of carbons received, broken, and placed into lamps. Force had recorded fifty-nine such orders by September 1888, when he began using a hand stamp to print these headings and the ONF number on the notebook pages. An unidentified assistant used a separate notebook in the latter part of 1888 to list numbered "ONF" entries interspersed with numbered "Edison" entries. N-87-12-10, Lab. (*TAED* NB008AAD, NB008AAG); N-88-05-17, Lab., NjWOE.

6. A rating of 240 candlepower per horsepower was standard for the improved sixteen-candlepower Edison lamps placed on the market in 1887. Doc. 3050 n. 5; cf. Doc. 3053.

7. The editors have not identified the sort of "Compound" Edison wished to try; possibly it was related to several plastic materials from which he extruded experimental filaments in February 1889 (see Doc. 3319). He had experimented in recent years with filaments formed by extruding various oxides and carbon materials through a die (see Docs. 2994, 3112, and 3117). Following the leads of Joseph Swan in England and Edward Weston in nearby Newark, he had also tried cellulose formed by nitrating cotton; the pulpy material could be squirted into thin threads or sheets (Docs. 2697 n. 2, 2820 n. 9). Leigh S. Powell and several collaborators had also been working along similar lines in England. Sometime between early 1887 and mid-1888, they discovered and patented a process of dissolving cotton in hot zinc chloride, which eliminated the explosive dangers of nitrated guncotton; the editors have not found what, if any, patents Powell took in the United States. The promise of cellulose filaments was bright enough that the Thomson-Houston Electric Co. brought four chemists from England and Europe to work on their development in the late 1880s. Squirted cellulose filaments would later become the standard in electric incandescent lamps (Swinburne 1886–1887 [pt. 6], 286; Howell and Schroeder 1927, 81–83; Doane 1907, 394).

–5– January–March 1889

Edison began the new year vacationing at his wife's family home in Akron, Ohio. Before leaving Orange in December, he gave his blessing to a long-discussed consolidation of the Edison electric light and power businesses, and he returned to New Jersey just days after the resulting Edison General Electric Company was incorporated in the state. Its leadership and structure were still inchoate, and Edison weighed in with proposals intended to sustain the "enormous and rapid development" and "phenomenal" earnings enjoyed by his electrical manufacturing shops.[1] Before the new firm had its legs, financier Henry Villard was already guiding it toward a selective alliance with the rival Thomson-Houston Electric Company. As much as Edison trusted Villard (whom he endorsed as the company's presumptive president), he was unwilling to follow this lead. Expanding markets and huge appetites for capital had driven Thomson-Houston and the Westinghouse Electric Company, the other major electrical concern, into strategic cooperation, but Edison characteristically took a go-it-alone approach. "We have all that is required," he assured Villard, and his arguments against "intangling alliances with any competitor" prevailed for the time being.[2] Unsurprisingly, he turned down an invitation (arranged through Edward Dean Adams, a financial pillar of the Edison light businesses) to visit George Westinghouse, Jr., in Pittsburgh. The offer came without conditions, but Edison scorned Westinghouse as an arriviste in the electrical world who was "flying a kite that will land him in the mud sooner or later."[3] A short while later, Edison signed a testimonial letter (Doc. 3330) in support of Harold Brown, a provocative activist against alternating-current electrical systems and the Westinghouse firm in particular.

Edison devoted much of his time to the phonograph. He continued experimenting with significant changes to the minutely sensitive parts in the recording and reproducing mechanisms.[4] Some of these alterations were to accommodate "new material blanks"—that is, the latest form of his still-evolving wax cylinders. One idea he continued to explore was applying a veneer of recording wax to an inexpensive base material.[5]

Edison had a number of projects going simultaneously, as usual. The kinetoscope—an instrument "for recording & reproducing moving objects photographically"—was more a concept than a device, but he opened an experimental account in February and toyed with ideas about it, particularly for adapting the curved surface of a cylinder to a series of tiny flat photographs.[6] And he never went long without trying to improve his incandescent lamp. Still facing the limitations and inconsistencies inherent in natural fibers, he now returned to the idea of attaining greater uniformity by extruding filaments from plasticized carbon materials.[7] In what had become a clear pattern by this time, relatively little of this work found its way into Edison's notebooks, and much of what did took the form of draft caveats or patent applications. In particular, his drafts of caveats, for which the Patent Office's rules were looser than for patents, were beginning to carry much of the record-keeping burden for which he had previously used notebook entries, and individual drafts sometimes rambled over a number of topics.[8]

Edison had a special space at the laboratory ("room 12") where he did his own experiments.[9] The wider lab complex, however, remained the working home for about ninety skilled and unskilled men with a payroll hovering around $1,300 per week. It was closely allied with Edison's manufacturing enterprises, with direct expenses for most projects reimbursed by the electrical factories (soon to be Edison General Electric), Henry Villard, North American Phonograph, or various other companies.[10] According to payroll records, much of the work at the lab in this period was on the phonograph and its cousin, the toy phonograph (or talking doll); ore milling; an electrical transformer; lamp testing; electrical insulation (in conjunction with the Machine Works); the Edison Phonograph Works (possibly designing and making tools); and unspecified "bug killing"experiments.[11] Four machinists, a pattern maker, a carpenter, and a wireman put some of their time toward a "birthday present" in the February week that their employer turned forty-two. They reportedly gave him a "complete new phonograph made of gold, silver and steel" and restored his old clock, now regulated by a telegraph signal from Washington, D.C. The entire staff pitched in for the purchase of new furniture, including oak tables and chairs carved with Edison's initials, that was put in while he was away.[12] Citing the staff's workload, Edison put off a request from George Gouraud, his foreign phonograph agent and an entrepreneurial showman, to record the sound of Niagara Falls to accompany the London exhibition of a large painted diorama of the famous falls.[13] He did send Walter Miller to Washington, D.C., long enough to record greetings by Japanese, Korean, and Chinese diplomats in a bid by his Asian agent to secure market concessions in their home countries.[14]

The laboratory force worked on one other significant project through the winter: Edison's "Paris Exhibit." Patrick Kenny, a trusted experimenter, and several machinists spent virtually all of their time preparing a comprehensive exhibit of Edison's inventions for the Exposition Universelle, set to open in Paris in May.[15] Edison financed much of the affair himself, intending to showcase his new phonograph.[16] Having already hired William Hammer to construct and manage the display, Edison engaged in awkward correspondence with George Gouraud about their respective responsibilities for presenting the machine to the expected crowds. Trust between Edison and Gouraud seems to have frayed on both sides as the former issued directives and the latter reluctantly agreed to share in the expenses. Hammer sailed for France in early March with Edison's clear authority over the phonograph.[17]

In February, an all-male cohort of scientists and engineers (and their female guests) came to the laboratory for a meeting of the American Institute of Mining Engineers. Distinguished engineer John Birkinbine presented a paper on "The Concentration of Iron-Ore" written with Edison's help.[18] Nothing was said publicly at the time, but Edison had recently begun buying land around Bechtelsville, Pennsylvania, on behalf of the New Jersey and Pennsylvania Concentrating Works, in anticipation of building a large plant to recover commercially viable quantities of iron from marginal ore.[19] Two or three days after the engineers' meeting, he narrowly avoided catastrophic injury in the laboratory when a vessel of acid exploded and burned his face and eyes.[20] Edison decided over the winter to furlough his university-trained chemists.[21]

The dramatic rupture of Edison's friendly relations with Ezra Gilliland and John Tomlinson in September continued to echo in the winter. Press reports of the breach began appearing on 17 January and multiplied rapidly.[22] At the same time, Edison negotiated a retainer for Sherburne Eaton, a former president of the Edison Electric Light Company, to act as his personal attorney in Tomlinson's stead; Eaton also took Tomlinson's place as general counsel of the Edison Electric Light Company.[23] And there was the practical matter of keeping up the shared Florida property where he and Gilliland had built separate homes while looking forward to joint winter vacations. Edison sent terse instructions to the caretaker that charges for work there on behalf of himself and Gilliland "should be kept separate, the dividing line of the property being the dividing line for charging to either of us the work which is done in that connection."[24]

In the second week of March, days after William Hammer left for the Paris Exposition, Edison's oldest child, Marion Estelle, also sailed to France. Marion was a few weeks past her sixteenth birthday, and she traveled with Jennie Miller to join Grace and Mary Emily Miller, all sisters of her stepmother, Mina Edison.[25] It is not clear what thought was given to her return; she remained abroad for three years.[26]

1. Doc. 3321. Because certain technical requirements in state law impeded the new firm's organization in New Jersey, it was incorporated anew in New York State in April.

2. Doc. 3327; see also Docs. 3325 and 3332.

3. Doc. 3314.

4. See, e.g., Docs. 3312, 3333, and 3334.

5. See Docs. 3307 and 3312.

6. See Doc. 3307 esp. n. 3.

7. See Doc. 3334.

8. See Doc. 3365. Caveats from the first half of 1889 include Edison's Case 114, filed in March (PS [*TAED* PT031AAE]), and Docs. 3319, 3320, 3334, 3349, 3353, and 3358.

9. Millard, Hay, and Grassick 1995, 1:23.

10. Cf. Doc. 3291; laboratory account statement, 1 Jan. 1890, DF (*TAED* D9064AAA).

11. These "bug killing" experiments began in early September and continued intermittently through the end of 1888, apparently overlapping with Arthur Kennelly's germicidal research in the fall (see Doc. 3265). Experimenter Frank Deems, a physician, took over the project at the end of December and gave the whole of his time to it well into the summer. Time Sheets, WOL.

12. Time Sheets for Herman Wolke, H. Kayser, R. Grabieksky, Eugene Lauste, J. S. Birney, S. Allen, and D. Magee, week of 14 Feb.

1889, WOL; "Honoring Edison's Birthday," *Madison (N.J.) Eagle,* 22 Feb. 1889, 3; Millard, Hay, and Grassick. 1995, 1:120–22.

13. Gouraud to TAE, 12 Jan. 1889, DF (*TAED* D8959AAD); TAE to Gouraud, 24 Jan. 1889, Lbk. 27:894 (*TAED* LB027894); cf. Doc. 3340.

14. See Doc. 3317.

15. See, e.g., time sheets for J. S. Birney (pattern maker), Kenny, and Julius Harburger, A. Kleeman, Hermann (or Herman) Niekan, H. Scheepsina, C. Thieme, and W. Westring (all machinists), WOL.

16. By the time the Exposition opened, Edison had spent about $21,000, almost all of that (about $19,800) between New Year's and the end of March. Account records show he spent nearly $37,000 when all was said and done. Laboratory Ledger #5:510, 535, WOL.

17. See Docs. 3306, 3326, and 3331; TAE to Fred Gense, 6 Mar. 1889, Lbk. 28:526 (*TAED* LB028526).

18. See Doc. 3323.

19. See Doc. 3309 (headnote).

20. See Doc. 3324.

21. See Docs. 3318 and 3329.

22. Cat. 1160, Scraps. (*TAED* SB019).

23. See Doc. 3310.

24. TAE to William Hibble, 31 Jan. 1889, Lbk. 28:25 (*TAED* LB028025).

25. Marion did not return to Bradford Academy after Christmas, and Mina had been planning since at least mid-February to send her on an extended European trip. Two of Mina's younger sisters, Grace and Mary Emily Miller, were already in Paris, and Mina asked them to arrange a tutor in two (apparently quite different) lists of subjects. She left the travel plans to her father, who in the end had Mina's older sister accompany Marion to France. Mary Miller to Mina Edison, 14 Feb. 1889; Grace Miller to Mina Edison, 25 Feb. 1889; both MFP (*TAED* X018C9AK, X018C3A); Jane Miller to Mina Edison, 24 Feb. 1889, FR (*TAED* FM001ABF); Lewis Miller to Mina Miller, 28 Feb. 1889, CEF (*TAED* X018C6AC2).

26. Marion returned in the spring of 1892. Thomas Edison, Jr., to Mina Edison, 30 Mar. 1892, EFP (*TAED* X018B1AP1); William Edison to Mina Edison, 20 May 1892, FR (*TAED* FD001ABA); cf. Israel 1998, 382–84.

–3305–

William Hammer to William Marks

[Orange?][1] Jan 2nd [188]9

Dear Sir.

Mr Edison & the various interests bearing his name have secured nearly 8,000 sq ft at the Paris Expo' of 1889 & propose to show working models of all of Mr Edison's Inventions & illustrating the commercial application & development of the same.[2]

One of the most complete departments will be that devoted to Electric Lighting & this will comprise a 3 wire Central Station Plant, Municipal Plant Historical Apparatus, Direct Current Transformer & Multipolar Dynamo,[3] Disc Dynamo[4] Thermo Electric Generator & Motor,[5] &c various apparatus & appliances connected with Incandescent Lighting together with Plans, Blue Prints, Statistical matter, Diagrams, Photographs &c,[6] &c. Mr Edison has expressed a desire ~~of~~ to show complete plans, blue prints &c of some of the principal stations & Mr Beggs has kindly agreed to assist me in securing plans of the Pearl St,[7] & Uptown Stations[8] & will secure pictures of exteriors[a] &c. I trust you will kindly send us the same of your new big station.[9] Mr Edison says he wants to impress the over 19,000,000 people expect[ed] at the Exposition of the commercial perfection we have attained in the Art in this country.[10] I know you are very busy, but this is highly important & will redound to the advantage of everything Edison directly & indirectly. Trusting you will assist me in this matter as far as possible & assuring you that I will meet you in any way possible in the matter I remain Yours very sincerely.

W. J. Hammer

ALS (letterpress copy), DSI-AC, WJH, Ser. 1, Box 4 (*TAED* X098C008). [a]Obscured overwritten text.

1. It is not clear where Hammer typically worked in this period. Although he was sometimes in New York, he was gathering materials at the laboratory for Edison's Paris exhibit and likely conducted related correspondence from there. Hammer to Edison Machine Works, 31 Dec. 1888, WJH (*TAED* X098C005); cf. Alfred Tate to S. K. Dingle, 31 Dec. 1888, Lbk. 27:593 (*TAED* LB027593) and Francis Upton to Samuel Insull, 2 Jan. 1889, DF (*TAED* D8939AAA).

2. In letters similar to this one, Hammer solicited telegraphic instruments from Western Union, electric lighting equipment from Bergmann & Co. and, from the Edison Machine Works, a municipal dynamo, disc dynamo, three-wire central station plant, and a one-third size ore-milling machine. Regarding the requisitions from Bergmann & Co., he stated that the lighting department would include "Indicating & regulating apparatus" and a "model meter department" and noted that the three-wire central station plant would provide power for the Edison exhibits. The London journal *Iron Age* described plans for the exhibit in March. Hammer to Thomas Eckert, 21 Dec. 1888; Hammer to Edward Johnson, 29 Dec. 1888; Hammer to Samuel Insull, 28 Dec. 1888; Hammer to Edison Machine Works, both 31 Dec. 1888; all WJH (*TAED* X098C001, X098C003, X098C002, X098C004, X098C005); "Edison Exhibit at Paris," *Iron Age* 43 (14 Mar. 1889): 393.

3. Edison later decided not to send the transformer and multipolar dynamo. Tate to Edison Lamp Co., 24 May 1889, Lbk. 30:46 (*TAED* LB030046).

4. After a fruitless search of the laboratory for this experimental machine, it was located at the Edison Machine Works and sent from

Schenectady on 7 January. Hammer to Insull, 5 Jan. 1889, WJH (*TAED* X098C009); John Kruesi to TAE, 11 Jan. 1889, DF (*TAED* D8946AAC).

5. That is, the pyromagnetic generator and motor.

6. At the end of December, Hammer had asked the Machine Works to send him plans and blueprints of "cross sections of wire tubing all styles of connection boxes, catch boxes &c." He noted that the exhibition would include "large collections of plans, blueprints" and statistics "illustrating the growth of the electric lighting business." He proposed to exhibit them in different ways, such as "frames, portfolios, scrap books." Hammer to Edison Machine Works, 31 Dec. 1888, WJH (*TAED* X098C005).

7. Edison's first commercial central station plant, at 255–57 Pearl St. in lower Manhattan, had been providing power to New York's financial district since 4 September 1882. An annex station opened at 60 Liberty St. in 1886 to help meet rising demand. Doc. 2243 (headnote); New York Edison Co. 1913, 109.

8. Two central stations in New York City (at 47–51 W. 26th and 117–19 W. 39th Sts.) opened in late 1888 to serve the area from 17th to 59th Sts. between 8th and (probably) 3rd Aves. on the Edison three-wire system. "The New Uptown Edison Stations, New York," *Electrical World* 13 (19 Jan. 1889): 29–32; Martin 1922, 171; New York Edison Co. 1913, 108–11, 131, 165, 241.

9.The plant of the Edison Electric Light Co. of Philadelphia was nearing completion. It began operating on 5 March 1889. William Marks to Edison Electric Light Co. of Philadelphia, 15 Apr. 1889, DF (*TAED* D8937AAH).

10. The editors have not identified a source for this estimate of attendance; possibly Edison based it on the 1878 Exposition in Paris, which attracted between 13 and 16 million visitors. The 1889 exposition ultimately drew more than 30 million. Findling and Pelle 1990, 376–77; Swift 2008, 100.

–3306–

To George Gouraud

[Orange,] Jan. 11, 89.

My Dear Sir:—

I wrote you a few days ago, stating that I was arranging to make an exhibition of the phonograph at the coming Paris Exposition.[1] I had in mind at the time certain details in connection with this exhibit which I was not quite prepared to explain, but which I will refer to more particularly in this present letter. My object in advising you briefly of my intention, was to forestall any preparations which you might have been entering upon in the same direction, as you of course understand, that considering the extent to which my inventions are to be exhibited, it would not be proper to have the phonograph placed anywhere except within my own circle. I have not made any accurate calculation as to the expense which will be incurred in connection with the phonograph exhibit, but I assume that you will share this expense equally with myself. I, of course, refer only to the phonograph exhibit, the benefits to be derived from which will accrue in your interest as well as my own. Yours very truly,

Thos A Edison T[ate]

<I have expected to hear from you on this subject in the belief that you have some suggestions to make and which I will be very glad to receive. Tate>[2a]

TL (letterpress copy), NjWOE, Lbk. 27:685 (*TAED* LB027685). Signed for Edison by Alfred Tate. [a]Marginalia written by Alfred Tate.

1. Edison's letter is Doc. 3298.

2. Gouraud's 5 January reply to Doc. 3298 would not yet have reached New York, a fact he surmised in his answer to this letter on 25 January. In accepting Edison's wish that he share the cost, Gouraud made a claim for having some hand in the phonograph's exhibition (cf. Doc. 3326):

> I have no objection to sharing expenses directly attendant upon the exhibition of the Phonograph, and presume you will consider it to your advantage as I do to my own, that in that case, I should have control of that expenditure. I presume that whatever is done with the Phonograph on that occasion will be under my direction, as it will not answer to have anyone acting in Paris in connection with the phonograph independently of myself; this view I presume is only anticipating your own. [Gouraud to TAE, 25 Jan. 1889, DF (*TAED* D8946AAD)]

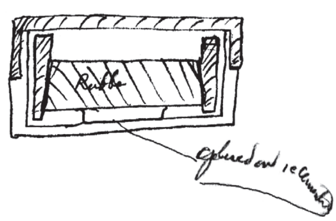
–3307–

Notebook Entry: Phonograph and Kinetoscope

[Orange,] Jany 11 89

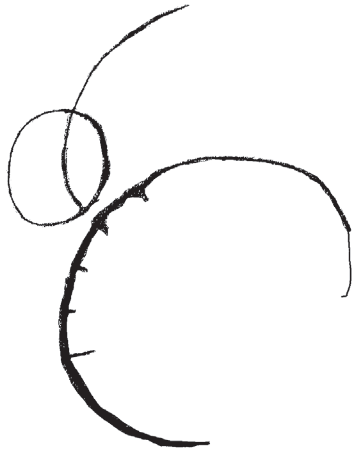
Phonogh

Phonogram[1]



Rubber gives the necessary spring & allows new material blanks to be used—by slowing up phono to ½ speed say 60 & running over once with a 004 Recorder[2a] & returning & running again between lines 1000 words can be got on phonogram 1 inch long—

Kinetoscope[3]



If ⅛ photo taken on 3 inch cylinder Then there should be 72 paralell flattened places longitudinally along Cylinder so that all parts of photo be in focus—

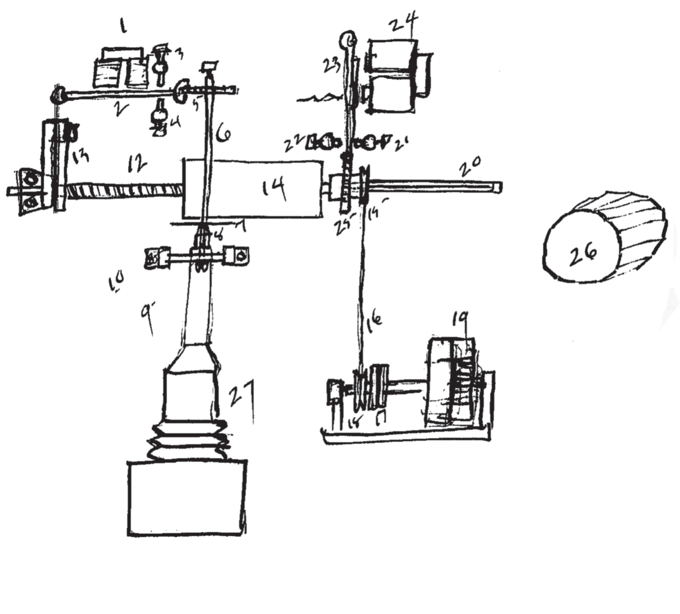
glass strip could be pasted along[a] side each other but this is perhaps unnecessary   a varnish might be used Collodion etc enamel etc

TAE

X, NjWOE, Lab., N-87-09-02 (*TAED* NA010I184). Document multiply dated. [a]Obscured overwritten text.

1. Figure labels are "Rubber" and "glued on ie cemented."
2. That is, the recording point or needle.
3. This document is one of the few technical items by Edison, other than caveats, pertaining to his early work on motion pictures. The dearth of contemporaneous technical notes and drawings makes it hard to follow his thinking without the interpretive aid of retrospective accounts, especially testimony given in court cases years later. Paul Spehr, a biographer of William K. L. Dickson (Edison's principal assistant on photography), has mined those subsequent records to create a useful narrative of the laboratory's motion picture work in late 1888 and 1889. Spehr 2008, 82–99, 119–78.

The ideas embodied in this document appear in several related drawings on laboratory letterhead on the same day. Taken together, they appear to mark the start of a significant shift in Edison's approach to motion picture devices. (*Edison v. American Mutoscope & Keith,* Complainants Exhibits, pp. 410–15, Lit. [*TAED* QM001410–QM001415]). On 3 February, Edison drafted a lengthy omnibus caveat that included a detailed drawing and brief description of a kinetoscope "for recording & reproducing moving objects photographically." (Edison did not sign the completed caveat 114 until 22 March.) The editors have not selected the draft because of its length and diffuse character, but one of its drawings (figure 19), reproduced here as an illustration, represents a break from the earlier smooth-faced cylinder covered with either a photosensitive emulsion or a sheet of celluloid coated with the emulsion (cf. Doc. 3271). The cylinder at the drawing's center (**14**) was "not round but paralell with its length are a number of flat places about 1/32 wide This gives a flat face for the photographic record from the microscope & the picture is not thrown out of focus as it would be if the cylindrical surface was round, especially on very small Cylinders which it is necessary to use on a Commercial apparatus." A detail (**26**) showed contours of the flat surfaces. The cylinder, on a closely threaded shaft (**12**), was driven through a shaft at the other end (**20**, evidently with splines) by a motor (**19** at lower right), pulley (**18**), and belt (**16**). An escapement wheel (**25**) on the cylinder shaft engaged a lever (**23**), moved by magnets (**24**) between limiting stops (**21** and **22**). A similar escapement mechanism (at top left) controlled the movement of a shaft (**6**) carrying "the revolving shutter **7**," though the source of its rotation was not named. The shutter would pass intermittently before the objective (**8**) of the camera (**27** at lower left). The two sets of magnets acted in unison, controlled by "break & contact wheels" (not shown) on a single shaft turned by a governed electric motor. Edison summarized the action of the complete mechanism this way: "The cylinder stands still. The shutter advances & opens the shutter while the cylinder is still the photographic effect takes place on the flat of the cylinder; the shutter closes then the cylinder advances another notch but such advance only takes place while the shutter closes off the light These actions take place continuously at the rate of 15 or 20 times per second." Caveat Case 114 draft, 3 Feb. 1889, PS (*TAED* PT031AAE1); see also Caveat 114 esp. fig. 54, Edison's Caveats, Pat. App. (*TAED* W100ABX) and Edison's testimony, pp. 4–8, 15, *Edison Manufacturing Co. v. Kleine Optical Co.*, Lit. (*TAED* QM002001); cf. Doc. 3358 n. 44.



–3308–

To Alfred Tate

[Orange, January 12, 1889][1]

Tate=

Read article headed Inventors[a] Beware ~~of~~ in today's world[2] You will see writer cites three my interferences as Evidence of fraud[3] Have Dyer today get his data of all interferences I ever had & dates filing etc of other parties & bring to house Sunday[4] I want to answer the citation— The writer of article is right but uses me to prove fraud the very man who has publicly complained of it

Edison

ALS, NjWOE, DF (*TAED* D8907AAB). [a]Interlined above.

1. This date is taken from a notation on the document, possibly by Alfred Tate.

2. Edison referred to "Inventors Beware," an unsigned critique of Patent Office policies and practices (especially interference proceedings) that filled nearly five columns of the seven-column *New York World* on 12 January (pp. 1–2). The article's tone was conveyed by four subtitles, one of which called the Patent Office "A DANGEROUS INSTITUTION" while another promised an exposé of "Frauds That May Be Practiced by Its Employees and Remain Undiscovered." A fragmentary clipping from the article was added to an Edison scrapbook. Cat. 1085:81, Scraps. (*TAED* SM085081a).

3. The article cited five interference cases in which Edison's application was not the first filed as examples of endemic procedural unfairness. It made no allegations of malfeasance in these cases but, as they were printed immediately above the subheading "OPPORTUNITIES FOR FRAUD," Edison may have misread it that way.

4. The editors have not found any communication to or from Richard Dyer or his law partner on this subject.

NEW JERSEY AND PENNSYLVANIA CONCENTRATING WORKS Doc. 3309

Doc. 3309 outlines a business strategy that took the Edison Ore Milling Company—and Edison himself—a step closer to actual iron ore-mining operations. Instead of leasing ore separator equipment to any operator willing to pay the royalties, the firm planned to partner exclusively with mining companies working under Edison's aegis. This arrangement would create a series of controlled experiments and allow Edison to demonstrate the commercial and technical success of his separator system. It also appeared to be a tacit recognition of the fact that running the machinery required special training and experience, and that any other engineer, no matter how skilled otherwise would, as Edison put it, be "working in the dark and encountering all the obstacles which I was obliged to overcome during the Early stages of my Experiments."[1] Edison accordingly organized two ore-milling companies of his own. The first was the Edison Iron Concentrating Company, which set up a milling operation in Humboldt, Michigan, in late 1888.[2] The second was the New Jersey and Pennsylvania Concentrating Works (NJPCW), organized at the end of 1888 with Edison as president, Samuel Insull as vice president, and Henry Livor as general manager.[3]

Even as Edison was working out the "bugs" that cropped up at the Michigan plant, he enlisted financier Robert Cutting, Jr., to help him organize the NJPCW and build a new ore-concentrating plant at the Gilbert Mine in Bechtelsville, Pennsylvania, some ten miles from Reading.[4] The Gilbert Mine had, in addition to what seemed an abundance of lean ore, the advantage of close proximity to Bechtelsville Furnace, where the concentrated ore could be tested.[5] The NJPCW began erecting an experimental plant at Bechtelsville in early 1889 and brought it into operation by the end of May.[6]

Edison had kept his distance from the Humboldt operation, preferring to work out technical difficulties at the Orange laboratory. But he visited the Bechtelsville plant soon after it began working, and the experience may have been decisive, leading him to plunge further into ore milling, both personally and financially.[7] Having seen for himself the working of the experimental plant, Edison began telling mining companies that "we do not sell our concentrating machinery as we have gone into the business of concentrating ourselves."[8] This policy appears to have marked a shift from the year before when he expected to profit more by licensing the patents to outside companies, manufacturing and selling the equipment to them, and collecting a royalty per ton of processed ore.[9]

Edison soon decided to expand operations at Bechtelsville.[10] He visited his Pennsylvania operation a second time in mid-July in company with Insull and Arthur Kennelly.[11] The three men, reportedly "attired like cowboys, wearing straw hats with immense brims," made a magnetic survey of nearby properties using a magnetic dipping needle.[12] Edison purchased several additional acres near the Gilbert mine and Livor began ordering more equipment, including rollers for crushing and another separator. The company also began constructing buildings at the site to house the new equipment.[13] As Insull reported to Tate, "The plant at Bechtellsville is a remarkable success. There is no doubt that we are going to make a lot of money. Livor and Edison are practically intoxicated by the business."[14] Edison now resolved to "waste no time" leasing his equipment to mine owners and instead decided to buy up mines himself and put up his own mills.[15] Soon after his return to Orange, he filed a new patent application for separating iron from lean ores (Doc. 3386).

Edison also prepared a prospectus (Doc. 3389) for a potential investor, noting that by July's end the mill was housed in a building 300 feet long and 40 feet high. He claimed that 200 tons of ore could be crushed and processed daily and that from raw material containing just 14 percent iron, the Bechtelsville plant was delivering to the furnace ore containing 65 percent iron, the percentage needed by the Bessemer steel process. Once the company was able to tap into ore containing 30 percent iron, he expected to make a profit of 150 percent on investment. His intention was to buy up "practically all the magnetic ore deposits in the Center of the coal & iron district of Penna" and process the ore himself.[16] Among the first mines he purchased were those at Ogdensburg, New Jersey, a remote spot about thirty-five miles northwest of Orange.[17] Before the end of the year, Edison had convinced NJPCW's stockholders to increase the company's capital to $150,000 and build a large ore-milling and concentrating plant at Ogdensburg.[18]

In the meantime, despite the initial optimism, the Bechtelsville operation ran into trouble. Soon after Edison's July visit, engineer Philip Daugherty fell into the rolls and was crushed to death. Livor, who said he could not understand how such an accident could happen, vowed to spare no expense to make the rolling house safe.[19] But the chief problem was the insufficient supply of lean ore suitable for magnetic separation. By January 1890, Edison, having thought "the Bechtelsville Mill business all over," ordered Livor to concentrate his attention on Ogdensburg. A week later, he ordered the mill shut down until the Gilbert mine proved capable of providing a sufficient quantity of suitable ore. It never reopened, and its equipment was moved to Ogdensburg.[20]

1. See Doc. 3335.

2. See Doc. 3228 (headnote).

3. Such a strategy, entailing an operating company paying royalties to a patent holding company and buying its equipment from Edison's shops, was similar to the one Edison used for the electrical central station business. In both cases, Edison encouraged the formation of

operating companies whose success might spur the formation of others, though in the case of NJPCW, he invested his own money up front. See Doc. 3309 n. 2 regarding incorporation of the NJPCW.

4. Edison contracted to purchase land at the Gilbert Mine from George Greiss on 5 February 1889. Livor to TAE, 18 July 1889, NJPCW LM-202:115, CR (*TAED* LM202115).

5. Leidy and Shenton 1958, 107.

6. NJPCW minute book, 27 Dec. 1888 and 20 July 1889, pp. 1, 23; CR (*TAED* CJ074001, CJ074023); Livor to Tate, 22 May 1889, NJPCW LM-202:38, CR (*TAED* LM202038). Daniel Brennan, Jr., of Bayonne, N.J., an inventor of rock and ore crushing machines, began drawing up plans for the mill in early February (Livor to Alfred Tate, 7 Feb. 1889, CR [*TAED* CJ001AAD]; see U.S. Pats. 281,829; 315,469; 315,469; 357,568).

7. TAE to Tate, 11 June 1889, CR (*TAED* CJ001AAI); Doc. 3366.

8. TAE to W. H. Walbaum & Co., 20 June 1889, Lbk. 30:460 (*TAED* LB030460).

9. For instance, the incorporation papers for the Edison Iron Concentrating Co. identified the object of the company not only as "mining, buying, selling and handling ores and minerals" but also as "dealing in machines for crushing and separating ores and patents therefor" (Edison Iron Concentrating Co. incorporation papers, 3 Jan. 1889, Misc. Legal [*TAED* HX89039]; see also Doc. 3228). The NJPCW incorporation papers also mention that the company had the right not only "to purchase or acquire patents, inventions or rights" pertinent to its mining and concentrating operations but also to lease such rights (Certificate of Organization, NJPCW minute book, 27 Dec. 1888, pp. 1–2, CR [*TAED* CJ074001]).

10. Even before the expansion in July, for which the company appropriated an additional $5,000, NJPCW had expended $30,000 for the experimental mill at Bechtelsville. NJPCW minute book, 20 July 1889, p. 23, CR (*TAED* CJ074023).

11. The *New York Tribune* reported that Edison was "accompanied on this trip by a number of New-York capitalists," but the editors have found no correspondence to corroborate this claim. "Edison's Machine for Preparing Ore," *New York Tribune,* 15 July 1889, 1.

12. "Edison's Ore Plant," *St. Louis Republic,* 18 July 1889, 2. Many years later, Harrison Reidenauer, a resident of Bechtelsville in 1889 who became an employee at the NJPCW mill, recalled seeing Edison at Frank Leidy's livery stable in nearby Boyerstown. Edison hired two horses along with a wagon and driver. He and Insull went in the wagon while Kennelly rode a saddle horse. Leidy and Shenton 1958, 105.

13. Livor to TAE, 20 June 1889, DF (*TAED* D8930AAZ); Livor to TAE, 25 July 1889, CR (*TAED* CJ001AAN); Leidy and Shenton 1958, 105–106; NJPCW minute book, 27 Dec. 1888, p. 23, CR (*TAED* CJ074023).

14. Doc. 3387.

15. See Doc. 3380.

16. Doc. 3389.

17. New Jersey and Pennsylvania Concentrating Works agreement with Ogden Iron Co., 16 Oct. 1889; New Jersey and Pennsylvania Concentrating Works agreement with Sussex County Iron Co., 22

Oct. 1889; both DF (*TAED* HM89ABS, HM89ABT); New Jersey and Pennsylvania Concentrating Works minutes, 16 Oct. and 4 Nov. 1889, CR (*TAED* CJ074024, CJ074027).

18. NJPCW minute book, 4 Nov. 1889, p. 28, CR (*TAED* CJ074027).

19. "Crushed by Edison's Ore Separator," *Boston Daily Advertiser,* 7 Aug. 1889, 1; Livor to Daniel Brennan, 6 Aug. 1889, NJPCW LM-202:167 (*TAED* LM202167).

20. TAE to Livor, 27 Jan. 1890; TAE to Henry Hartzell, 3 Feb. 1890, Lbk. 36:381; 37:42 (*TAED* LB036381, LB037042); William Perry to P. F. Gildea, 13 May 1890, NJPCW LM-202:841 (*TAED* LM202841); Gildea to Livor, 11 Oct. 1890, CR (*TAED* CJ002ADS).

–3309–

Samuel Insull Report to Edison Ore Milling Co., Ltd.

[New York,][1] 14th January, 1889.

To the Directors and Stockholders of The Edison Ore Milling Company, Limited.

The re-organization of the Company resulted in renewed efforts being made by Mr. Edison with a view to perfecting his system for concentrating Iron Ores. His work in this connection has resulted in what would appear to be complete success. The Officers of the Company have made preliminary arrangements with a Syndicate to operate the patents of the Company for dealing with Iron Ores in Pennsylvania and New Jersey[2] The first plant is now being constructed[3] and will doubtless be in operation within the next few months. Should this plant prove successful the same Syndicate will proceed to erect plants throughout New Jersey and Pennsylvania

Exactly what royalty the Ore Milling Company will receive from the Syndicate has not yet been decided upon It has been thought better to postpone the final decision on this matter until such time as the exact economy of the Concentrating Process can be fully established.[4] The arrangements under which the Pennsylvania and New Jersey business will be operated are very favorable to your Company inasmuch as should the enterprize prove a failure no obligation whatever will be incurred by The Ore Milling Company, but in the event of the business proving a success, your Company will derive benefits in the shape of royalties.

A somewhat similar arrangement has been made with relation to the States of Michigan, Wisconsin and Minnesota. A plant is now being erected in the Lake Superior District[5] by a Company recently formed in Chicago to work the patents in the States above mentioned

It has been thought desirable to await the results of these two initial plants, one in the Eastern States and the other in the Western States, before vigorously pushing the business in the remaining territory. Parties who in the first case are willing to risk their money on a comparative uncertainty, naturally expect better terms than they would be able to obtain were the business a firmly established one, and the profits accruing from the Edison System beyond question should the two plants referred to prove a success, there is very little doubt[a] but that a large and lucrative business can be developed in all Magnet Iron-bearing Districts.

Since the re-organization Mr. Edison has devoted a great deal of time to experimental work on his system for working Rebellious Gold Ores.[6] The success which has so far attended his efforts would seem to show that eventually he will produce a system which will successfully deal with these Ores, and consequently bring a large revenue to your Company. So far, Mr. Edison has not been able to devote the whole of his time to this particular line of experimental work, but he promises in the near future to do so.

With the immediate development of the Iron Concentrating Process, and the possibility of Mr. Edison's experiments to work the Gold Process proving a success, we think that your Company has reason to take a very favorable view of its future prospects doing a successful business.

Samuel Insull Vice Prest

D (copy), NjWOE, CR (*TAED* CG001AAN4). Possibly written by William Perry. [a]Interlined above.

1. This report was read at a special meeting of the directors of the Edison Ore Milling Co. called for that purpose on 14 January at the company's office at 19 Dey St. in New York. The five directors in attendance (including Samuel Insull and company president John Tomlinson) accepted the report and ordered it made available to stockholders at the regular annual meeting the next day, at which it was also entered into the record. The only other business at the latter meeting was the election of a new slate of directors, on which Tomlinson was not included. Edison Ore Milling Co. directors' minutes and stockholders' minutes, 14 and 15 Jan. 1889, both CR (*TAED* CG001AAN4, CG001AAN5).

2. The New Jersey and Pennsylvania Concentrating Works (NJPCW) was organized in New Jersey on 27 December 1888, with a capital stock of $30,000, "to mine, separate, smelt or otherwise treat, concentrate and deal in iron and other metallic ores" in those two states. Stockholders included Edison and financier Robert L. Cutting, Jr., (100 shares each); Insull, Harry Livor, and William Perry (30 shares each); and Alfred Tate and Joseph Hutchinson (5 shares each). At a stockholders meeting in late January, Edison was elected president, Insull vice president,

Hutchinson secretary, and Livor general manager. Like the Edison Ore Milling Co., the NJPCW had its headquarters in New York at 19 Dey St. Day-to-day operations at the company's Bechtelsville, Pa., plant were left to P. F. Gildea, superintendent, Philip Dougherty, engineer, and Frederick Willer, who took care of the magnets, one of which was said to have been nine feet long. Certificate of incorporation 27 Dec. 1888; minutes of stockholders' meeting, 29 Jan. 1889; minutes of directors' meeting, 29 Jan. 1889; all NJPCW minute book, pp. 1–4, 15–17, 19; CR (*TAED* CJ074001, CJ074015, CJ074019); "Edison's Ore Plant," *St. Louis Republic,* 18 July 1889, 2; Leidy and Shenton 1958, 106.

3. See headnote above.

4. The royalty was set in November 1889 at fifteen cents per ton of concentrated ore. NJPCW agreement with Edison Ore Milling Co., 31 Dec. Mar. 1890, CR (*TAED* HM90AAV).

5. Insull referred to the plant in Humboldt, Mich. See Doc. 3228 (headnote).

6. "Rebellious" ores are those mixed with minerals, often sulfides, that make processing them more difficult. William K. L. Dickson had worked on this project at intervals throughout much of 1888. See Docs. 3129 n. 19 and 3163 esp. n. 1.

–3310–

From Sherburne Eaton

[New York,] Jan. 15, 1889.

Dear Sir:

The arrangement for my services as your attorney I understand to be this:

(1) Whenever requested by you, I am to serve you professionally as your personal counsel and legal adviser, and am to be paid therefor an annual retainer of $2,000., payable monthly, beginning as of September 18, 1888.[1] This retainer is to cover all my cash disbursements of every kind, including traveling expenses to and from Orange, stenographic and typewriting charges, telegrams, postage and all ordinary cash outlay. Whether or not I am to receive from time to time any other and further compensation is to be left entirely to your discretion, it being, however, understood that you are to remember me to such an extent as you may think proper when apportioning among your staff extra reward or compensation. I am willing to leave this entirely to you.

(2)[a] Litigated business, including for instance your claim against Gilliland and Tomlinson, is to be excluded from the above compensation. For that class of work I am to be paid such fair and reasonable compensation, without regard to the above arrangement, as may be proper. I do not anticipate that you will ever have any fault to find with my bills in this regard, but if you do, I am quite willing to leave this also to you, your decision to be final.

(3)[a] Whenever a question arises, as to whether in any particular matter, services and disbursements are to be considered as appertaining to yourself and to be covered by the said $2,000., or whether they are to be considered as proper charges against a third party, your decision is to be final.

(4) All services and disbursements of my firm are included in the above arrangement, this letter covering their work and outlay just as if done by me. That is to say, I will take care of my firm, out of what I get.

(5) Should any dissatisfaction arise between us, either party may terminate this arrangement on three months written notice.

I send you two copies of this letter. If the letter meets your approval, please write your name at the bottom of both copies, and then return one to me, and file the other away among your own papers.

Hoping this will prove satisfactory to you, as it is to me, I remain, dear sir, Very truly yours

S. B. Eaton[2]

<Mr. Edison accepted this proposition January 24th 1888. A.O.T.>[3b]

TLS, NjWOE, Miller (*TAED* HM89AAC). [a]Second and third numbered paragraphs enclosed by brace in left margin. [b]Marginalia written by Alfred Tate.

1. That is, a week after Edison severed his professional relationship with John Tomlinson.

2. Sherburne Blake Eaton (1840–1914) had been president and de facto manager of the Edison Electric Light Co., which he still served as legal counsel, and an official of related Edison firms. Docs. 2420 n. 32, 2771 n. 10; "Sherburne Blake Eaton," *The University Magazine* 5 (Oct. 1891): 976–79.

3. The editors have not found the original of this document, which Edison presumably signed and returned to Eaton. Ten days later, several brief press notices announced that Edison had appointed Richard Dyer as his legal advisor in place of Tomlinson. Those reports were in error; Eaton clearly held that responsibility as Dyer (and his partner) remained in charge of Edison's patents. See, e.g., "Inventor Edison Changes His Counsel," *New York Sun,* 25 Jan. 1889; "Edison Changes His Counsel," *New York Tribune,* 25 Jan. 1889; both Cat. 1160, Scraps. (*TAED* SB019019e, SB019019f).

–3311– [Orange,] Jan. 21, 1889.

To Edward Johnson

Dear Sir:—

Mr. Insull informs me he has had some conversation with Mr. Bergmann, during which Mr. Bergmann stated, as he is going to resign his position of Treasurer and General Manager of Bergmann & Co., he would like action taken in relation to the matter as early as convenient.[1] I would suggest that you call a Board meeting of Bergmann & Co., forthwith, and accept Mr. Bergmann's resignation, and elect Mr. Insull in his place. When Mr. Insull is elected, I should like his salary fixed at the rate of five thousand dollars per annum. It is my intention that this amount shall be taken off the remuneration which he at present receives[a] from The Edison Machine Works as Gen'l. Manager and Treasurer of that Company.[2] I shall not be able to be present at the meeting of Bergmann & Co's Directors, but this will not be necessary, as you can get a quorum without me. Mr. Insull will act for me in any matters in relation to this subject. Yours very truly,

Thos. Edison

TLS (letterpress copy), NjWOE, Lbk. 27:841 (*TAED* LB027841). [a]Obscured by ink blot.

1. Within two months, Sigmund Bergmann was using his own letterhead as a manufacturer of gas and electrical fixtures at 527–31 W. 34th St. in New York. He also had a lease on 79 Fifth Ave., where he intended to open a showroom. Bergmann was in the process of forming a stock company with longtime associate Philip Klein, Jr. The trade press reported in late March that the new Bergmann Electric and Gas Fixture Co. was entering "the general business of manufacturing electric light and gas fixtures." It presumably was to be independent of the Edison enterprises; as Bergmann pointed out in Doc. 3283, he had been doing profitable business apart from them for years. Uriah Painter and Edward Johnson had some financial stake, though they seemed to be in the dark about Bergmann's plans, and Painter, in particular, opposed the idea of incorporating a stock company. As Bergmann pressed ahead, Painter pointed out in April that Johnson was "very sensitive about his status with the Edison Light Co." with respect to the new company, and that "Edison is extremely bitter in reference to it, and Insull will spend a great deal of money to injure it." Bergmann to Painter, 16 Mar. 1889; Bergmann to Johnson, 28 Mar. 1889; Painter to Bergmann, 7 Apr. 1889; Bergmann to Painter, 17 May 1889; all UHP (*TAED* X154A8BD, X154A8BE, X154A8BN, X154A8CD); "A New Electric Fixture Company," *Electrical Review* 14 (23 Mar. 1889): 1.

Under the terms of Bergmann & Co.'s absorption into Edison General Electric, its stockholders were "to receive for every $100 share $120, of which one-third will be cash, one-fourth will be stock on which the dividends will be deferred and the balance will be stock immediately entitled to 8 per cent dividends." Bergmann & Co. stockholders' circular and agreement, n.d. [Jan. 1889?], Misc. Legal (*TAED* HX89057).

2. Edison simultaneously advised the Edison Machine Works that Samuel Insull's "remuneration as General Manager should be rearranged. I have arranged with him that he shall forego all interest in profits, and that his salary shall be at the rate of ten thousand dollars per annum." TAE to Edison Machine Works, 21 Jan 1889, Lbk. 27:840 (*TAED* LB027840).

–3312–

Draft Patent Application: Phonograph

[Orange, c. January 28, 1889][1]

829[2a]

Dyer or Seeley

I am not sure that I have applied for this or not if not file—

The object of this invention is to produce a cheap an efficient cylinder or phonogram blank which can be pressed or moulded The surface of which is coated in any suitable manner with a thin coating of proper material for receiving the indentations of the phonograph. The base or principal portion of the weight of the cylinder being Composed of very cheap material.

The Coefficient of Expansion of the blank material and the thin veneer should be very nearly Equal so that in shipping the cylinders or blanks to regions where Especially in the winter the temperature falls very low when Exposed in freight cars the Outer Coating will not crack & thus render the blanks useless The principal difficulty is to get a cheap material which will have the same or about the same Coefficient of Expansion as the Coating and yet be cheap~~er than~~ The veneer material for recording is always preferably hard and brittle at ordinary temperatures[3] The record is not so perfect on material which is somewhat pliable at ordinary temperatures The pliability renders it unnecessary generally to ~~render~~ have[b] the base the same Coefficient of Expansion for instance Cylinders of paper have been used & coated with a thin Veneer of pliable soft recording material ~~which~~ whose coefficient of Expansion is very much greater than the paper. The pliability of the material accommodates itself to The great difference of Expansions between the two Except in Extreme Cases of Low temperature, but where a non pliable veneer is used this accommodation cannot take place hence the Coefficient of Expansion[b] the two materials must be close together—

I used for the blank Asphaltic or Bituminous Resins, mixed with a small percent of a material which shrinks greatly in solidifying such as Carnauba wax.

Asphalt when melted & poured in moulds do not contract on solidifying[c] hence are difficult to get out of the moulds easily. by mixing 5 to 7 percent of Carnauba wax, The resulting Compound shrinks slightly thus allowing it to be taken from the mould Easily. Asphalts as found in the market vary considerably in the degree of heat required to melt them and also to the degree of Liquidity or mobility of the molten liquid Some asphalts even at high temperatures give a viscous liquid difficult to pour this may be corrected & the liquid made mobile[d] like water[e] by adding a wax of Low melting point like Japan wax Ozocerite, or a liquid like Tar, Crude petroleum Turpentine, or Even Rosin

The proportions of Asphalt, Carnauba & Liquifying material such as petroleum to obtain the proper coefficient of expansion to suit the outer Coating of material depends on the material and must be determined for each material by experiment. To determine it mix the material above mentioned in various proportions, mould the Cylinders by pouring then[d] dip them in the molten veneer material ~~one after another~~ for one or two seconds according to the thickness of the Coating desired When the several cylinders are Cold place them in a chamber and subject them to a very low temperature by the usual means[4] The Cracks which appear will be more or less or none according to the proportions. They will show the gradations & thus you will in a second Experiment be able to proportion the ingredients to prevent cracking alltogether for the particular material used, for any other material the same method must be employed.

When I speak of Asphalts & Bitumens I refer ~~to the~~ not only to natural Asphalts Known in the market as Trinidad, Cubian, Mexican, Syrian but the Asphaltic residues produced artificially in Commercial Operations such as Asphalt pitch, Hard Coal tar pitch[f] ~~Tar pitch~~,— Syrian asphalt produces the best results but is too dear Asphalt Pitch which is ordinary trinidad asphalt from which the more volatile Elements have been distilled is very cheap & serves the purpose admirably—[5]

The mould I prefer to use is a split mould discribed in my appn ____.[6] The inner core should previous to being inserted in the mould be coated with paper which adheres to the asphalt[b] cylinder & allows its Easy removal from the Core

I prefer to put the veneer of recording material on by dipping the cold Asphaltic cylinder in the molten Compound

~~but~~ In this case the cylinder when cold should be put on a mandril & the surface trued by turning before it is ready for the market, but the asphalt Cylinder may be placed in a second mould slightly larger than the one originally moulded in and the veneering material poured in on its periphery thus rendering turning unnecessary but Experience so far shows the turning off is cheaper= of course the blank might be made of powdered cold material & subjected in a mould to pressure while heated to form it, or forced through a squirting Lead pipe machine[7] in a continuous cylinder & cut off in proper lengths & veneered[g]

Claim. 1st new article mfr Consisting of a ~~moulded~~ phonogram blank or[h] cylinder veneered with a[d] different material for recording The coefficient[d] of expansion being sufficiently near to prevent cracking

An Asphaltic or Resinous cylinder or phonogram blank Covered with a recording material brittle at ordinary temperatures

A blank & a veneer both made from the Liquid state

A blank ~~& ven~~ formed by squirting in press & then veneered

The use of Asphaltic material as a base for blank

The use of a material which contract greatly when returning from a liquid to solid state such as Carnauba Wax to mix with the asphaltic material when the molten process is used ~~s~~to [enouble][8] get it out mould

The used a a material of low melting point like wax or a liquid like tar or ~~p~~Crude petroleum to give the molten asphalic material ~~l~~Great liquidity to assist in pouring—

~~Use~~

Turning off the veneer to true it up (It might be ironed by hot iron while rotated, the iron being fixed this would true it perfectly—but turning preferable—

~~The use of a materia~~

Seely— The Graphophone people use paper I find it costs 7¢ doz to wind them & pay for paper & cutting— it costs 5¢ doz to dip & put them in marketable shape making 12¢ as actual cost without profit or general Expense,[9] & they are compelled to use a very <u>soft</u> material otherwise they Crack. now a soft material is no good. I use Asphalt moulded[d] taper just like the regular white cylinder now used but ⅓ thinner the stock costs 1½¢ per doz Labor 1¢ Veneering ½¢ turning ½ total 3½ cost veneering material & general expenses & profit 7½ cents doz= As my new material is very brittle at ordinary temperatures <u>I cannot</u> use paper as it cracks at 40 above zero—hence this new dodge which turns out to be a big thing where the cylinder is only to be used once or musical records are to be made cheaply & duplicated[10] Get me some good claims—

Cant you work in a claim for new art mfr also a phonogram Containing a record for amusement & instruction consisting of a blank formed by moulding from a liquid or formed by pressure which is veneered with recording material. ~~hard and brittle at ordinary tempert~~

I want to confine the Grapho[d] people to paper leaving me the moulded material also the equal Coeff Expns dodge—

Edison

P.S. of course I use the Regular new material Cylinder for office work it being used 100 times. The new cylinder is only to be used once, although the veneer will be thick enough for several turning off— E[dison]

ADfS, NjWOE, PS (*TAED* PT032ABQ). [a]Obscured overwritten text; followed by dividing mark. [b]Interlined above. [c]"on solidifying" interlined above. [d]Obscured overwritten text. [e]"& the liquid…like water" interlined above. [f]"tar pitch" inserted in right margin. [g]"of course…& veneered" written in extra space before claims. [h]"phonogram blank or" interlined above.

1. The application prepared from this draft was one of nine that Edison signed on Friday, the first of February. Because patent attorneys Richard Dyer and Henry Seely substantially rewrote the draft, in addition to the time they invested in the other applications, the editors conjecture that Edison gave it to them several days earlier, perhaps at the start of the work week.

2. This is the case number assigned to the patent application created from Edison's draft; it was cross-referenced by Edison's attorneys on a related draft application (Doc. 3316). This application was filed on 16 February; it issued, with two drawings and ten claims, in July 1889. U.S. Pat. 406,576.

3. In the issued patent, Edison stated his preference for a metallic soap, which had become his standard recording material by this time. Also cf. Doc. 3253 n. 26.

4. Reference to "the usual means" was omitted from the completed application. The "usual means" of refrigeration at this time was ice, either produced naturally and conserved throughout the year (as by the Hudson River, which supplied the New York City region) or, increasingly, by mechanical methods. Artificial refrigeration by the compression and condensation of gases (typically flammable ammonia) required machinery that was bulky, expensive, unreliable, and often custom-built, and was feasible only for large-scale commercial uses. Pat. App. 406,576; Rees 2013, 27–47; also cf. Doc. 3265.

5. Asphalts and bitumens, pitch-like hydrocarbons formed by the same geologic processes as petroleum, were used in the ancient world; in recent times, different types of asphalt, in particular, were often

still distinguished by their place of origin. Since the seventeenth or eighteenth centuries, they were created artificially as byproducts of petroleum distillation (Abraham 1920, chap. 1; *OED,* s.vv. "asphalt" and "bitumen"). Edison had considerable experience with asphalt and similar materials in a variety of uses, notably experimental attempts to manufacture or treat lamp filaments with them (see, e.g., Docs. 3012, 3039, 3041, 3091, 3117); as insulation on conducting wires (e.g., Doc. 3085); and for phonograph cylinders (e.g., Docs. 3060, 3101).

6. Edison likely referred to his Case 743 (Doc. 3119, recently divided and re-filed as Case 751), in which he briefly described a cylindrical mold, sawed longitudinally into several sections, for making duplicate recordings. See also Doc. 3101.

7. Edison included a very similar idea in an 1887 draft caveat (Doc. 3101; see esp. n. 6).

8. Edison may have meant to write "enable" after originally beginning to write "so enough."

9. The editors have not identified the source of Edison's cost calculations and other information about the wax-covered wound paper cylinders favored by American Graphophone, but it could have been Charles Stolpe, former assistant to Charles Tainter. See Doc. 3252 n. 2; for a further brief description of the cylinder, see "Reproduction of Articulate Speech and Other Sounds," *Sci. Am.* 49 (14 July 1888): 15–16.

10. As Edison makes clear in the postscript below, a thin coating could not be turned off on a lathe multiple times as required for recording repeatedly on the cylinder.

–3313–

To George Gouraud[1]

[Orange,] Jan. 30, 1889.

Dear Sir:—

In view of the recent decision of the Supreme Court of the United States, I desire to modify Rule No. 3 of my letter of instructions to you under date Dec. 15th, 1888,[2] which will now read as follows:—

"<u>In countries which grant patents for various terms up to fifteen years</u>, you may without awaiting the issue of the corresponding U.S. patents make application for and take out fifteen year patents only, paying the fees for the short terms and making proper provision for the payment of subsequent fees necessary to maintain such patents for the full term for which they are originally granted. Following is a list of such countries:

Portugal
Turkey
Austria
Italy
Argentine Republic.

In your letter to me under date 5th instant, you state that the 15 years fees which you paid the Austrian Government in connection with Cases 86 and 87 will be refunded for 14 years without any prejudice to the Austrian patents,[3] and as the decision which I have previously referred to prevents such refundment from prejudicing my United States patents, I have no objection to your accepting the same. Yours Truly

Thos A Edison

<Note: The Supreme Court decision herein referred to is that disposing of the Bate Refrigerator Case— A. O T[ate].>[a]

TLS (letterpress copy), NjWOE, Lbk. 28:21 (*TAED* LB028021). [a]Postscript handwritten by Alfred Tate.

1. This letter was written at the suggestion of Dyer & Seely, to whom Alfred Tate sent it for review and transmittal to Gouraud. Dyer & Seely to Tate, 25 Jan. 1889, DF (*TAED* D8954AAJ); Tate to Dyer & Seely, 22 and 30 Jan. 1889, Lbk. 27:857, 28:23 (*TAED* LB027857, LB028023).

2. Edison's prior letter is Doc. 3297. The modification set forth below was in response to the U.S. Supreme Court's 21 January ruling in *Bate Refrigerating Co. v. Hammond* (129 U.S. 151 [1889]) concerning ambiguities in section 4,887 of the U.S. Revised Statutes. The court held that the life of a U.S. patent was not necessarily abbreviated by the short term of a foreign patent, provided that the latter was properly renewed or extended for a longer term. It declined, however, to decide whether the date of a U.S. specification's application or its issue should be the governing fact in such cases. Because of its potentially far-reaching effects, the *Bate* case had been closely watched by the principal electrical companies, including Edison's associates ("Supreme Court Opinions," *NYT,* 22 Jan. 1889, 3; "Patenting the Lightning," 24 Jan. 1889, *NYT,* 8; "The Supreme Court Decision," *Electrical Review* 13 [2 Feb. 1889]: 10; "The Edison People Happy," *New York Tribune,* 23 Jan. 1889, 2; see Doc. 3120 n. 3).

3. In his letter of 5 January (one of four he sent to Edison that day), Gouraud sought approval to accept the refund from the Austrian government. DF (*TAED* D8959AAB).

–3314–

To Edward Dean Adams

[Orange, February 2, 1889][1]

Edward D. Adams,[2]

Cannot possibly go on account of just getting out phonographs.[3] Am very well informed of all his resources and plant, and his methods of doing business lately are such that it cannot be accounted for on any other grounds than the man has gone crazy over sudden accession of wealth, or something unknown to me, and is flying a kite that will land him in the mud sooner or later.[4]

Edison.

L (telegram, copy), Villard, Box 78, Folder 552; typed copy also in same folder. Written by Harry Miller.

1. Harry Miller noted that he "Sent this telegram Saturday night"; that was 2 February, the date that Adams addressed his letter to Edison (see note 2). The telegram was addressed to the Adams home in New York City.

2. A financier with an engineering background, Edward Dean Adams (1846–1931) represented the New York banking firm of Winslow, Lanier & Co. He was a principal investor in the Edison Electric Light Co. and the Edison Electric Illuminating Co. Doc. 2690 n. 2; John McClement to Alfred Tate, 29 Oct. 1888, DF (TAED D8856ADN).

3. Adams wrote the same day that he had been invited by George Westinghouse, "an old personal acquaintance," to visit Pittsburgh "and see his electrical plant and what they are doing"; at his request, Westinghouse extended the invitation to Edison. Adams wished him to go "for the purpose of adding to our knowledge of the strength and weakness of our competitors, as well as aiding our judgments in dealing with the problems that are now coming up, by reason of the extensive consolidations which Mr. Westinghouse has consummated." Adams promised to arrange the trip with little or no public fanfare. Adams to TAE, 2 Feb. 1889, Box 78, Folder 552, Villard.

4. Edison disdained George Westinghouse's business methods generally (cf. Doc. 3008) but probably was referring specifically (as Adams did) to several recent acquisitions by the Westinghouse Electric Co.: purchase of the Consolidated Electric Light Co., for its incandescent lamp manufacturing capacity; purchase of the Waterhouse Electric and Manufacturing Co., for its arc lighting system; and lease of the United States Electric Lighting Co., for important patents on arc and incandescent lamps and dynamos. Passer 1972 [1953], 146–47.

–3315–

From Everett Frazar

New York. Feb. 2nd, 1889.[a]

Dear Sir:

I have lately received Yokohama letters dated Jan. 7th, advising receipt of my cable of the 1st ulto.[1] requesting that the Edison Phonograph be advertised in the Japanese papers, with instruments and expert to arrive out early in Feb.[2] Enclosed I hand you copy of notice put in the foreign and native Japanese papers.[3] Frazar & Co., send me enclosed copy of "Japan Gazette," dated Yokohama Jan. 5th, containing interesting article on the Edison Phonograph for your perusal.[4] They write: "We have, in anticipation of any special concessions which we understand the Graphaphone agent is trying to secure from the Government, advised the U.S. Minister[5] of the superiority of the Phonograph and at the same time made inquiry if, under the new patent regulations,[6] protection can be secured by foreigners. On the 2nd inst. we wired you[7] recommending seeing Mr. Mutsu, Jap. Minister at Washington,[8] and securing from him letters of introduction, i.e., phonograms, to prominent Jap. officials, as similar letters were given to the agent of the Graphaphone. Mr. Austin Herr (not Herv)[9] agent for the Graphaphone here has placed samples of his instruments in the U.S. Legation Tokio and in the Consulate, Yokohama and has now left for Kobe, Osaka &c.. Among foreigners who have heard the Graphaphone, the impression is that that instrument cannot prove of great commercial value in Japan. We trust, however, that when the Edison Phonograph arrives, it will be found to be a much superior instrument to the Graphaphone.[10] (As previously mentioned, the Graphaphone on exhibition in Japan is worked by foot only and this will be objectionable as compared to the running of the Edison Phonograph with an elec. battery). Frazar & Co., Yoko., also add: "In the 'Scientific American' of July 14th last the Tainter Graphophone is illustrated and described.[11] This is the instrument here which has been brought out by Mr. Herr. The samples we have seen at the Consulate and Legation do not bear the name of maker or patentee, but the box containing the record cylinders has the following: Record Cylinders Am. Graphophone; Washington D.C. patent May 4th, '86 No. 341,288, patent Nov. 29th, '87 No. 374,133." On Jan 2nd, '89 my firm addressed the U.S. Minister at Tokio, Hon. R. B. Hubbard as follows: "We beg to inform you that we have received a telegram advising us that the perfected phonograph, the invention of Mr. Thomas A. Edison, will be sent out here next month in charge of an expert. This is stated to be far superior to an instrument termed the 'graphophone.'

In this connection we shall esteem it a favor if you will kindly advise us if under the new patent regulations recently promulgated and published in the 'Japan Daily Mail' of this date, foreigners can now obtain protection in Japan for their inventions."

The above information you no doubt will be glad to receive and place on file for future reference.

This morning I received your valued favor of the 1st inst. handed me through Mr. Tate, enclosing copy of your letter of Jan. 31st to the Edison-Berlin Co.[12] On behalf of my Japan friends, I have to thank you for the prompt and firm manner in which you have taken up this question of interference by the Germans with our reserved rights in Japan, Korea and China. I fear that another incident has occurred, showing the probable interference in the same direction. For many months past

Mr Lindsley[13] has been in correspondence with the Engineer of the Korean Govt. in Seoul, having charge of all the elec. lighting matters, and as late as Dec. 16th and 17th last this engineer, Mr. Bjerre,[14] hands my firm a memo. of just what elec. fixtures are required for furnishing the Korean Home Office with suitable elec. lights, among them being orders for over 6,000 lamps, 1,200 assorted fixtures, 2,000 shades, 300 lt. dynamos, engines, boilers, wire, electroliers, &c. &c., the most important and difficult question then under negotiation being to arrange payment for the plant. My firm require to give some credit and take some risk in this matter, which we are willing to do. Now I learn from Mr. Upton that by mail received from Mr. Dyer in Antwerp, he has received letters from Japan, evidently inspired by such Japs. as the Niwas, inquiring for prices for this identical plant for Korea. I have personally explained this matter in detail to Mr. Tate this noon, and shown him copies of the correspondence which passed between my firm and the Korean engineer. I await anxiously the result of your request for explanation from the German Co. in regard to their interference with our Japan territory. As soon as received, if of value, I will at once cable to Japan, as it is of vital importance to us.

PHONOGRAPH. I have suggested to Mr. Tate that you take the young gentleman proposed from Schenectady[15] into the phono. works not later than Feb. 15th, that he may have a good schooling and be ready to leave N.Y by March 10th, to take our C.P.R str.[16] from Vancouver March 22nd, due Yoko. about April 7th. With the expert I would be very glad to have you furnish me with at least 20/25 phonos. These should be sent from here not later than March 1st, to make sure of their accompanying the expert. Will you please try to have this carried out?

In connection with the Korean plant, I last evening wired to Yoko. as follows: "Telephone Co. Yokohama, cables Dyer, Antwerp about Korean Plant." This will enable Mr. Lindsley to ascertain at once from headquarters where this interference comes from and who are the parties interested. Possibly, the German Co. may have representatives in Japan who are canvassing secretly[b] for such Edison Incandescent lighting business, but I am not advised of such being the case.

Please keep me informed of the progress of the outturn of the phonographs from your factory, and the proposed movement of our expert for Japan. I remain, Yours very truly,

Edward Frazar

TLS, NjWOE, DF (*TAED* D8905AAU). Letterhead of Everett Frazar. [a]"New York." preprinted. [b]Interlined above.

1. The editors have not found Frazar's 1 January cable, which was part of a string of correspondence and telephone calls about the introduction of Edison's phonograph in Japan, China, and Korea. Frazar to TAE, 31 Dec. 1888 and 2 Jan. 1889, both DF (*TAED* D8849ADF, D8960AAA).

2. As early as April 1888, Edison advised Frazar that introducing the phonograph in Japan and China would require a "trained expert" who could "teach local agents…the use of the machine." He also expected that "The blanks and material used in running the phonograph should be made in China and Japan and not sent from this country." Frazar at first resisted the expense of an expert's salary and instead wanted Edison to prepare phonograph instructions for his company's electrician, W. H. Brenner. Edison, however, was adamant and at one point warned that the phonograph rights to Japan and China could be transferred to his English agent if Frazar found it too costly to introduce the machines on those terms (Frazar to TAE, 18 Apr. [with TAE marginalia] and 30 Apr. [with TAE marginalia], TAE to Frazar, 20 Apr. and 2 May 1888; all DF (*TAED* D8805ACF, D8849AAK, D8818AJC, D8818AJS]). The matter of a new hire was revisited in December, after the graphophone's debut in Japan, and Samuel Insull reviewed candidates. After Robert Lozier wavered in accepting the position, Arthur Churchill was selected and approved for the post in March 1889 with Edison's assurance that he would also be "a first class all-around man" for Frazar's electrical business in China, Japan, and Korea (Alfred Tate to Insull, 15 Jan. 1889; Tate to Lozier, 21 and 28 Jan. 1889; Tate to Frazar, 16 Feb. and 8 Mar. 1889; Lbk. 27:736, 843, 943; 28:253, 578 [*TAED* LB027736, LB027843, LB027943, LB028253, LB028578]; Frazar to TAE, 31 Dec. 1888; Insull to Tate, 18 Jan. 1889; Lozier to Tate, 24 Jan. 1889; Frazar to Tate, 12 Feb. and 11 Mar. 1889; all DF [*TAED* D8849ADF, D8905AAJ, D8914AAC2, D8905ABG, D8960AAQ]; "Misc. Notes," *Electrical World* 15 [10 May 1890]: 325; see also note 15).

3. Enclosure not found.

4. Enclosure not found. The *Japan Gazette* was founded in 1867 by John Reddic Black and published in Yokohama. Kenrick 1978, 55.

5. Richard Bennett Hubbard, Jr., (1832–1901) was the U.S. diplomatic envoy to Japan during the Grover Cleveland administration. A former governor of Texas, he was born in Georgia and studied law at the University of Virginia and Harvard University before moving to Texas; he was a Confederate colonel during the Civil War ("Death List of A Day," *NYT,* 13 July 1901: 7; J. Duncan 1978, 29–34). Frazar considered him "not in a position legally to take any diplomatic action tending to suppress the piracy of Japanese manufacturers," but Hubbard occasionally exercised some influence on behalf of the American electric light business. Hubbard also had a personal interest in sound recording and in December 1888 had received from Austin Herr a message recorded on a graphophone by fellow diplomat Durham White Stevens (Frazar to Thomas Bayard, 17 Oct. 1888; Frazar and Co. [Yokohama] to Frazar, 27 Dec. 1888; Frazar to Alfred Tate, 17 Jan. 1889; all DF [*TAED* D8839ACF, D8849ADD, D8960AAC]).

6. The Japanese government had recently promulgated new patent regulations which, as Frazar noted below, were published in the *Daily Mail.* The editors have not found the published version but, according to an explanation in the *Japan Weekly Mail* of 5 January 1889, the new rules did not protect foreigners. When Frazar inquired whether he might face competition from Japanese-made imitations of the phonograph, Tate reassured him that it "will be practically impossible for the Japanese to make phonographs by any method within their reach as cheaply as your firm will be able to supply them from our factory." "New Patent Regulations," *Japan Weekly Mail* 11 (5 Jan. 1889): 7; "Patent Regulations," ibid., 9–10; Frazar to TAE, 16 Jan. 1889, DF (*TAED* D8905AAF); Tate to Frazar, 24 Jan. 1889, Lbk. 27:897 (*TAED* LB027897).

7. Frazar's cable has not been found, but he conveyed its gist in a brief letter the same day. Frazar to TAE, 2 Jan. 1889, DF (*TAED* D8960AAA).

8. Count Mutsu Munemitsu (1844–1897) was the Japanese Minister in Washington, D.C., from 1888 to 1890. Messages from Mutsu and his wife recorded on a graphophone in Washington were among those played in Tokyo. *Japan At War: An Encyclopedia,* s.v. "Mutsu Munemitsu (1844–1897)"; "The Graphophone in Japan," *Japan Daily Mail,* 17 Jan. 1889, Clippings (*TAED* SC89031A).

9. The son of a successful miller in Washington D.C., Austin Herr (1851?–1900) inherited his wealth in 1886 and became a founding director of American Graphophone the next year. He obtained the Volta graphophone concession for China and Japan by the end of 1888 and arrived in Japan on 19 December prepared to promote the machine among influential members of the government. His demonstrations included messages recorded by Japanese and American diplomats in Washington. He was identified as "Austin Herv" in Frazar's 17 January excerpt (to Alfred Tate) of a letter from Frazar & Co. in Yokohama. Obituary, *Washington Post,* 7 Sept. 1900, 10; "The Graphophone: The Company Organized at Harper's Ferry Yesterday," *Washington Post,* 26 June 1887, 8; "Georgetown. Gone to San Francisco," *Washington Evening Star,* 19 Nov. 1888, 5; Frazar & Co. (Yokohama) to Frazar, 27 Dec. 1888; Frazar to TAE, 28 Dec. 1888; Frazar to Tate, 17 Jan. 1889; all DF (*TAED* D8849ADD, D8849ADE, D8960AAC).

10. Although not marked in the text, Frazar's quotation of the Yokohama letter presumably ends either here or after the parenthetical sentence that follows.

11. "Reproduction of Articulate Speech and Other Sounds," *Sci. Am.* 59 (14 July 1888): 1, 23.

12. On 1 February, Tate gave Frazar a copy of Edison's 31 January letter to Allgemeine Elektricitäts Gesellschaft (AEG). Edison's letter had been sent to Berlin enclosing a copy of his as-yet unanswered November complaint (Doc. 3278) about the firm's willingness to serve East Asian markets. Edison blamed AEG for "our losing a very large contract in one of the principal cities of China, after my agents had spent a great deal of time and money to secure it" (Tate to Frazar, 1 Feb. 1889; TAE to AEG, 31 Jan. 1889; Lbk. 28:63, 61 [*TAED* LB028063, LB028061]). The matter had come to the fore after Frazar forwarded to Edison a report from his Osaka branch ascribing their loss of a central

station contract to the Niwas relaying price information from Berlin and to the related influence of Kunihiko Iwadare. Frazar suggested that a review of the German contracts might clarify AEG's legal obligations to Edison, but Tate replied that the German lighting interests had "passed through a number of different stages, and it would be a difficult, if not fruitless task, to attempt to sift their various contracts… to ascertain their present legal status with respect of their obligations to Mr. Edison." Frazar pressed the matter in a visit to Orange on 8 February, when he apparently urged Edison to draw Henry Villard into the matter (Frazar to TAE, 16 Jan. 1889; Frazar to Tate, 12 Feb. 1889; both DF [*TAED* D8905AAF, D8905ABG]; Tate to Frazar, 1 Feb. 1889, Lbk. 28:63 [*TAED* LB028063]).

The German company responded to both Edison letters on 19 February. According to the translation in Edison's files, it denied having sold lamps directly to China or Japan and doubted "if the complaints of your agents really refer to our product, which, as we know to our regret, is frequently imitated." More significantly, it declared itself free of the Edison orbit. Having closed out relations with the umbrella European firm, the Compagnie Continentale Edison,

> we do not stand any longer in the position, as you describe it, of one of the Edison Companies, confined to a certain territory.
>
> We also do not work exclusively under the Edison patents, acquired in common with the firm of Siemens & Halske, but we own many more.… The market for our product is the entire world, and we cannot restrict ourselves in the sale of the same any more than do Siemens and Halske and the other manufacturers of incandescent lamps, with all of whom we are in the same position. [AEG to TAE, 19 Feb. 1889, DF (*TAED* D8941AAH)]

AEG's advertised readiness to construct central stations anywhere in the world caught the eye of Francis Upton, who also saw copies of some of Edison's correspondence on the subject (Tate to Upton, 1 Feb. 1889, Lbk. 28:65 [*TAED* LB028065]; Upton to Tate, 16 Feb. and 8 Mar. 1889, both DF [*TAED* D8939AAK, D8939AAU]). Frazar, however, was evidently unmoved by AEG's declarations and urged Edison to take up the matter personally when he visited Berlin in the summer (Frazar to Tate, 23 May and 26 June 1889, both DF [*TAED* D8905ADK, D8941AAV]).

13. John Lindsley (1845–1909), the resident partner of Frazar & Co. in Yokohoma, was born in Dorchester, Mass., and was the younger brother of Frazar's wife. Lindsley became associated with the Frazar businesses after graduating from Harvard College in 1867 and became a partner in 1872 while based in Shanghai. He also established a short-lived branch in Hong Kong before going to Yokohama. Poole 1950, 1–3; Harvard College 1892, 80; "In Memoriam. Everett Frazer," *Asia: Journal of the American Asiatic Association* 1 (21 Jan. 1901): 121.

14. A European named Bjerre was the chief engineer of electric lights at the King's Palace in Seoul. When Bjerre left Korea in October 1889 under suspicion of embezzlement, Lindley proposed W. H. Benner to take his place. *Chronicle & Directory* 1888, 43, 448; Swartout 1984, ix,

6, 10, 93–7, 100, 171 n. 37; "Corean Notes," *Chinese Times* 3 (12 Oct. 1889): 633.

15. The trainee (see note 2) was Arthur Churchill (b. 1867). Born in Islington, near London, to Eliza and Robert Churchill, he had been working as an electrician at the Edison Machine Works. He became Frazar's new phonograph expert and electrical associate in East Asia at a salary of $1,200 per year plus expenses, arriving in Japan in mid-April 1889. Ives and Crawford 2012, 196; "Letters to the Editor," *Electrical Engineer* 24 (Oct. 1897): 409; Frazar to Tate, 12 Feb. 1889; Insull to Tate, 13 Feb. and 7 Mar. 1889; DF (*TAED* D8905ABG, D8960AAN, D8960AAP); Tate to Frazar, 16 Jan. 1889; Tate to M. D. Barr, 9 Mar. 1889; Lbk. 27:759, 28:588 (*TAED* LB027759, LB028588); "Passengers Arrived," *Japan Weekly Mail* 11 (13 Apr. 1889): 366.

16. Frazar was New York agent for the Canadian Pacific Railway, and Frazar & Co. managed the railroad's steamer routes between Vancouver and China and Japan. "Our Asiatic Trade via British Columbia," *American Mail and Export Journal* 20 (Aug. 1887): 45; "In Memoriam. Everett Frazar," *Asia: Journal of the American Asiatic Association* 1 (21 Jan. 1901): 121.

–3316–

Draft Patent Application: Phonograph

Orange NJ Feby 3 1889[1]

<830>[2] Patent.

The object of this invention is to produce a strong cylinder or shell for phonographic records over the surface of which a thin coating of material to be recorded upon is placed, which shell shall have great strength and be capable of withstanding rough usage but which shall have a coefficient of Expansion in near relation to the material placed on its surface to receive the record. The material I use for this purpose is the stearates of the metals and their cofefficient[a] of Expansion is very small compared to waxes parafine and like material. Hence I am enabled to use Hard Rubber or Ebonite, sometimes[a] called Vulcanized Rubber a commercial product of a very variable character Consisting of Rubber or[a] allied gums in combination with Sulphur— ~~The coeff~~ the expansion of this material is very great so that it nearly approaches The Expansion of the stearates of the metals, hence the two can be used together. The veneer of Recording material may be put on by dipping the Ebonite shell in the molten liquid or it can be placed in a mould & poured around it in a molten state. The surface of the Ebonite should not be polished but made rough to cause adherence.

Afterward the surface is turned true & is ready for the phonograph The great value of the backing shell of Ebonite is that ~~the~~ it has great strength with abnormal Expansion it being unique in this respect, standing almost[b] alone in this respect Hence Musical or other phonographic records or duplicate made on material with Ebonite backing may be handled & shipped without danger of breaking— As Ebonite varies so much in composition the Expansion of the stearate of a metal may be increased or diminished by using a little Oleate of a metal, for instance if Mono[b] Stearate of Soda is used the Expansion ~~of~~ may be increased by adding to it a small quantity of Oleate of Alumina the proportions must be determined Experimentally to suit the particular[a] Ebonite used—

Claim a phonogram blank of Hard Rubber Sometimes[a] called Ebonite, Vulcanized Rubber faced with phonographic Recording material

2nd. Ebonite[a] shell coated with a Recording substance of about the same coeff of Expansion [---][c]

3rd Ebonite[a] faced with a stearate of a metal.

Etc

TAE

ADfS, NjWOE, PS (*TAED* PT032ABS1). [a]Obscured overwritten text. [b]Interlined above. [c]Canceled.

1. Patent attorney Henry Seely marked this draft as received on 5 February.

2. This is the case number assigned by Edison's patent attorneys to the application created from this draft. Someone (perhaps Henry Seely) wrote at the top of the page: "See Case 829," which is Doc. 3312 and to which the text of the finished application referred specifically. Edison did not sign Case 830 until 22 March. It was filed at the Patent Office three days later and issued in November, with two drawings and four claims, as U.S. Patent 414,759.

–3317–

Alfred Tate to Everett Frazar

[Orange,] Feb. 5, 1889.

My Dear Mr. Frazar:—

I have your note of 4th instant,[1] and will be glad to see Mr. Tyson[2] to-morrow afternoon.

I think you are already aware that the Graphophone people are making strenuous efforts in China and Japan to obtain concessions, giving them the exclusive right to introduce their machines. They, of course, will try to exclude the phonograph altogether. Would it not be well to let the Japanese and Chinese officials know that the Edison Perfected Phonograph is to be sent to those countries shortly? To-morrow night we are sending a young man[3] to Washington, with a phonograph, for the purpose of giving an exhibition before the Commissioners of the Patent Office,[4] to overcome some objections which have been raised in that Dep't. of the Government in connection with patents.[5] I suppose it would be impossible for you to arrange in so short a time to utilize this man for the purpose of obtaining records and giving an exhibition before the Japanese and Chinese officials?[6] I am quite sure that if they once heard the phonograph, no special grants would be made on behalf of the Graphophone.[7] Yours truly,

A. O. Tate M[aguire]. Private Secretary.[a]

TL (letterpress copy), NjWOE, Lbk. 28:105 (*TAED* LB028105). [a]Signature line typed in left margin; signed for Tate by Thomas Maguire.

1. Frazar wrote on behalf of Alexander Tison, recently "appointed by the Jap. Minister in Washington to fill the law chair in the Tokyo University." Tison was also to assist with Frazar's business interests in Japan, and Frazar wished Tate to receive him at the laboratory on 6 February to see the phonograph, electric light, and phonograph factory. Frazar to Tate, 4 Feb. 1889, DF (*TAED* D8960AAG).

2. A native of Missouri, Alexander Tison (1857–1938) was an 1886 graduate of Harvard Law School. He practiced in Tokyo and concurrently served as professor of English and American law at the Imperial University from 1889 to 1894. Obituary, *NYT,* 17 July 1938, 26; Leonard 1907, s.v. "Tison, Alexander."

3. Walter Miller went to Washington on the evening of 6 February after first visiting Frazar in New York. Frazar to Munemitsu Mutsu, 6 Feb. 1889; Frazar to Tate, 6 Feb. 1889; both DF (*TAED* D8960AAK, D8905ABC).

4. That is, the Office of the Commissioner for Patents under Benton Hall, an appointee of Grover Cleveland until 31 March. "Biographical Sketches of the Commissioners of Patents," *Journal of the Patent Office Society,* 18 (July 1936): 191–92.

5. The matter may have involved Edison's Case 783, the text of which is Doc. 3219. Having been twice rejected, the application was the subject of an appellate hearing on the afternoon of 7 February, shortly after Walter Miller's arrival in Washington. Case 783 file wrapper, PS (*TAED* PT032ABB).

6. Frazar had been anxious to obtain recordings by Chinese, Japanese, and Korean diplomats to send to their home countries, as the graphophone's promoters were doing (Frazar to Tate, 17 and 24 Jan. 1889; Frazar to TAE, 2 Feb. 1889; all DF [*TAED* D8960AAC, D8960AAF, D8905AAU]). Frazar provided Miller with letters of introduction to the Washington delegations of those countries and also mailed his own letters to the same officials, requesting in each case a brief recorded interview with Miller (Frazar to the Chinese minister, both 6 Feb. 1889; Frazar to Munemitsu Mutsu, both 6 Feb. 1889; Frazar to Horace Allen, both 6 Feb. 1889; all DF [*TAED* D8960AAH, D8960AAI, D8960AAJ, D8960AAK, D8960AAL, D8960AAM]).

7. Walter Miller was not initially received by the Chinese or Japanese legations, but he and Frazar recorded the Japanese minister and associ-

ates in March. The phonograms were presented to Japanese officials in Tokyo. Frazar to Tate, 12 Feb. 1889; Frazar to TAE, 16 July 1889; both DF (*TAED* D8905ABG, D8960AAT).

–3318–

Alfred Tate to Erwin von Wilmowsky

[Orange,] Feb 8/[188]9

Dear Sir:

Mr Edison desires to discontinue the expense of your Department,[1] and I therefore beg to advise you that he will be compelled to release you from your present engagement on Saturday next 16th inst. Yours truly

A. O. Tate Private Secy

ALS (letterpress copy), NjWOE, Lbk. 28:145 (*TAED* LB028145).

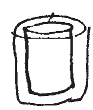
1. Tate referred to the laboratory's chemistry department and its university-trained staff. Having released Drs. Johannes Braun and L. Cornice ten months earlier, Edison would also dismiss Dr. Henry Wurtz in March (Tate to Braun, 19 Apr. 1888, DF [*TAED* D8815ABB]; see Doc. 3329). Wilmowsky remained employed at the laboratory until mid-May, after which Edison gave him a general letter of recommendation (Time Sheets, 16 May 1889, WOL; TAE to Wilmowsky, 31 May 1889, Lbk. 30:183 [*TAED* LB030183]). Increasingly, Edison seems to have been relying on Reginald Fessenden, an aspiring electrical engineer redirected into chemical experiments (cf. Doc. 3324).

–3319–

Draft Caveat: Miscellaneous

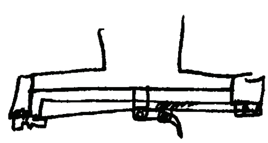
[Orange,] Feby 10 1889—[1]

Caveat



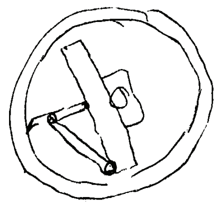
Take Record. chill it to zero in a mould. then pour Hot No 2[2] to get on inside. Then split this & by pouring hot No 2 while mould is at Zero duplicate [-][a] also perhaps type metal or soft material warm forced in—[b]

Worsted or thin Cotton dipped in a tough molten material like Asphalt & Rubber etc to make tough blank for Veneering

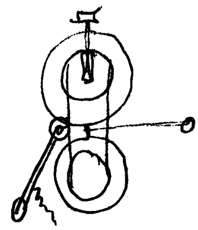


weight Recvr also as Transmitter[3b]
swing brush[c]

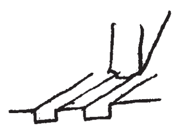
Recording on inside so it Can be split & used as mould.



Duplicating[4]

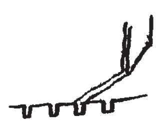


Musical or Master blanks to be Hard Rubber [backing?][a] & Records to have same

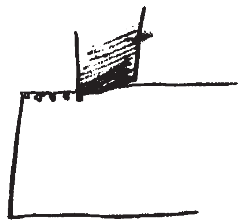


following tool to take edges off—
so be thus

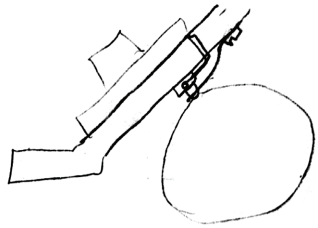
grooving tool forming part of Shaving tool so as to get rid of raised space between Lines



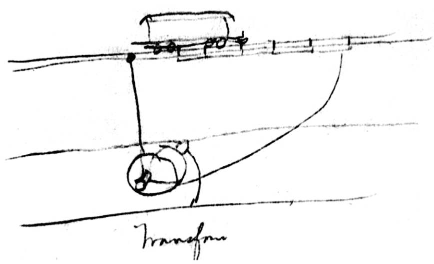
shaving tool



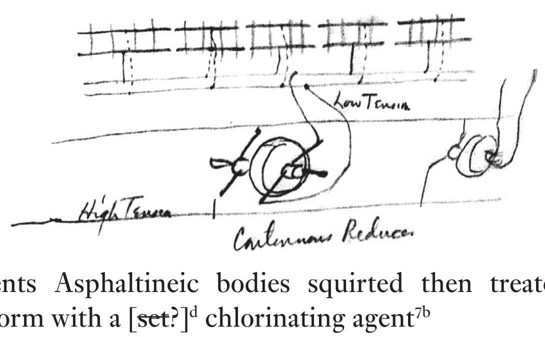
to keep same position



Electric RR[5]



Street RR[6]

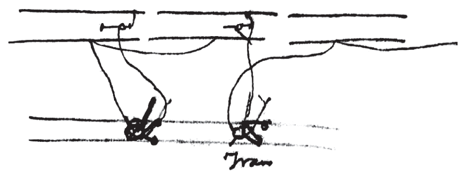


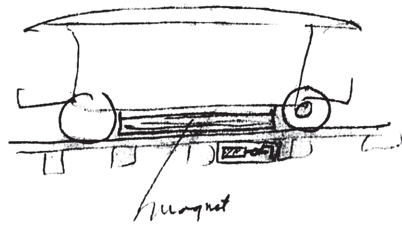
filiments Asphaltineic bodies squirted then treated in Chloroform with a [~~set~~?][d] chlorinating agent[7b]

Iodide Amyline Squirted[b]

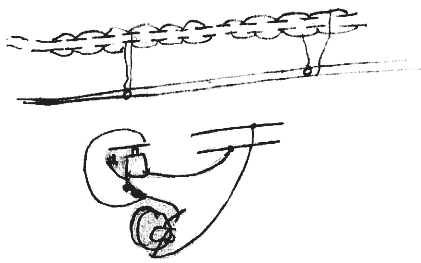
Sulph~~u~~ Anilic Acid[e] [p----][a] & squirted.

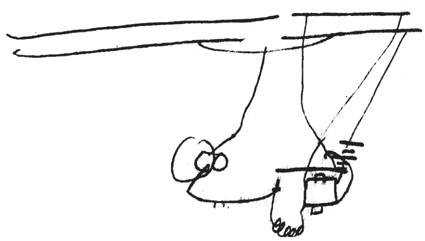
[A][8]





auto increasing Current when Car Comes on section & then reduces Current when goes off





¼ ohm per foot.
2 feet ¼ ohm
4 ⅛
8 $\frac{1}{16}$
16 13
 $\frac{1}{50}$ ohm[9]

ADf, NjWOE, Lab., N-87-09-02 (*TAED* NA010J176). Document multiply dated; miscellaneous calculations and incomplete sketches not reproduced. [a]Illegible. [b]Followed by dividing mark. [c]Drawing followed by dividing mark. [d]Canceled. [e]Obscured overwritten text.

1. Edison wrote this date on the first page of his draft but then marked subsequent pages as 10 February 1888. Adding to the confusion, he used this notebook from both the front and back (re-numbering the pages) over a considerable period of time, perhaps copying material into it from other books or loose sheets. In the absence of a finished or filed caveat, however, the editors believe that 1889 is the correct year because of the overlap of subjects in this draft (specifically, phonograph cylinder veneers and squirted lamp filaments) with those in other documents positively dated from early 1889. Edison seems to have repeated the mistaken date in a related draft patent application (Doc. 3320) on the same day. Cf. Docs. 3312, 3316, and 3334; PN-88-05-01, N-87-12-10, N-89-03-01, N-88-03-15.2 [Mar. 1889 patent application draft and 31 Mar. 1889 caveat draft]; all Lab. (*TAED* NB008AAY, NP033C, NB067AAA, NA023188, NA023207).

2. The editors have not identified this experimental compound.

3. That is, the reproducer and recorder, respectively.

4. The idea embodied in this drawing appears to have made it into a caveat that Edison executed on 22 March and filed three days later. There he described a similar drawing (figure 16) as a "steel belt with tightner" to rotate one cylinder against another at a set pressure in a duplicating process. Case 114, Edison's Caveats, MdCpNA (*TAED* W100ABX); cf. Doc. 3152.

5. Figure label is "Transformer." This drawing and the following one (with a "continuous reducer") appear to represent a rotary converter for changing voltage.

6. Figure labels are "Low Tension," "High Tension," and "Continuous Reducer."

7. These filaments may be related to "Edison Speci[a]l" carbons (treated and untreated) placed in experimental lamps on 20 February (N-87-12-10, Lab. [*TAED* NB008AAY]). In addition to the contemporaneous records of squirted filaments mentioned in note 1, Edison jotted a number of prospective materials and experiments into a pocket notebook on 23 February (PN-88-05-01, Lab. [*TAED* NP033C]).

8. Figure label in first drawing below is "Trans"; in second drawing, "Trans" and "magnet."

9. Edison made several undated and unlabeled drawings on the following pages that may be related to the electric railroad.

–3320–

Draft Patent Application: Electric Railway

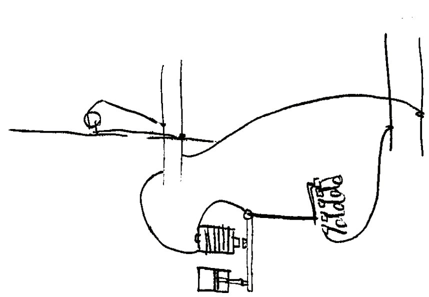
Orange Feby 10 1889[1]

Dyer & Seely—

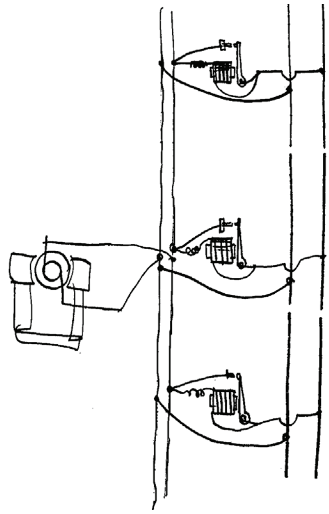
The object of this invention is to produce an ~~economical simple~~ a practical system of distributing Electricity to street Railway Cars without too great a loss in leakage and without the use of Conduits with travelling Contacts which are Expensive or without the use of Overhead Conductors & Trolleys which are now allowable in large cities[2] The invention consists in ~~distributing from~~ Cutting the tracks up in sections of say 250 feet Each [-][a] and Causing the Entrance of a Car & motor on the section to Automatically cause a magnet to Close a circuit increasing the Current from a weak one[b] to[b] its full strength and when the car passes out of that particular section the Automatic device disconnects the main circuit from such section leaving still a circuit for the magnet thus The loss due to leakage is reduced to a mere fraction when the section is not occupied by a car or cars[3] A multiple arc circuit passes along the street paralell with the track & buried underneath the pavement at any convenient point between the track and the ~~pavemen~~ sidewalk A small box sunk to the level of the Street preferably at the intersection of two streets Contain the Automic circuit closer. This box has the usual double cover to keep the interior free of moisture & to allow of inspection.

A multiple arc circuit runs parallell with the track say one mile the Dynamos being in the Centre. There may be as many such Dynamo Centers as there are miles of track. Or these mile Centers of Energy may be worked by means of Motor generator transformers from one general station as set forth in a previous Application[4]

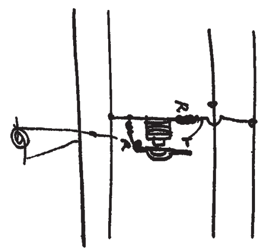
In practice a central conducting rail may be necessary the two Traffic rails [~~and th~~?][a] used as one pole & the central Rail for the other but this is not necessary if in the Construction of the track the traffic rails are not metallically Connected together. The manner of Connecting the rails one with the other is to use Copper or even iron strips under the rails & Electrically weld[5] them to the rails.

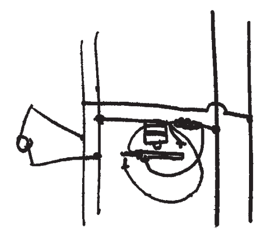


This puts it on easy[d]



The spark at Contacts[b] is taken Care of by bkg in several places (by springs) simultaneously[6]





Claim the auto.[7]

" in junction boxes

" Electric welding

" general system so only sections having Cars on are connected to system.

Use of Car ~~Motor~~ [~~con to ct~~?][a] to close ckt of auto.

The details.

The Earth.[8]

E[dison]

<Have you an application in progress for a Street Car truck also on a Rock Drill[9] if not ask me about it E>[c]

ADfS, NjWOE, PS (*TAED* PT032AAT). Document multiply dated; drawings made on separate sheet. [a]Canceled. [b]Obscured overwritten text. [c]Written in left margin of first page. [d]Text accompanied by index pointer toward drawing.

1. Edison wrote this date and place on a single sheet of drawings that was found pinned to his three pages of text, the first of which he dated 10 February 1888. Because of the overlap between this draft and Doc. 3319 (and the absence of congruence with extant documents from February 1888), the editors believe that he wrote 1888 in error, as he apparently also did in Doc. 3319.

2. Edison presumably meant that such overhead electric wires were not allowed in large cities. His own earlier experimental electric railway at Menlo Park had used a locomotive (instead of motorized cars) with current distributed through the rails, and attenuation of electric power over its short distance had been a persistent problem. See *TAEB* 5–6 passim.

3. Edison's idea of dividing the track into sections is analogous to the block signal system used on American railroads, an automated variation of which he described in an 1887 patent application (Doc. 3072).

4. Edison had several patents issued or pending for reducing voltage in substations with motor-generator machines, devices in which a motor in one circuit drives a generator in another circuit. Among them were an application filed in December 1887 that issued in May 1888 and another pending since December 1886 that did not issue until 1895 (U.S. Pats. 382,415 and 545,405). Edison also had a broad patent on the general concept that issued in September 1887 with two related specifications (U.S. Pats. 369,441; 369,442; and 369,443; see Doc. 3011).

5. Electrical welding (or resistance welding) was a new process of fusing metal pieces together with the heat created by a heavy low-voltage current passed through them. It was developed in the mid-1880s by Elihu Thomson, who eventually took out dozens of patents, and was widely adopted in manufacturing. Compton 1939, 153–54; Thomson 1904.

6. This design appears similar in principle, if not its particulars, to one Edison created in 1879 to limit sparking on electric railroad switches. See Doc. 1745 esp. n. 1.

7. The editors have not found evidence that Edison's attorneys completed or filed an application based on this draft.

8. Edison sometimes instructed his attorneys to "claim the Earth" or other astronomical objects—that is, to make broad claims (cf. Docs. 3089 n. 1, 3103, 3152, and 3157). Intentionally or not, the phrase echoed an editorial retort to the 1885 decision of a British court to uphold an expansive interpretation of Edison's patent claim on the carbon telephone transmitter. The case hinged on the definition of a diaphragm so broad that, the writer observed, it could include the Earth itself: "Did Edison, then, intend to patent the earth? Surely not" (Beauchamp 2015, 154; "Some Thoughts about the Telephone," *Teleg. J. and Elec. Rev.* 17 [3 Oct. 1885]: 291).

9. The editors have not found evidence of completed applications on either subject.

–3321–

To Henry Villard

Orange, N.J., Feby 14th *188*9[a]

Dear Mr Villard:

I enclose you herewith memorandum of suggestions as to the organization of the new Edison General Electric Company.

This memorandum is but an elaboration of the one I handed you in your office some time back.[1] I have not dealt with details. These are matters which should not I think be decided on until your staff is organized. The people who will run the details of the business will I am sure be able to give valuable suggestions on such matters.[b]

All I claim for my memorandum is that it follows the same general policy on which the manufacturing business has been run for years. This policy has led to enormous and rapid development and has enabled us to reach an earning power which is phenomenal notwithstanding the severest possible competition. It is on this earning capacity that you are acquiring control of the business— Surely it is best to leave well done alone and not inaugurate changes the success[b] of which are to say the least uncertain. Yours very truly

Thomas A Edison

ALS, Villard, Box 78, Folder 552. Letterhead of Edison laboratory. [a]"*Orange, N.J.*," and "*188*" preprinted. [b]Repeated at bottom on one page and top of the next.

1. The editors have not identified what Edison gave to Villard, but it likely was some version of a long typed document without date titled "Memorandum of Thomas A. Edison as to the Organization of the Edison General Electric Company." It listed the company's offices, their responsibilities, and candidates to fill them. It was heavily amended in pencil, in part by Edison. The memorandum is similar in essence to a brief outline, handwritten by Edison and also undated, listing additional names and positions (TAE draft memoranda, both n.d. [Feb. 1889?]; both DF [*TAED* D8938ABD1, D8938ABY]). In the latter, Edison named Villard as president; John Dougherty or Calvin Goddard (former treasurer of both the Edison Electric Light and the Edison Electric Illuminating Co.) as secretary and treasurer (specifically rejecting John McClement and Frank Hastings); Samuel Insull as vice president and general manager of manufacturing; William Marks as chief engineer; John Vail as assistant engineer; John Henderson (a longtime Villard associate) as constructing engineer; Cornelius Field (chief engineer of the Edison United Manufacturing Co.) as engineer for isolated lighting and superintendent of construction; Charles Chinnock (vice president of the Edison United Manufacturing Co.) reporting to the vice president as head of the "Isolated Co."; and William Preston Hix (former agent for the Edison Construction Dept.) as the "General Agt Outside franchises, etc." Edison wished the heads of the manufacturing plants to remain as they were except for Sigmund Bergmann, who was leaving Bergmann & Co. to form another company, with Insull to

fill his place on an interim basis. The long typed draft stated that the manufacturing "establishments are operated by men who for years have conducted their businesses as if they were private concerns, and are entirely unaccustomed to the necessary restrictions of corporation management," a paragraph that was substantially enlarged by hand. The typed memorandum also identified a "Technical Advisory Board" consisting of Edison, Marks, Henderson, Insull, and Villard as chair. It would review for the president "all plans with relation to Central Stations" and all proposed changes in equipment and operating methods. Edison's own handwritten outline included a "Technical Ex[ecutive] Com[mittee]" to be composed of the same members (absent Villard). This group "not only decides as to plans specifications etc of any new station or scheme, but also to report to the finance Com their ideas as to the Commercial aspect of the scheeme." No such technical body appears in the organizational structure drafted by Sherburne Eaton in late March (Edison General Electric draft bylaws, n.d. [c. 26 Mar. 1889], Miller [*TAED* HM89AAJ, exhibit no. 4]). Finally, Edison used a separate undated page to list candidates for the Board of Directors and a smaller body, probably the Executive Committee; the latter group was accompanied by a notation, "This gives me two but then we know & must run the details of the business I dont see How [Drexel, Morgan & Co] could object to this" (TAE draft memoranda, n.d. [Feb. 1889?], DF [*TAED* D8938ABY1]; cf. Doc. 3348 n. 2 regarding company governance and executive structure).

–3322–

To Philip Dyer

[Orange, February 19, 1889][1]

Dyer—

See Doctor Lelande Inventor Lelande Chaperon Battery.[2] get License during life American patent for battery for general purposes outside of Electric Lighting will pay royalty five per cent on cost dont care[a] for Exclusive License, only want right to make ~~and~~ no objections showing Telegram to Lelande[3]

Edison

ALS (telegram), NjWOE, DF (*TAED* D8932AAA). [a]Obscured overwritten text.

1. A docket notation on this document indicated that the cable was sent on 19 February. A same-day confirmation was also mailed to Dyer in Antwerp. TAE to Dyer, 19 Feb. 1889, Lbk. 28:263 (*TAED* LB028263).

2. That is, the primary cell designed by Felix de Lalande and Georges Chaperon.

3. After Dyer reported that Lalande wanted a one-franc royalty for each liter of battery capacity to license U.S. Patent 274,110, Edison drafted a response (sent on 1 March): "Royalty asked absurd.… Couldnt compete with a greater royalty than ~~Four~~ [---] five cents Litre Capacity= Ascertain [---] cash price for License for all uses outside Lighting also for patent." One French franc was equivalent to about sixteen U.S. cents (Dyer to TAE, 27 Feb. 1889; TAE to Dyer, 1 Mar. 1889; both DF [*TAED* D8932AAC, D8932AAD]; online Historical Currency Converter [http://www.historicalstatistics.org/], accessed 19 Dec. 2017). Through Dyer, Lalande proposed a royalty of five cents per liter (with a $2,000 annual minimum) or $20,000 outright to use the patent. In the course of more back-and-forth, partly about Edison's dual concerns about the possible existence of a license previously granted to Hilborne Roosevelt and a second relevant U.S. patent, Edison agreed in essence to terms that were embodied in legal form in August. His contract with Lalande and Chaperon provided for a royalty of twenty-five centimes (about four or five cents) per liter of battery capacity (with a $2,000 minimum) for use in the United States or export to France for the remaining life of the patent. The battery was generally prohibited from use for electrical storage or electric lighting; in France, it was specifically limited to the phonograph. The right to terminate the agreement rested solely with Edison (Dyer to TAE, 7 and 29 Mar. and 19 Apr. 1889; TAE to Dyer, 7 May 1889; all DF [*TAED* D8932AAE, D8932AAG, D8932AAH, D8932AAI]); Alfred Tate to Dyer & Seely, 11 Mar. 1889; TAE to Dyer, 23 Mar. 1889; Lbk. 28:610, 768 [*TAED* LB028610, LB028768]; TAE agreement with Lalande and Chaperon, 24 Aug. 1889, Miller [*TAED* HM89ABR]).

–3323–

From John Birkinbine

Philadelphia. February 21st. 1889.

Dear Sir:

I regret that I had so little opportunity to confer with you about my paper. I therefore spoke extemporaneously so as to take time to revise the matter with you for publication.[1] I should very much like to spend several hours with you in this revision so that the paper when it goes to press will be truly valuable to you. There will be an edition of about 1800 published for members, exchanges, etc, and in addition some 1400 will be printed to be bound in with the finished Volume of Transactions. As a member I have the privilege of ordering as many author's copies as I choose at the cost of printing. It seems to me that by putting this paper in A.1. shape it can be widely distributed to all the iron ore mines, blast furnaces, etc, and present concentration to them in such a light as will be advantageous.

I therefore think it very important that we take up the matter in detail together. If it will suit you I will come over some time next week. We should embrace a discussion of magnetism as it affects the action of your own and other separators.

I think it well also to sketch in a general way your investigations of various forms of separators, to show that your present arrangement is the result of thorough study of the various methods proposed by others.

Every one was delighted with the Concentrator, and the visit to the Laboratory in general. I think now is the time to make the results generally known. Your Truly.

Jno Birkinbine

TLS, NjWOE, DF (*TAED* D8949AAT). Letterhead of John Birkinbine.

1. The American Institute of Mining Engineers, meeting in New York City, held a session at Edison's laboratory on 20 February attended by members and their female guests, about 250 persons in all. After visiting the Spiral Weld Tube Works in Newark, the group journeyed to Orange, where Edison personally led a two-hour tour of the laboratory and hosted a lunch in the library. After lunch, Birkinbine presented a paper on "The Magnetic Concentration of Iron Ores," one of three given that afternoon. "The Visiting Engineers," *NYT,* 21 Feb. 1889, 2.

Birkinbine had hoped to discuss his presentation with Edison at the laboratory in early February. After canceling that plan, he came on 11 February, when he found Edison unavailable. He talked instead with Alfred Tate and left a draft for Edison's review. He subsequently encouraged Edison to "write up the operation of the different machines from the standpoint of an electrician, either as a separate paper, or that it be embodied in this paper of which we could take the authorship jointly as you prefer." Having no response to his draft by 19 February, Birkinbine wrote that his own attendance at the event was uncertain owing to his wife's health. The same day, Tate inquired by telegraph (in Edison's name) whether Birkine could "get here tomorrow couple of hours in advance of others to fix your paper on ore milling." Birkinbine to Tate, 30 Jan. 1889; Birkinbine to TAE, 2, 9, 12, and 19 Feb. 1889; all DF (*TAED* D8949AAI, D8949AAJ, D8949AAL, D8949AAN, D8949AAS); TAE to Birkinbine, 19 Feb. 1889, Lbk. 28:271 (*TAED* LB028271).

Birkinbine's paper was published jointly with Edison in the *Transactions of the American Institute of Mining Engineers* for 1889 (Birkinbine and Edison 1889a). A four-page abstract appeared in *Minutes of Proceedings of the Institution of Civil Engineers* (Birkinbine and Edison 1889b).

–3324–

Charles Batchelor Journal Entry

[Orange,] Feb 22. 1889 c[opied].[1]

1402[2] Edison hurt.[3]

Edison got hurt today whilst working on substances for fine tar carbons. He has been experimenting on these a great deal during the last 12 months with Kinney, Joe Force & Hipple.[4] Now he has Fessenden[5] on it all the time in Room 4.[6]

AD, NjWOE, Batchelor, Cat. 1235:92 (*TAED* MBN012092).

1. The 22 February date of the event described here is open to some question. According to the *New York Tribune,* a clipping from which Batchelor appended to this journal entry, the accident happened on "Saturday evening," which fell on 23 February. This entry is the last of four that Batchelor wrote retrospectively in this journal following a series of entries from 1895. On the first such dateline he wrote "(Copied)"; the others he marked with the abbreviation "c." Cat. 1335:91 (items 1399–1401, 5 Dec. 1888, 1 and 21 Feb. 1889), Batchelor (*TAED* MBN012091, MBN012091A, MBN012091B).

2. Charles Batchelor consecutively numbered each entry in this journal.

3. The brief account in the *Tribune,* not published until 2 March, noted that Edison's staff had tried to suppress news of this incident. The paper stated that Edison's eyes were injured by a chemical explosion in which "The flames shot up in his face, singeing his eyebrows and scorching his hair. Some of the acid struck him on the face and eyes and caused severe and painful burns." Edison reportedly immediately plunged his face in a basin of water, preventing more serious harm, and a week later he was said to show "but little trace of the accident." The *New York Herald* published a similar account. A copy of the *Tribune* article was added to an Edison scrapbook and the notice was reprinted by out-of-town papers ("Mr. Edison's Eyes in Danger," *New York Tribune,* 2 Mar. 1889 [p. 1, Clippings [*TAED* SC89061A]; "Edison's Narrow Escape," *New York Herald,* 2 Mar. 1889, 2). The publicity prompted a flurry of inquiries and well-wishes from associates and acquaintances (e.g., Sigmund Bergmann to TAE, 1 Mar. 1889; James Clancy to TAE, 3 Mar. 1889; Robert Thurston to TAE, 3 Mar. 1889; Thomas Connery to TAE, 3 Mar. 1889; Augustus Smith to TAE, 4 Mar. 1889; Charles Hughes to Alfred Tate, 3 Mar. 1889; all DF [*TAED* D8945AAE, D8905ABS, D8905ABU, D8905ABV, D8905ABW, D8905ABT]).

4. James C. Hipple (1855–1917) was born in New Jersey and reportedly worked for his father, a carpenter, before joining an influx of new assistants at Edison's Menlo Park laboratory in early 1880 (Hipple death certificate, *Indiana Death Certificates, 1899–2011,* online database accessed through Ancestry.com, 4 Dec. 2017; U.S. Census Bureau 1965 [1870], roll M593_1079, p. 261A [Flushing, Queens, N.Y.]). Assigned to glassblowing under Frank Holzer, he became closely associated with the manufacture of Edison lamps, first at the Menlo Park factory and then, in 1881, with Charles Batchelor in France. Hipple was also chosen to help start a lamp factory in Berlin. He was still working for Deutsche Edison Gesellschaft in September 1887, and it is not clear when he returned to the United States (*TAEB* 5, chap. 5 introduction and App. 2; Doc. 2196 n. 2; Hipple to TAE, 25 Sept. 1887, DF [*TAED*

D8741AAE]). Hipple left Edison by the mid-1890s to join Edward Acheson, another Menlo Park alumnus, in the manufacture and sale of carborundum. At about the turn of the century, Hipple returned to the lamp business as superintendent of General Electric factories in Toledo, Ohio, and then Fort Wayne, Ind. ("Personals," *Electrical Engineer* 23 [21 Apr. 1897]: 433; Griswold 1947, 2:292–93). Hipple had two familial ties to Edison: his maternal grandmother, Elizabeth Leek, was the first wife of Nicholas Stilwell, father of Mary Stilwell (Edison's first wife); and his sister, Sara Louise Hipple, married Frank Holzer (Doughty Genealogy, Edison Biographical Coll.).

5. A brief resume submitted by Reginald Aubrey Fessenden (1866–1932) in applying for work with Edison in 1887 is rather at odds with his later reminiscences and biographical accounts based on them. What seems clear is that Fessenden was a Québec native and minister's son who was schooled in the vicinity of Niagara Falls, attended Bishop's College in Québec and then, by dint of financial necessity and family connections, taught for a short period at the Whitney Institute in Hamilton, Bermuda. Fessenden came to New York sometime prior to mid-1887 with the promise of some writing and editorial work and, evidently, the hope of working for Edison. He applied for a job on the strength of "a thorough grounding in mathematics" and a desire to learn electrical engineering. His path to the West Orange laboratory is unclear, notwithstanding later stories of being hired by the Edison Machine Works to help lay electrical conductors in Manhattan. Fessenden later claimed that his lack of training in chemistry was the reason Edison directed him to that field (R. Fessenden 1925 [May–June]; H. Fessenden 1940, 1–36; Fessenden to TAE, 18 July 1887, DF [*TAED* D8713AAB]). By November 1888, in any case, Edison considered him to be "making good progress" toward becoming "a first class chemist" (Alfred Tate to Elisha Fessenden, 2 Nov. 1888, Lbk. 25:377 [*TAED* LB025377]). Fessenden remained at the laboratory until 1890, when he went to work first for the United States Electric Lighting Co. in Newark and then, briefly, for William Stanley in Pittsfield, Mass. He taught at Purdue University and for about seven years at Western University (now the University of Pittsburgh) until 1900, when he began working on radio transmissions for the U.S. Department of Agriculture. Having set up a company to develop inventive ideas in that field, Fessenden made the first broadcast of music and voice in 1906. He invented the heterodyne detector and continuous-wave transmission and developed the principle of amplitude modulation (the basis of AM radio), all of which proved crucial for commercial broadcasting (*ANB,* s.v. "Fessenden, Reginald"; Fessenden 1925).

6. Batchelor referred to one of several small experimental rooms lining the central corridor on the second floor of the main laboratory building. These flexible spaces had locks on their doors for privacy but were divided by thin partitions for easy reconfiguration. Millard, Hay, and Grassick 1995, 22–23.

–3325–

To Henry Villard

[Orange,] Feb 28/89

Personal
Dear Mr Villard:

Do not commit yourself as far as electric light is concerned to Thompson Houston.[1] Delay talking. There are some very bad features. I am investigating advisability from all points. Yours truly

Thomas A. Edison T[ate]

L (letterpress copy), NjWOE, Lbk. 28:409 (*TAED* LB028409). Written by Alfred Tate.

1. Edison was reacting to discussions about cooperation between the Thomson-Houston Electric Co. and the Edison General Electric Co. which, despite his reticence, led quickly to a specific proposal for electric lighting (discussed in Doc. 3327). These overtures coincided with an alliance of convenience between the two firms in the electric railway business. In late 1888, when Westinghouse Electric tried to block Thomson-Houston from revising its state charter to allow for expansion into railways, Edward Johnson offered to assist Charles Coffin against their mutual opponent. Henry Villard and Coffin came to terms about the middle of February, agreeing that the Edison-affiliated Sprague Electric Railway & Motor Co. and Thomson-Houston would not bid against each other to build lines in Richmond, Va., (designated for Sprague) and Washington, D.C. (Carlson 1991a, 283, 291–92 esp. n. 33). The episode was part of a larger unraveling of agreements between Thomson-Houston and Westinghouse Electric in the latter half of 1888 that left none of the three major electrical firms with a decisive patent advantage over the others (Passer 1972 [1953], 145–47; Carlson 1991a, 253–57).

The February discussions were not the first attempt at rapprochement between the Edison and Thomson-Houston firms. There had been some discussions about arc lighting in early 1885 (see Doc. 2748 n. 2). Later, perhaps in the summer or fall of 1887, Thomson-Houston evidently put forward a broader licensing offer. The timing of that offer probably coincided roughly with the firm's request in September 1887 that the Edison Electric Light Co. proceed with threatened infringement suits as a way of testing the merits of its patents. Whatever the proposal was, Edison rejected it, telling Edward Johnson in an undated letter that he preferred to "wait couple years & decide the litigation, then we can talk about licensing." He also urged that in the meantime the Edison forces should "Go in & do this small town business ourselves." Thomson-Houston Electrical Co. to Edison Electric Light Co., 29 Sept. 1887, PPC (*TAED* CA019A2); TAE to Johnson, n.d. [summer/fall 1887?], DF (*TAED* D8832AAP4).

–3326–

To George Gouraud

[Orange,] March 5/89

My Dear Sir:

Mr. W. J. Hammer is to have charge of my full exhibit at the coming Paris Exposition and I have tonight given him a letter of introduction to yourself and requested him to consult you in regard to the exhibition of the Phonograph.[1]

As I have previously written you, the Phonograph is to be exhibited in the American Section of the Exposition,[2] a very large portion of which has been set apart for the display of my inventions, and while I have perfected arrangements to make the Phonograph a very prominent feature of my[a] exhibit, bearing in mind the important part which it will play with respect of your relations to the same, I have considered it desirable that Mr Hammer should meet you and receive your views concerning the details of its exhibit, and have instructed him to respect your wishes to the fullest possible extent consistent with the general instructions he has already received from me.[3]

This without doubt will be the best opportunity which can or will be had to introduce the Phonograph to the peoples of Europe, in fact the whole world, and as[a] my desire to take every advantage of it is I know heartily seconded by yourself I feel sure that I can count upon your cordial coöperation and valuable suggestions to make it a pronounced success, and it seems unnecessary to ask you to assist Mr Hammer in carrying out my wishes with which he is already familiar.

I have considered your recent correspondence in regard to the expense connected with this exhibit, and still think that the whole of the expense attendant upon the exhibition of the phonograph should be borne by yourself[a] but as you appear disinclined to concur in this view of the case I am willing to bear an equal share of the cost of exhibiting this instrument in so far as it is displayed within the limits of the space devoted to my other inventions and to the extent of co-equality with these.[4] Of course if you arrange for any extraordinary exhibitions of the phonograph, by which I mean any display apart from the exhibit I have already provided for through Mr Hammer, the expense of the former must be wholly borne by you. The financial obligations which I have been obliged to assume[a] in connection with this whole exhibit, and from which you will derive a not inconsiderable benefit have been so enormous that I do not feel able to incur or share in any additional expenditure.

Mr Hammer will draw upon you at the end of each month for that portion of the expense which is chargeable against yourself and I wish you to kindly arrange to meet his drafts in this manner. At times as they may be needed or called for I will forward Phonographs and supplies of various kinds and assist in every possible way to ensure the success of my exhibits. Yours very truly

Thos A Edison

LS, NjWOE, Lbk. 28:520 (*TAED* LB028520). Written by Alfred Tate. [a]Repeated at bottom of one page and top of the next.

1. Edison's 5 March letter of introduction is Lbk. 28:517 (*TAED* LB028517). Hammer left the next day for London, where he intended to retrieve Edison's original tinfoil phonograph from the South Kensington Museum to display in Paris. Alfred Tate to A. B. Laurence, 7 Mar. 1889; Lbk. 28:553 (*TAED* LB028553); Hugh de C. Hamilton to Tate, 20 Dec. 1889, DF (*TAED* D8959AGR).

2. See Doc. 3298.

3. See Doc. 3331 esp. n. 2.

4. Gouraud replied to this paragraph on 26 March, when he quoted the first portion of it back to Edison and expressed puzzlement that "The correspondence to which you refer contained no proposal that I should pay the whole, nor any expression of opinion that you thought I should." He then referred to Edison's earlier offer to share the expenses and to his own stated willingness to do so. Gouraud to TAE, 26 Mar. 1889, DF (*TAED* D8946AAW); see Docs. 3306 esp. n. 2 and 3343.

–3327–

Memorandum to Henry Villard: Thomson-Houston Electric Co. License Proposition[1]

[Orange, c. March 5, 1889][2]

Notes on License Proposition to Thomson-Houston Co.[3]

(1) <u>Thomson-Houston go out of isolated business</u>.

This is no consideration to us, except they use their agents to sell our goods; permitting two sets of agents to work in the same territory would certainly demoralize our organization in this line, and cannot be thought of; hence, there is absolutely no consideration, as their withdrawal only removes one-tenth ($^1/_{10}$) of the competition, and this one-tenth is a weak quality.

(2) <u>They to go entirely out of the lamp business and purchase lamps from us</u>.

1st. This would give them a powerful lever to hurt our business.

<u>SECOND</u>. The harm would be greater than any possible profit.

<u>THIRD</u>. We can take their entire lamp renewal business away from them any way if we reduced the price of lamps to a point where they would be willing to buy, or even to the point of no

profit to them we could sell to their customers and make more than they would be willing to pay us.

FOURTH. They would not give up the manufacture of lamps in my opinion, as they have I am told quite a foreign trade, and must look forward to the day when our patents will be out, i.e., 4½ years, when they would be relieved from contract with us.

FIFTH. They certainly would not agree to a contract compelling them to buy of us after patents were out; hence at the expiration of 4½ years they would have got themselves in such a strong position by contracts made with local companies, over which we could have no control, that we would be left out in the cold.

(2½) The Thomson-Houston Company to take a license on three wire system.

This patent is good, holds for 13 years; it controls direct Central Station lighting; no alternating system, with its 25 per cent loss, can for a moment compete in small towns for mile areas; it is as inexpensive as alternating; 80 per cent of the paying business in a small town is within this area; an alternating system in this area competing with the direct would lose money at rates where the direct would pay a dividend. If you give them a license for this system, even without the lamp, they would kill our isolated business as well as Central business in every town the license extended to; with the lamp license it would be absolutely dead and we get a small return, but with the proviso in the memorandum that alternating may be used, they would use this system to obviate the necessity of buying direct machinery from us. If you make it compulsory that they only use direct system in mile areas and extend beyond with alternating, they would not agree to it. To prevent them from using alternating altogether you insert a clause that they must purchase one million dollars annually of material from us for this purpose, outside lamps. They will not agree to this; they will not bind themselves. This is a guarantee of $200,000 profit. The Manager of the Thomson-Houston Co.[4] wouldn't dare to do it. If they did, it would be for a short period, in which period they would so entangle things that at its expiration we would have no organization for that class of business, and we would lose a practically continuous and profitable business, and one which grows with the growth of the country for the sake of a short guarantee of profits made by a Company, which in the present state of the art has no legal right to what they now sell, and which has no special capacity to do the business any better than we can, who have the legal right.

From false premises your mind has been impressed with the importance of the Thomson-Houston Company, their business capacity and the results they have obtained, and you have drawn a conclusion from what has been told you that they are very desirable parties to be connected with, that they are very successful &c.— correspondingly the Edison Company is not so successful.

The reason of the success of the Thomson-Houston Co. is:

FIRST. They take part of their pay in stock and bonds of the Company they form; hence, they are enabled to get good prices; whereas, if they did not take stock and bonds they would not, in eight cases out of ten, form the Company at all or sell their machinery at high rates; hence, by taking say three million of such securities and selling them, they are enabled to make several hundred thousand dollars profit in their factory, but there is not a clear unadorned profit like that of the Edison shops. If all the securities turn out to be good and valuable, then the several hundred thousand profits are like ours, but if we deduct from these three million of securities the inevitable percentage which will never pay dividends or return the principal, this percentage will go a long way towards cutting down the profits they show. In other words, by their peculiar financial system they are enabled to show a profit of, say, a million.

Supposing the Edison Company had the same arrangement, they could have done twice as much as the Thomson-Houston Co., whereas, they never invest a cent, pro contra, they make the local people take all, and pay them besides. Again, the Thomson-Houston Co., and, in fact, all the Companies admit they make nothing on incandescent lighting, yet the Edison Shops showed $600,000 profit, and scarcely touched the small town business, while the Thomson-Houston people have done all their work in the small towns. A dynamo of 40 horse power when sold for arc lighting brings double the price as if sold for incandescent; yet it costs not a cent more.

I have tried for years to get the Edison Company, or rather Drexel, Morgan & Co., to allow the shops to do the small town business, but the restrictions were so great that the shops did not feel like taking the risk, and after we finally decided to take the risk and go in and had arranged with the best man in the country to take hold of that Department. We were not allowed, however, to hire him, because Mr. Hood Wright had some prejudice against him.

In the memo you say, the Thomson-Houston Co. is to do arc lighting exclusively. As we never did arc lighting, this is immaterial; but I want to say that there is no earthly reason why we should not go into a very profitable branch of the lighting business. I had a complete system once and had organized an agency and would have built up a vast arc business, but Drexel, Morgan and Company hearing of it peremptorily sat down on it, with a loss of about $15,000 to myself.[5] We should have an arc system of our own. To bring the machinery up to the present state of the art would require probably $15,000 experimenting.

Your memo says that Thomson-Houston are not to go in large cities with the three wire system. Although illegally using all our devices in several small cities, and being just as free to go in large ones, they have not done so; not having done so, I do not see that there is a concession. You also state that they are to furnish the alternating to us if wanted in large cities to extend the system. The alternating is not useful under any condition in large cities; its value is in small towns, especially small towns below 8,000, and to extend to suburbs in towns of 20,000. It is not necessary for us to buy alternating apparatus from any one; very small alterations provide us with a system. There are no patents held by any one controlling any essential feature. The Light Company has the right to use the Zippernowski system on a royalty, if it so desires.[6]

In reverting again to the memo where the Thomson-Houston Co. is to buy machinery for the direct system from us, I will from Central Stations already built take data to ascertain how much of a given station is electrical and would come from us, and the profit thereon, also how much non-electrical and would yield Thomson Houston a profit.

Take

Bellefonte, Pa. 1,000 lights.
Cost complete $21,958, of which building cost $2,100.
Electrical $4,149; 20% on this, $829.

Harrisburgh, Pa.[7]
Total cost $52,570
Building cost $5,761
Electrical part $9,732; 20% on this $1,846.

Thus it will be seen that our profit, even in a town like Harrisburgh, having 35,000 people, would only be $1,846.

Whereas, if we didn't take 25 per cent, or rather 33% on actual cost, as Light Co. does, but only charged 20% profit on actual cost, we would make $10,514, and the Local Company would get their Station for $17,530 less than they do now under the policy of the Edison Electric Light Company. If we made $10,514 on one station, and let our competitors have the other five, we would be as well off and not have the trouble of an intangling alliance; but, in fact, the whole of our competitors could not take more than three out of the six, even with the load added on by the Light Company; much less could they compete at all if we did business purely on the 20% basis and charged nothing for the license. Again, by referring to the figures of Harrisburgh, if the Thomson-Houston Co. guaranteed us one million dollars worth of business yearly, they would have to do about six millions of incandescent business capitalized at, at least, nine millions, and if they added the arc light system, as they would, and got the prices they have been accustomed to get, it would require doing from 12 to 14 millions of business, which they could not do. Assuming they did the whole of the $2,619,000 in towns from 9,000 to 25,000, on the Harrisburgh basis they would buy of us only $690,000 worth of material, on which we would make $138,000. Hence, we would practically sell the United States, minus 3,203,000, to Thomson-Houston for $138,000. This is absurd, and shows the absurdity of any guarantees; whereas, if we did the business ourselves we would sell over $4,000,000 of goods, make $800,000 instead of $138,000, and as much more in towns below 9,000; we would also make a profit on alternating; also full profit on lamps, and on an arc system; also furnish power for street railroads from our stations, which would be two millions more, to say nothing of any emoluments from the sale of our licenses.

Regarding the memo. stating they are to have all towns below 25,000 population, I have taken the United States Census of 1880, and using the State of Illinois as data, to see how they would come out.

Illinois

Total population 555,000. Census 1880. Probable population now 750,000[a]

There are the following towns:

A.
70 over 1,000 population.[b]
35 over 1,500 "
35 over 2,000 "

9 over 2,500	"
17 over 3,000	"
7 over 3,500	"
5 over 4,000	"
7 over 5,000	"
3 over 6,000	"
1 over 7,000	"
4 over 8,000	"
3 over 9,000	"
4 over 10,000	"
3 over 11,000	"
1 over 13,000	"
1 over 17,000	"
1 over 19,000[c]	"

This leaves us nothing in Illinois if small towns are taken out, and our isolated business will be killed.[d]

B[e]	
1 of 27,000[b]	
2 of 29,000	
1 of 503,000	"

B. All parted with already.[f]

Taking the whole United States and towns and towns above 9,000, we have 10,873,000; of this 5,051,000 is sold, leaving us 5,822,000. There are to be deducted from this towns above 9,000 and below 25,000, or 2,619,000 which would go to Thomson-Houston, leaving us 3,203,000.

You will see by the State of Illinois that the population in towns where a plant could be sold and which is below 9,000, is 393,000, leaving only 162,000 for towns between 9,000 and 250,000; so it will be seen that taking the United States as a whole, under this scheme we could not possibly have more than 3,203,000 to work on, whereas Thomson-Houston would have, I estimate, 7,500,000.

Do not forget that in all human probability our lamp patent will be sustained.[8] If so, we shall be able to collect about 55 cents on every lamp ever sold by Thomson-Houston Co., and it will amount to not less than $500,000, besides royalties on the three wire patent by way of damages.

In lieu of any arrangement with Thomson-Houston, I suggest that the General Company adopt the policy of no intangling alliances with any competitor. We have all that is required, and legally own it, and if we want alternating apparatus and arc apparatus, I will provide it; and further, that we should get the best men that can be got for money and work every Department aggressively. I know absolutely that I can get a splendid man to organize and run a small town Central Station plant, which being untrammelled with Drexel, Morgan & Co's methods will prove of immense and immediate profit, and to the confusion of our competitors, including Thomson-Houston Company. We are organized to do business and not to delegate its doing to others at a loss. For years we have been trying to get a fair field to show what can be done, but have never been given the slightest chance (except in our shops with results you know), and now when we will have a chance we want the benefits.

TD, NjWOE, Miller (*TAED* HM89ACH1). [a]Paragraph typed to right of column below. [b]Vertical dividing marks typed down right side of column. [c]List enclosed by right brace from top and marked "A" by hand; followed by blank line. [d]Paragraph typed to right of column; enclosed by left brace and marked "A" by hand. [e]List enclosed by right brace and marked "B" by hand. [f]Paragraph typed to right of column and marked "B." by hand.

1. Although this memorandum bears no author, recipient, or date, it was filed with a typed cover page ascribing authorship to Edison. It was evidently a direct response to Henry Villard's request on 3 March that Edison offer "such suggestions as you desire to make apropos of my memorandum regarding the Thomson-Houston Co." (see note 3). Villard pointed out that he planned to discuss the proposal with Charles Coffin, vice president and treasurer of the Thomson-Houston Electric Co., on 7 March in New York (Villard to TAE, 3 Mar. 1889, DF [*TAED* D8938AAG]). After meeting with Coffin, Villard wrote him on 11 March that he intended to visit Edison's "laboratory some time this week, to discuss the scheme we considered." He and Edison met at Villard's office on 15 March, when they had a "long conversation." Villard told Coffin afterward that Edison had authorized him to forward "a copy of his points" (likely some version of this document), to which Doc. 3332 is Thomson-Houston's response. He also said that Edison also promised "to think out a plan of co-operation between our two different interests" (Villard to Coffin, 11 and 15 Mar. 1889, Letterbook 61:345, 381, Villard). Perhaps it was about that time that Edison started drafting his own set of terms for a licensing agreement covering cities under 20,000 residents in the U.S. and Canada that would have extracted heavy concessions from the rest of Thomson-Houston's business. In any case, he left it undated, heavily crossed out, and seemingly incomplete (TAE draft memorandum, n.d. [Mar. 1889?], DF [*TAED* D8938AAI1]).

2. See note 1 regarding the conjecture of this date.

3. Villard sent a "copy of my memorandum regarding the General Edison and Thomson-Houston Companies" to Edison on 26 February. The undated and unsigned "LICENSE PROPOSITION TO THOMSON-HOUSTON COMPANY" consisted of seven numbered items typed on a single page. According to the terms, the Thomson-Houston Co. would:

1) leave the isolated lighting and lamp manufacturing businesses; 2) license the Edison three-wire distribution system; 3) cease installation of direct current lighting systems in cities of more than 25,000 residents but keep the right to use alternating current with Edison equipment; 4) retain the right to use direct current in cities smaller than 25,000; 5) install arc lighting exclusively; 6) purchase all its incandescent lamps from Edison enterprises on a profit-sharing basis; and 7) contract with Edison General Electric for the manufacture of dynamos, fixtures, and other equipment. In his discussion below, Edison understood the fifth item to mean that only Thomson-Houston would do arc lighting (to the exclusion of the Edison company), not that it would be limited to arc lighting. Villard to TAE, 26 Feb. 1889, Letterbook 61:235, Villard; Villard memorandum, n.d. [c. 25 Feb. 1889], Miller (*TAED* HM89ACH).

4. Silas Barton was officially the company's general manager but Charles Coffin exercised much operational control from his positions as vice president and treasurer. Carlson 1991a, 220; "Organization of the General Electric Company," *Electrical World* 19 (14 May 1892): 331.

5. Edison may have been thinking of discussions in 1885 about a cooperative agreement with Thomson-Houston or about his role in a prospective new company suggested in early 1886 by George Markle, a Pennsylvania banker closely associated with Drexel, Morgan & Co. partner James Hood Wright. Docs. 2748 n. 2 and 2898 n. 1.

6. At the end of 1886, Francis Upton had negotiated an agreement with the Budapest engineering firm of Ganz & Co. for the Edison Electric Light Co. to license United States patents on the alternating current transformer and distribution system of Károly Zipernowsky and two colleagues. Docs. 3008 n. 16 and 3013 n. 9.

7. Some calculations below are incorrect, but in the absence of Edison's draft the editors cannot determine if errors originated with him or the typist. In particular, under the scenario outlined below, the local company would realize a savings of only $6,834 by paying $10,514 as profit on manufactured items instead of the patent license fee of thirty-three percent of the full cost ($17,348).

8. Edison likely referred to *Consolidated Electric Co. v. McKeesport Light Co.,* a major infringement lawsuit against Edison patents on behalf of the Westinghouse Electric Co. The case was moving rapidly toward a trial date in federal court in Pittsburgh. Richard Dyer to TAE, 6 Feb. 1889, enclosing Dyer to Edward Johnson, 6 Feb. 1889; both DF (*TAED* D8954AAO, D8954AAP); see Doc. 3359.

–3328–

Draft to John Beggs

[Orange,] March 20, 1889.

Dear Sir:—

The letter from President Spencer Trask,[1] of the Edison Electric Illuminating Co. of New York, under date 15th inst. addressed to yourself, a copy of which was forwarded to me, regarding a contemplated new station in the first district, and soliciting explicit answers to a number of questions for presentation to the Company's Board of Directors,[2] has brought to my mind a train of circumstances which, while never entirely forgotten, have been for a number of years partially obscured by affairs of greater importance, and reference to them on my part has been withheld by the hope, which I have always harbored, that some day those familiar with the subject and having power to act would revert to the period I touch upon and cause justice to be done me for the assistance I at that time voluntarily extended to a Company which after demonstrating the practicability of my system of underground incandescent electric lighting, was unable to earn an amount sufficient to cover its legitimate operating expenses. The probes of its professed guardians—the same by the way who a short while before had heralded the discovery of a weak spot in that portion of my own intellect which has to deal with commercial affairs—failed to discover the weak spot in the system known as the First District, and while I naturally felt timid to approach a subject which, I had been informed upon such excellent authority, nature had failed to equip me to consider intelligently, my desire for the success of our initial electric lighting station finally over[came?][a] all other feeling and I set out earnestly upon a voyage of discovery on my own account. It took me but a short time to arrive at the conclusion that the entire fault lay in the direct management of the station; that the position of Superintendent was occupied by an incompetent man,[3] and that a change ensuring a proper administration of this office would not only render the station self-sustaining, but would bring to the stockholders a return for the money they had invested. I selected a man, had him placed in charge and personally agreed to pay him Ten Thousand Dollars as soon as he had succeeded in making the station earn a dividend of five per cent on $1,000,000.00.[4] The result of this arrangement is expressed in the report of the Treasurer of the Company[5] under date July 17th, 1885, an extract from which I quote:

> "I take pleasure in announcing that a quarterly dividend of one per cent, being the first dividend on the Capital stock of this Company, is payable on August 1st, 1885."

EXTRACT FROM MINUTES.

> "The President[6] then exhibited a detailed report of the earnings and expenses of the Company, showing that the net earnings for the six months ending June 30th, 1885, after paying all expenses of every description, were

[$25,666.20?].[a] The President further stated that the Company is now absolutely free from floating debt of any kind, the debt incurred in increasing the capacity of Pearl Street station[7] having been entirely paid from earnings, and that after such payment, and after the payment of all outstanding accounts for current supplies &c., there remained from the earnings a sum of $10,539.40 cash on hand applicable to dividends."

The sum of $10,539.40 applied as above on dividends was just a fraction more than the amount ($10,000) which I had a few months previously paid out of my own pocket to the man of my selection who had accomplished these results.

Upon several occasions I have in a jocular way referred to this matter in the presence of some of my good friends, who upon a like number of occasions have promised to secure an adjustment in my behalf, but whether they consider that a self imposed obligation, viewed in that strictly commercial light which alone renders objects visible to them, presents too absurd an appearance for serious consideration, or whether they have simply taken advantage of my own forbearance, I cannot say. I only know that nothing has ever been done towards recognizing the service which I rendered them at a time when they sorely needed assistance.

Time and again since the occurrence of the above events, I have furnished those who then sat in judgment upon me and rendered their intelligent verdict, with fresh evidence of the utter lack of the "commercial" development of my character, most notably in connection with the new lamp. After experimenting for a year and a half, at my own expense, I presented them with a lamp which enabled them to obtain fifty per cent more light from a given amount of power—[8] the net result of which so far as I am personally concerned being almost the ruination of my health from overwork, and to my factory an increased cost of manufacture and the consequent reduction of its earning capacity.

In mentioning these events I do not desire in any way to convey the impression that I am unwilling to render you at the present time any assistance which lies in my power, nor do I mean to indicate the development of a purely commercial side to my character. Neither do I wish to force appreciation upon those who cannot comprehend an unselfish action, but my time, to myself at least, is valuable, and I am engaged upon work, which in my own poor judgment is important, and in laying it aside to give further attention to the affairs of your Company, which I will gladly do to any extent circumstances may require, I consider the occasion a fitting one to place on record a few incidents which have been brought to the surface of my memory by your President's letter referred to in the commencement of this communication. Yours very truly,

Thos A Edison

<This letter was not sent to Mr. Beggs but retained in this office. A. O. Tate>[9b]

TDfS (letterpress copy), NjWOE, Lbk. 28:694 (*TAED* LB028694). [a]Illegible copy. [b]Marginalia handwritten by Alfred Tate.

1. Spencer Trask (1844–1909), born in New York, was an investment banker, philanthropist, and member of the New York Stock Exchange. He served as president of the Edison Electric Illuminating Co. of New York from 1884 to 1889 and again from 1891 to 1899. He was also a director of the Edison Electric Light Co. and of the Edison Electric Illuminating Co. of Brooklyn. In 1869, Trask formed the investment firm Trask & Stone, which later became Spencer Trask & Co. For more than twenty years, he provided financial support to Edison's phonograph and electric lighting enterprises. Doc. 2753 n. 5; "Spencer Trask, Millionaire Banker, Killed in R.R. Wreck," *Bridgeport (Conn.) Times and Evening Farmer,* 31 Dec. 1909; "Edison Electric Light Company," *NYT,* 23 Oct. 1889, 8; "A Huge Plant," *Brooklyn Eagle,* 23 Mar. 1889, 1; Worth 2008, 57–70.

2. Trask wrote Beggs in advance of a proposed meeting with Edison and John Kruesi to discuss "a contemplated new station in the 1st. district and the practicability of successfully and economically connecting the present two wire system with the new standard three wire system." The editors have not determined if the meeting took place, but Trask hoped to gather opinions on seven technical questions for the consideration of the directors of the Illuminating Co. at their meeting on 19 March. A central issue was the location of a new generating station to permit the expansion of the First District to encompass most of the area from the Battery to Canal St. (Trask to Beggs, 15 Mar. 1889, DF [*TAED* D8936AAL]). A 2,000-light generating station at 60 Liberty St. had been augmenting the Pearl St. plant's capacity since September 1886. In 1890 and 1891, the original downtown First District was converted to a three-wire system and its service area expanded southward to the Battery and northward to Canal St. A large new plant at 53–57 Duane St. (near City Hall in lower Manhattan) came online in May 1891, making the Liberty St. station redundant. By the end of that year, the downtown district was connected electrically with the uptown stations to create an integrated distribution system from the tip of Manhattan to Fifty-ninth St. The original Pearl St. plant was retired in 1894 (Jones 1940, 217–22; New York Edison Co. 1913, 108–12; *Electrical Trades' Directory* 1899, 1162).

3. Joseph Casho (1840–1924) was superintendent of the Pearl St. central station from September 1882 until Edison discharged him in the spring of 1883. Casho had a fine reputation as a mechanical engineer,

but Edison came to believe that he did not have a firm grip on the plant's financial management. Doc. 2403 n. 6; *TAEB* 7 App. 1.B.29–31.

4. Charles Edward Chinnock (1845–1915) took over as superintendent of the Pearl St. district in May 1883. Chinnock immigrated from London with his mother and siblings in 1848 to join his father in the United States. He apparently served in a New York militia and the Navy during the Civil War before beginning his professional career as a telegrapher, and he later worked as an electrician under Theodore Vail for the Bell Telephone Co. of New York. In 1888, Chinnock became vice president of the Edison United Manufacturing Co. He secured a number of patents over his career, including for a cinema camera and a kinetoscope that he exhibited in 1895. Doc. 2456 n. 6; "Charles E. Chinnock Dead," *NYT,* 12 June 1915, 11; "Obituary," *Electrical World,* 65 (19 June 1915): 1654; Passenger list for Charley Chinnock, 21 Oct. 1847, *New York, Passenger Lists, 1820–1957,* online database accessed through Ancestry.com, 30 Oct. 2017; U.S. Census Bureau 1963? (1850), roll M432_38, p. 7A, image 19 (Fairfield, Fairfield, Conn.); records for Charles E. Chinnock (and aliases Charles E. Eaton and Frank Watts), 7 May 1907 and 30 June 1915, *Civil War Pension Index, General Index to Pension Files, 1861–1938,* online database accessed through Ancestry.com, 2 Nov. 2017; Robinson 1996, 50; see also note 9.

5. Frank Hastings held the office at that time.

6. That is, Trask.

7. This reference presumably was to construction of the Liberty St. station; see note 2.

8. On Edison's new high-resistance lamp, see e.g. Docs. 3002 (headnote, esp. n. 17) and 3050.

9. Edison apparently awarded Chinnock two payments of $5,000 each in 1884 and 10 shares of Illuminating Co. stock in 1885. Despite not sending this letter, he seems to have tried unsuccessfully to recover the money from the Illuminating Co., attempts that he later recalled with dark humor. Doc. 2771 n. 22; Vouchers—Lab., nos. 265 and 671 (1884) and 44–45 (1885); *TAEB* 7 App. 1.B.29–31.

–3329–

To Alfred Tate

Orange, N.J. [c. March 21, 1889][1a]

Tate=

Write note to Dr Wurtz[2] Chemist in other room[3] that I cant make his work pay me hence will not want him after 1st April— Also Write Hedden[4] say have had to give up Chromic Batteries[5] as too unreliable hence will not need his services after April 1, 89[6]

E[dison]

ALS, NjWOE, DF (*TAED* D8914AAG). Letterhead of Edison laboratory. [a]"*Orange, N.J.*" preprinted.

1. Alfred Tate wrote "OK March 21/89" on this page as the date on which he sent the letters requested by Edison. TAE to Henry Wurtz,

21 Mar. 1889; TAE to William Hidden, 21 Mar. 1889; Lbk. 28:744–45 (*TAED* LB028744, LB028745).

2. Henry Wurtz (1828–1910) graduated from the College of New Jersey (later Princeton) in 1848 and then studied chemistry at the Lawrence Scientific School at Harvard. His varied career included teaching positions at the Yale Scientific School, the medical college in Kingston, Ontario, and the National Medical College in Washington, D.C., all before 1861, when he opened his own consulting laboratory in New York City. Wurtz also worked for the New Jersey State Geological Survey as a chemist and mineralogist, for the U.S. Patent Office as a chemical examiner, and edited the *Gas Light Journal* from 1868 to 1871. He joined Edison's laboratory staff in October 1888 and worked on insulation experiments until he left at the end of March 1889. During his long career, Wurtz published numerous scientific papers, took out several patents, and received an honorary Ph.D. from the Stevens Institute of Technology in 1877. *ANB,* s.v., "Wurtz, Henry"; Stevens Institute 1920–21, 256; Time Sheets, WOL.

3. Edison likely referred to one of the two rooms in the chemistry lab.

4. Edison meant William E. Hidden (1853–1918), a mineralogist whom he had employed in 1879 to search the southeastern United States for deposits of platinum and minerals for his electric lamp experiments (Doc. 1802 n. 4). During the course of that work, Hidden discovered a new mineral which, when he announced it in the *American Journal of Science* in October 1888, he proposed to name "Edisonite." He sent Edison a copy of the article from Newark in November 1888, also taking the opportunity to ask for employment. Edison replied in two letters, one thanking Hidden and the other offering him temporary work at a salary of $166 plus expenses to search for chrome ores (Hidden 1888; Hidden to TAE, 15 Nov. 1888, DF [*TAED* D8814AEZ]; TAE to Hidden, both 30 Nov. 1888, Lbk. 27:242–43 [*TAED* LB027242, LB027243]). Edison's letter of dismissal (see note 1) reached Hidden in North Carolina (TAE to Hidden, 4 Apr. 1889; Lbk. 29:4 [*TAED* LB029004); Hidden to TAE, 4 Apr. 1889, DF [*TAED* D8901AAD1]).

5. See Doc. 3136 regarding Edison's research on chromic batteries.

6. Wurtz and Hidden were evidently among a number of laboratory staff members dismissed about this time. Writing to Henry Seely on 8 April about the protégé of a friend, Alfred Tate explained that "Mr. Edison has just let a lot of men go from here, and there is no opportunity at present." Laboratory time sheets show a decline in the number of employees from 85 at the end of March to fewer than 70 by the middle of April. Over the next four months, the staff fluctuated between 64 and 70, with a brief increase in late July to 74; the numbers increased again in mid-August and reached about 100 employees by mid-September. Tate to Seely, 8 Apr. 1889, Lbk. 28:999 (*TAED* LB028999); Time Sheets, WOL; see also App. 4.

–3330–

Testimonial for Harold Brown

[Orange,] March 21, 1889.

To Whom It May Concern.[1]

I have during the past few months become acquainted with Mr. Harold P. Brown,[2] having met him in connection with certain experiments which he has been conducting on behalf of the authorities of the State of New York.

Mr. Brown is, in my opinion, a thoroughly competent Electrical Engineer, and all the reports prepared by him showing the results of his various experiments, which have been brought to my attention, I have found to be accurate and truthful.

Thomas A Edison

TLS (letterpress copy), NjWOE, Lbk. 28:748 (*TAED* LB028748).

1. Harold Brown was acting as an electrical expert for the city of Scranton, Pa., which he advised to ban the use of wires carrying alternating currents (AC) above 300 volts. Such action would have thwarted the Brush Electric Co.'s efforts to set up an AC lighting system in Scranton, and the company responded by trying to tarnish Brown's credentials. He appealed to Edison: "If you can conscientiously send me a line or two which I can show to Mayor [Ezra] Ripple, I shall be able to add Scranton to the list of cities which have shut out the high-tension alternating current." Edison replied promptly that he took "much pleasure in enclosing herewith a testimonial signed by myself, which I hope will answer your purpose." Edison's letter is Doc. 3337. Brown to TAE, 17 Mar. 1889; TAE to Brown, 22 Mar. 1889; both DF (*TAED* D8933AAN2, D8933AAN3); TAE to Brown, 22 Mar. 1889, Lbk. 28:749 (*TAED* LB028749).

In late August, the *New York Sun* published Brown's solicitation, Edison's response, and several dozen other pieces of correspondence presumably stolen from Brown. Brown and Edison had recently given testimony in the appeal of convicted murder William Kemmler's death sentence, and the *Sun* sought to show their complicity in what it called "Disgraceful Facts about the Electric Killing Scheme" ("For Shame, Brown!" *New York Sun,* 25 Aug. 1889, 6; see also Doc. 3337 n. 1). Kemmler's attorney, W. Bourke Cockran, asked Edison if Brown had "any business connection with yourself or the Edison Company," to which he replied: "Not that I know of." Edison also stated that he did not recall giving a recommendation letter to Brown, though Cockran seems to have been asking about a specific letter addressed to Edward Johnson rather than the general "To Whom It May Concern" testimonial (Edison testimony, pp. 628, 648–49, *Kemmler v. Durston,* 23 July 1889, Lit. [*TAED* QE003A0623]).

2. Harold Pitney Brown (b. 1857), electrician, inventor, and anti-AC crusader, was born in Janesville, Wisc., and educated variously at the Saunders Institute (New Orleans), the public Moseley school (Chicago), and the Chicago High School. He planned to enter the mining engineering program at Harvard but did not after the great Chicago fire undermined his family's finances. He was employed at the Chicago works of the Western Electric Co. from 1876 to 1879, where he

managed the account for Edison's electric pen and duplicating press. From 1879 to 1884, Brown was involved in the construction of electric power plants in the Chicago area for the Brush Electric Co. He set up his own firm, the Brown Electric Co., specializing in long-distance transmission of electricity, and moved to New York in 1887 to work as a consulting engineer. Brown later stated that he met Edison in the summer of 1888 when he asked to borrow electrical instruments and was invited to conduct his animal experiments at the Orange laboratory. "Brown, Harold P.," Pioneers Bio.; "Harold P. Brown," *Street Railway Review* 5 (15 Dec. 1895): 742–43; Leonard 1922, 196; Harold Brown circular, n.d. [Dec. 1888?], DF (*TAED* D8828AEA).

–3331–

To William Hammer

[Orange,] March 23, 1889.

My Dear Sir:—

I confirm elsewhere my cablegram to you of to-day's date, instructing you not to exhibit the phonograph to anyone until after the 15th of April next,[1] which is the date of Colonel Gourand's lecture before the French Academy.[2] I have advised Col. Gourand that you have a number of latest style phonographs which are complete excepting spectacles.[3] I will send these spectacles in time to have them reach you before the 15th April, and I desire you to place the machines which you have at Col. Gourand's disposal for the purpose of his lecture above referred to, after which he will return the machines to you as part of my Paris exhibit.[4] Yours very truly,

Thos. A. Edison T[ate]

why don't you register a <u>cable address</u>. Your present one is very long—[5a]

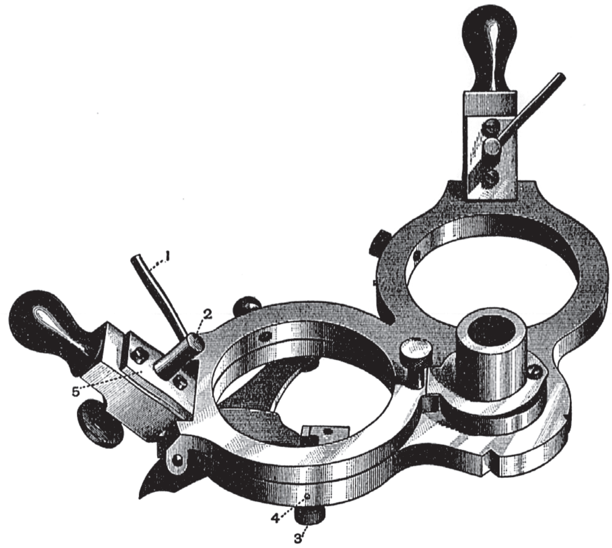
TL (letterpress copy), NjWOE, Lbk. 28:784 (*TAED* LB028784). [a]Postscript written in left margin by Alfred Tate.

1. The editors have not found the cable nor a similar one evidently sent to Hammer on 2 April. Hammer was vexed that Edison issued these instructions at George Gouraud's request. TAE to Gouraud, 23 Mar. 1889; TAE to Hammer, 2 Apr. 1889; both Lbk. 28:766, 913 (*TAED* LB028766, LB028913); Hammer to TAE, 6 Apr. 1889, DF (*TAED* D8946AAZ).

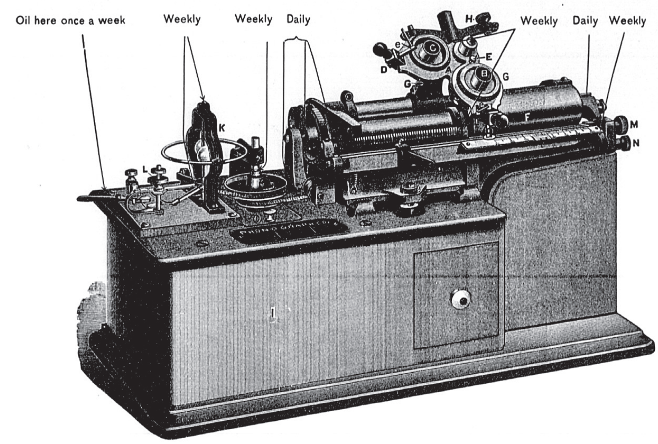
2. The presentation to the Académie des Sciences, originally scheduled for 15 April, was moved to the twenty-third, though there may have been small private demonstrations in the Académie office on the fourteenth and at the home of Gustav Eiffel four days later. At the Académie, Gouraud demonstrated the new phonograph while the French astronomer Jules Janssen, who had seen his exhibition of the instrument in Bath, England, in September 1888, explained its operation. Gouraud and Janssen recorded and played back messages in

French (later printed by *Le Figaro*), as did other Académie members, including Antoine Thomson d'Abbadie, the explorer, linguist, and astronomer, who recorded messages in a number of different languages. The demonstration at the Académie also included musical performances. It was followed by others at Janssen's Paris apartment on 25 April and at the Académie des Beaux Arts two days later. Gouraud also presented the phonograph at a dinner of the Marmite, a republican society of which Janssen was president, on 17 May. "Le Nouveau Phonographe d'Édison," *Le Figaro,* 24 Apr. 1889, 1–2; Fauser 2005, 298; Launay 2008, 138–40.

3. A number of minor alterations had accrued to the phonograph through late 1888, the most visible being a change from brass to a nickel finish on some parts, including the ruler marking the position of the recorder or reproducer on the cylinder. More significant changes to the spectacle and the recorder and reproducer heads appeared in late 1888 and early 1889, not necessarily all at once, but occasioning further production delays. Alfred Tate advised Thomas Connery in early March that Edison had "a great many phonographs completed, excepting the spectacle part, for which we have only just received from the manufacturers our special tools" (Tate to Connery, 7 Mar. 1889, Lbk. 28:542 [*TAED* LB028542]). Gutta percha knobs were added to the recorder and reproducer units, the better to move them into position, and jewel points (Edison specified sapphire) supplanted metal ones. The cutting-off knife (for paring the cylinder surface) was fixed in place, and the small chute for collecting wax shavings may have gone away (though it was the subject of a patent application at just this time [U.S. Pat. 414,759]). A key alteration was the addition of "an entirely new automatic adjustment screw" (according to printed instructions) to determine automatically the correct height setting of the recorder and reproducer devices. The operator still had to lock each device in place, with the option to change the suggested setting, though it was now "impossible to put undue pressure on the Spectacle when setting it, thus securing a perfectly uniform cut at all times." Even so, neither recording nor playing back was a simple operation. Illustrated instructions acquainted the user with no fewer than fifteen parts, several of which had to be carefully manipulated in sequence to obtain good results. And because it was a piece of precision machinery, the phonograph required lubrication at eleven marked points at daily or weekly intervals (North American Phonograph Co. instructions, all 1889, CR [*TAED* CA028A, CA028B, CA028C, CA028D]; cf. Doc. 3209 [headnote] and see also U.S. Pats. 406,572; 406,573; 406,574; 406,575; 426,527; and 430,277).



Printed illustration of the new spectacle. Adjustable nut 3 (at bottom) pivoted at 4 indicated the proper height. The locking mechanism (1, 2, 5) at left held the pressure foot at that height against the ruler on the phonograph proper. Note the handles, one each on the recorder and reproducer units.



Illustrated instructions for "Edison's Improved Phonograph," showing lubrication points. The accompanying text explained each step of readying the machine to record or play back sound.

4. Edison wrote to Gouraud the same day to confirm these instructions, which he also reiterated to Hammer in early April. He planned to ship two each of the spectacles, recorders, and reproducers to Gouraud in care of the Meudon Observatory on 6 April. TAE to Gouraud, 23 Mar. and 4 Apr. 1889; TAE to Hammer, 2 Apr. 1889; all Lbk. 28:766, 912–13 (*TAED* LB028766, LB028912, LB028913).

5. Hammer subsequently registered the cable address "Newark." Hammer to TAE, 6 Apr. 1889, DF (*TAED* D8946AAZ).

–3332–

Thomson-Houston Electric Co. License Memorandum[1]

[Boston?,][2] March 23, 1889.

MEMORANDA.

1. The Thomson-Houston Co. is doing a large isolated business. It should be remembered that the entire isolated business of the Sawyer-Man Electric Co.[3] prior to last August was done with the Thomson-Houston automatic dynamo,[4] and all the reputation acquired by the Sawyer-Man Co. was because of the excellence of that dynamo, to the use of which they were exclusively confined. In the change of relations which occurred at that time between the Sawyer-Man, Westinghouse and Thomson-Houston companies,[5] the Thomson-Houston Co. acquired the exclusive right to exploit its own apparatus, and since then the Sawyer-Man Co. has been deprived of the right to call upon our company for dynamos. The result is that we are now doing a large isolated business, and a much larger business than the Sawyer-Man Co. was doing last year at this time. In fact the prospect is that we shall take nearly all the isolated business heretofore done by the Sawyer-Man and Westinghouse companies. <This is a change from a fixed profit to an uncertain one [as?][a] Sawyer Man lost money> We can not understand where the other nine-tenths of the competition alluded to by Mr. Edison comes from,[6]—ours being referred to as one-tenth,—as outside of the United States[7] and Sawyer-Man Companies there has been very little competition with the Edison Co. in the isolated field. <The US Co did an almost exclusively Isolated biz— They lost over 1 million in Six years as Mr W did ½ [this?][a]> More than half the entire isolated business of the U.S. Co. has been done by their Gen. Agt. Warren,[8] of the Chicago office, who has just connected himself with our company. <acquisition of his services can hardly be available as a [~~future~~?][b] consideration [~~for~~?][b]> We regard the consideration with respect[c] to the isolated business of very great value to the Edison Co., and we are sure that upon full examination Mr. Edison can not fail to agree with us.

2. It is asked that we go entirely out of the lamp business. This is a proposition which we could not agree to, and which, under the circumstances of the case, would not be desirable for your company either.[9] It would not be well for our mutual interests

(a) Because we should in no way interfere with your business by continuing to make our present lamp, nor would we compete with you in any way, as we might directly do by claiming to manufacture your lamp.

(b) By having for our installations and for your installations lamps of somewhat different manufacture, especially as regards socket and base, it would be very difficult and even impracticable for the installation of either company to secure lamps manufactured by the other for use on its circuits. We should thus be permanently protected against a very considerable degree of annoying competition which might result from the procuring at second hand, by various customers, lamps made by the other party, because the difference in sockets, voltage, and general construction, would prevent their using the lamps in competition.

(c) By keeping our interests separate and maintaining our separate lamp factories a larger amount of business could be secured by both companies under friendly relations than could be secured by one company, and an arrangement could easily be made between our companies for a division of the profits from our lamp business[c] which would be satisfactory to both your company and ours. <The whole Lamp output can be done cheaper in one factory— I guarantee to furnish Lamps of any voltage or with any socket on 60 days notice= This paragraph shows their hand, and is only only useful for argument with persons who are unfamiliar with the biz>

Mr. Edison's allusion to the greater cheapness of your lamp may be true, but we would call your attention to the fact that we are making between two and three thousand lamps per day at the smallest possible expense, and while our lamps may cost us slightly more than yours,[10] they certainly are made with infinitely greater economy than are the Sawyer-Man Westinghouse lamps. They have a large and extravagant factory in New York, of which you are doubtless well aware, and a large one at Pittsburg;[11] in each which they are doing a comparatively small business, much less than we are doing, and in both of which they have a management the reverse of economical and efficient.

3. The three-wire license. Whether this patent can be sustained we do not desire to argue, as we are discussing the matter under consideration purely on a commercial and not on a patent basis. It will suffice to say that we believe that we have a defense, which will be produced at the proper time. <If patent no good—why do they desire a license—> We notice that Mr. Edison suggests that if we have a license under this system we would kill your isolated as well as central station business in every town the license extended to. We will agree not to use the 3-wire system for any isolated work, and we

will agree not to use it in any small town or central station work without dividing with your company the profits arising therefrom on a basis that will be entirely satisfactory to you. Today the business is being secured by bitter and expensive competition between the agents of our two companies, the results being the demoralization[c] of prices; all of which could be avoided by the proposed arrangement and the business secured at a profit between the two companies, giving to each more than either is getting under the present system. As evidence of this fact you need only to take the proposition lately submitted by your office in the town of Nyack, N.Y., where, after bitter competition between our two companies, the contract was awarded to your company at a price (taking into consideration the guarantees your agents have made) we believe to be far below cost. If you will take the report of any of your careful engineers this statement will be easily proven. Similar instances are constantly arising which could be entirely avoided by harmonious work. <All prices are too high— We make big money at present prices—>

4. We observe that Mr. Edison assumes that any contract on our part, binding our company to buy a stipulated amount of apparatus from the Edison Co. would be only a temporary arrangement. Any contract which we might make could be made for a sufficiently long term of years to be entirely satisfactory, with a guaranty that the annual profit should also be satisfactory.

<The[d] man has yet to be born that could draw a contract with the writer of this memorandum that could not be evaded—>

5. We note his remarks upon the success of the Thomson-Houston Co. in which he attributes our success to taking part pay in stocks and bonds, and evidently assumes that we figure our profit by taking these stocks and bonds at the par value or face value.[12] We observed that in the annual statement of the Edison Co. for 1887, we think it was, the amount of stocks and bonds held by that company was a little in excess of a million of dollars, and such stocks and bonds were taken at par, thus showing that the profits[c] of your company can hardly be said to be "unadorned." Our annual statement for the same year showed that we took our bonds at less than fifty cents on the dollar, every one being good, and that we took the stocks of our local companies held by us at less than thirty-three and one-third cents on the dollar. If Mr. Edison understood this he certainly would not have thought that we were "adorning"

our profits by an overestimate of the value of the securities which we held. Mr. Edison thinks that by pursuing our policy their company could have done a much larger business than it has. By referring to the annual statements above cited, it will be seen that the securities held by our company were inventoried at about one-fourth the amount at which the Edison Co. inventoried the local company securities held by it.

<~~I never assumed par value~~[e] I did not assume any particular value— If they did not take Bonds at par they took them at some other figure but whatever that was the lower value was bookeeping humbuggery ~~they~~ If they took them at 50 c they took twice as many of them so it comes to same thing I made no argument about the value of Edison securities we havent floated them we paid no money for them my argument still is sound The TH made their profits by reason of being able to finance the money that bought their machinery that this shifting of risks was done from the Corporation to the individual stockholders and the [~~final pro~~?][b] actual profit will depend on whether these individual stockholders ever get their money back in bonds They being on little two penny makeshift Cos all Liable to competition for instance Let the Edison Co go in 20 of the towns where they have stations always on a small scale & put in a large comprehensive station. Set the prices to the ruination point of the TH The E Co would earn money & the TH Bonds wouldnt be worth a copper notwithstanding the 20 000 worth of machinery with 40 000 bonds sold at 50>

<Your Co. is all bonded—ours is not>

6. We notice that Mr. Edison thinks that there is no concession in our agreement not to go into large cities with the three-wire system. Our success in many of the large cities, such as New Haven, Ct., Paterson, N.J., Cleveland, Oh., Columbus, O., and many other places, having now about one hundred 3-wire central stations, is perhaps an answer to this.

<These are not large Cities. The TH plant is on 1/10 scale even here as compared to gas—>

7. Mr. Edison argues with perhaps more or less justice that the direct system will earn dividends in small places where the lighting is chiefly confined to an area of one square mile, where by the use of the alternating system the companies would lose money. Inasmuch as we propose to make a satisfactory division with your company of profits arising from all three-wire central stations his argument should be

met by such proposition. <Why should we divide we can do it all—>

In[c] conclusion we would say that we do not wish to be understood as asking favors of the Edison Co.,—we are merely suggesting commercial relations which the writer feels well assured would result in mutual good. After ten years of bitter litigation and commercial competition it is our opinion that the business interests of both companies can be best subserved by some unison of business interests. <There has never been any competition They know not what real Brainy competition is These phrases are the usual stock phrases general used in Lieu of arguments or facts> We have in a previous letter[13] suggested a closer alliance than that embodied in the draught submitted to Mr. Edison, and we are quite convinced that in the way of enhanced prices and reduced business expenses, the stockholders of both companies would secure a greater return if some close business connection could be brought about; and that one could be arranged that would be satisfactory to yourself, to Mr. Edison and to your stockholders, we have no question. <How about making all Lamps in one factory one greatest reductions can be made right here> If Mr. Edison would make himself familiar with the very efficient legal corps controlled by our company and our associate companies, <no consideration. more Lawyers worse you are off> and with the fundamental nature of many of the patents controlled by the Thomson-Houston Co., by Mr. J. J. Wood,[14] and by the Schuyler,[15] Excelsior,[16] Fort Wayne "Jenney,"[17] and Van Depoele[18] Co's, the electricians of all of[f] these companies being very early in the field, we think he will conclude that a combination might be made which would be very strong and very effective. <all arc & what incandescent there are were minor devices made by men who came in biz several years after I had tied the biz up>

ADDENDUM[g]

[Orange, c. March 28, 1889][19]

1st= ~~They say that have recently a~~

This is a change from a fixed profit to an unknown one which I apprehend is not great as they talk of fierce Competition. The Sawyer Man Co made a very serious loss selling The TH Dynamo, & the break of relations resulting The[d] change of method of disposing of the Dynamo hasnt bettered the TH Exchequers. before the profit was fixed now the sales are made under competition in which the Saw Man lost money[h]

They [~~say~~?][b] put forward their acquisition of Mr Warren formerly of the US Co[20] as a consideration He[f] having done ½ of the whole US Co biz as The US Co did an almost exclusive Isolated business & lost in seven years upwards of 1,400 000. ~~Mr Warren may not be so valuable a person~~ This statement does not appear[d] to be of great argumentative value—[i]

¶ 2= See Lines 9 & 10 page 6.[21] Reduced Expenses is one of[j] the inducements[d] held out. one of the greatest reductions is making all Lamps in one factory Ditto similar Type Dynamos[k] ~~ditto similar type Dynamos~~[l] yet they refuse this and give as reasons a & b ¶ 2 Reasons that might pass with a board but which the writer if he understood his own business could not for a moment believe would blind [––][b] those familiar with it[m] They are absolutely silly & fallacious. Any[d] well equipped Lamp factory could on 60 days notice furnish Lamps of any Voltage & with any socket. in Connection with Lines[d] 9 & 10 see statement in Re Westinghous 2 Lamp factories. because of two factories I suppose the lamps cost Extra, where does[d] the value of this statement come[d] into this argument except on the wrong side[n]

¶ .3. If at the proper time they can produce Evidence to void our 3 wire patent why do they want a License. No secret thing can be used to void a patent, & if a public thing other[d] competitors can void it & yet The TH want a License. As[d] they say in ¶ 8 or last paragraph they have a very efficient corps of Lawyers Hence I infer[d] they must know the above facts &[o] ~~The above would imply that hence the untruthfulness of the statement otherwise they would want no License~~ If the above statement of capability of voiding[p] is true they would not want a license if untrue they would, as they ask for the License the statement is another very poor sample of argumentation

¶ .3. page 4 They speak of fierce competition Low prices and asume that if we make a coilition this will be stopped—This is a conceited assumption. The TH & Edison Co can no more control the price than the tides— The Co with the best record the best & ~~the~~ cheapest machinery will do the business patents or no patents[q] The fact of the matter is Mr Villard that all Electric Lighting machinery is entirely too high now These high prices hurt business With the Leaden Collar of the Edison E Light Co around me [It we?][a] have never been able to show what can be done. All these people are amateurs. The ground of cheapening has scarcely been scratched. They do the best they can with what they have but let us break the Leaden Collar and you will see [-][b] [~~so~~?][r] a[f] brainy a[f] competition ~~that inside of a year The TH will~~ that will show them what the real ~~article~~ competition[f] is—[22]

¶~~—4~~— The man has yet to be born who can draw a contract with the writer of the TH memo that cannot be evaded The business is too comprehensive The moment they want to stop payments they can do [-- ~~the~~][s] as the Bell Co did to evade their WU[23] contract drawn by several lawyers after three months work—

¶ 5— I did not assume any particular value for the Edison stocks =Whatever value they have ~~they were~~ The Co or stockholder paid no cash for them=

The statement that the TH took bonds at 50 cents & stock at 33⅓ on dollar is only a play on figures, Bookeeper humbuggery. & no statement at all no data nothing[t] ~~I took the total bonds bonds at 50 cents, putting in a station the actual CShop hard pan Cost of which is 50 000. bonding the same adding on enormous[l] profits & various other increments agency Expenses Commissions and Calling actual cost 150,000[d] Bonding the same for 120 000 125 000[f] & selling the bonds for 50. cents only on a dollar~~

What relation does the actual bottom cost of the station bear to the bonds & stock is the only determining factor for ascertaining whether the bonds are taken at 50 c or some other figures—

~~They say in L~~ Last 6 lines of ¶ 5= My[d] statement holds good had we done as TH does we would have made enormous profits. As the TH Sold their bonds & held their stock & ~~the~~ took ~~them~~ it[f] at 33⅓ Cents on dollar They should inventory them at about[f] 1⁄10th[d] as the Edison Co took [th~~em~~eir?][d] stock[l] at par ~~and in addition to being Stock taken at par~~ from Cos which have no water and what is of far more consequence no bonds This paragraph serves[d] to show the loose character of the arguements of the writer.

¶ .6. These are not large Cities. Their stations are two penny affairs overhead are makeshifts and are equivalent to about 1⁄10 of the gas supply one might as well bond that part of a Railroad which runs to gravel pits. They are not permanent & go when confidence & Investors go into real Electric Light[u]

¶ .7. Why should we divide. why hire the TH to do our own business.

page .6. Top paragraph These are the usual stock phrases. The reduced business expenses etc arguement is entirely nullified by ~~their not~~ the other ¶ of the memo—The statement that they ask no favors from the Edison Co might be met by the fact that having boldly appropriated & infringed every patent we use there is very little left to favor them with except our business which they are now after[v]

The way to reduce Expenses would be for the TH to Turn over their Incandescent business to us who know it & own it[w] & keep their Arc Light to themselves. [&?][a] work together. But they do not want this but keep Everything & purpose a[d] working arrangement which would give them everything & us a sum pacarious in reception & entirely inadequate to reimburse us for loss of biz prestige & other things

He[d] speaks of Costly Litigation.[d] They can easily reduce this expense by stopping infringing our patents. Last part of ¶ speaks of Efficient ~~L~~Corps Lawyers & control of inventions early in field— As none of these Cos went into the field until years after I proved the commercial Value of Incandescent system & then only to save themselves the character & value of these Early inventions can be realized [–][b]

finally on no solid business ground is there a shadow of reason or any justification for any coilition with The TH or any other Co The more I figure on the benefits of any coilition The more worried I become that you ~~will enter~~ may be induced to enter into one I have figured it out in every light over a period of years & the more I figures the more fatal it seems to the general Edison Co being the dominant Electrical Co in this Country not only in prestige but in profit If you ~~are afraid~~ fear[f] we cannot do the business as well as TH why go on with the scheeme— The ruinous competition may be correct in their point of view but I assure that prices are too high now. I sweep aside all consideration of competition and maintain that to do a great business in this Co prices must be got down 50 to 75 per cent ~~lower~~ lower than now. And[d] the moment the Leaden collar of the Light Co is removed It will be done and we make a great profit at prices that would soon show our competition what good Brainy aggressive competition means. But to do this the new Co must stand alone unencumbered by any alliances or Contracts The money we will have will be sufficient If you find[d] it difficult to raise any more If you make the Colition[d] my usefulness as an inventor is gone, my services wouldnt be worth a penny. I can only invent under powerful incentive, no competition means no invention Its the same with the men I have around me. Its not[d] money they want but a chance for their ambition to work

TD, NjWOE, Miller (*TAED* HM89AAG). [a]Illegible. [b]Canceled. [c]Repeated at bottom of one page and top of the next. [d]Obscured overwritten text. [e]Followed by "over" indicating page turn. [f]Interlined above. [g]Addendum is an ADf. [h]"before the profit…lost money" interlined below and followed by dividing mark. [i]Followed by dividing mark. [j]"one of" interlined above. [k]"Ditto similar Type Dynamos" interlined above. [l]"~~ditto same type Dynamos~~" interlined above. [m]"those familiar with it" interlined above. [n]"because of…wrong side" interlined below and followed by dividing mark. [o]"Hence…facts &" interlined above. [p]"of capability of voiding" interlined above. [q]"patents or no patents" interlined above. [r]Canceled and interlined above. [s]"[-- ~~the~~]" canceled and interlined above. [t]"& no statement…nothing" interlined above. [u]"They are not permanent…Electric Light" interlined below. [v]"from the Edison Co…now after" interlined below. [w]"who know it & own it" interlined above.

1. This document is the Thomson-Houston Electric Co.'s response to Henry Villard's license proposition and Edison's critique of it (Doc. 3327). Its author ("the writer") and intended recipient ("yourself") are not named but Villard acknowledged receiving a "memorandum of suggestions" dated 23 March from Charles Coffin, vice president and treasurer of Thomson-Houston, which he promised to discuss with Edison. Edison made extensive notes on the document which are transcribed as marginalia. He elaborated those remarks into an eleven-page handwritten draft response, attached here as an addendum. That response was then typed (under date of 1 April) and sent to Villard, who had the final paragraph re-typed and sent to Coffin on 3 April. In a covering letter, Villard told Coffin he had "at last received something from Mr. Edison in reply to your suggestions. It is not a scheme, but simply a re-negation of all the points you make." TAE memorandum, 1 Apr. 1889 (typed version), Miller *TAED* (HM89AAI); Villard to Coffin, 26 Mar. 1889 and 3 Apr. 1889 (enclosing excerpt of TAE memorandum), Letterbook 61:438 and 62:3–4, both Villard.

2. Though the Thomson-Houston Electric Co. was founded and had its manufacturing plant in Lynn, Mass., Villard addressed his correspondence with Charles Coffin to the company's Boston office at 620 Atlantic Ave. Carlson 1991a, 210–11; see, e.g., Villard to Coffin, 18 Feb. 1888, Letterbook 61:161, Villard.

3. The Sawyer-Man Electric Co. was formed in 1886 by the Consolidated Electric Co. and the Thomson-Houston Electric Co., which held most of the stock outright and also controlled the Consolidated Co. The Sawyer-Man firm owned the oft-contested patents of the late incandescent lighting pioneer William Sawyer and his business partner, Albon Man, which had already passed through several hands. Passer 1972 [1953], 144–45; Bright 1972 [1949], 83.

4. In 1879 and 1880, Elihu Thomson and Edwin Houston jointly invented both a dynamo with a distinctive spherical armature and an automatic regulator. When coupled with the regulator, their dynamo could quickly and sensitively adjust to maintain a constant current despite changing loads, and it became the backbone of the Thomson-Houston arc-light system. Carlson 1991a, 135–37; Thomson 1888, 11, 129, 236–44.

5. In 1887, the Thomson-Houston Electric Co. licensed from the Westinghouse Electric Co. a transformer patent for use in its own alternating current incandescent system; at the same time, Westinghouse agreed to sell arc-lighting equipment made by Thomson-Houston. As a corollary, Westinghouse sold its Pittsburgh incandescent lamp factory to the Consolidated Electric Co., then controlled by Thomson-Houston. These cooperative arrangements began to unravel in August 1888, when a legal defense of the transformer patent failed. Thomson-Houston broke off its license agreement and Westinghouse pulled out of the sales pact. Concurrently, the Thomson-Houston automatic regulator patent was upheld in court, strengthening the company's position. Before the end of the year, Thomson-Houston also sold the Consolidated Co. to Westinghouse, giving the latter control over a large portfolio of incandescent lighting patents, some of which it leased back to Thomson-Houston. Passer 1972 [1953], 54, 145–47; see also Bright 1972 [1949] (85) for a graphical representation of these shifting patent rights.

6. Cf. Doc. 3327 item 1.

7. The United States Electric Lighting Co. was formed in 1878 and competed in incandescent and arc lighting on the strength of patents taken out by Hiram Maxim and Edward Weston, respectively. Among its prominent arc installations (via a subsidiary firm) was the Brooklyn Bridge. Docs. 2455 nn. 5 and 8; Passer 1972 [1953], 147–48.

8. "Commodore" C. C. Warren (1835–1905), a coffee wholesaler on the Ohio shores of Lake Erie, had a strong personal interest in electricity, and he founded the Citizens Electric Co. in Toledo in 1880. Leaving the coffee trade two years later, he went to Chicago to manage the new western department of the United States Electric Lighting Co. After Westinghouse Electric acquired that company, Warren went to work for the Edison interests in 1889 as a district manager. He returned to Westinghouse after about a year and later started the Warren Electric Manufacturing Co. in Sandusky, Ohio. "Obituary," *Electrical Age* 34 (Apr. 1905): 313; "Warren Electric Manufacturing Company," *Western Electrician* 20 (10 Apr. 1897): 208–9; "The Electric Light," *Electrical World* 14 (30 June 1883): 410.

9. The Thomson-Houston Electric Co. did the majority of its business in arc lighting but continued to manufacture incandescent lamps under the Sawyer-Man patents by a limited arrangement with Westinghouse Electric. Bright 1972 [1949], 82–83.

10. Although the editors have not found lamp production costs at this time, costs of the Edison lamp had dropped from fifty cents apiece in 1884 to twenty-two cents just two years later. Hammond 1941, 43–44.

11. The New York factory was a new one. Westinghouse acquired a Connecticut arc-lamp company in November 1888 and moved its production to Pittsburgh, displacing at least some incandescent lamp manufacture from there. "Electrical News. The Westinghouse Electric Co. Buys the Waterhouse Arc Lamp," *Boston Daily Advertiser,* 14 Nov. 1888, 8; "Growth of the Westinghouse Electric Company," *Electric Power* 2 (Feb. 1890): 54.

12. Thomson-Houston's willingness to accept securities from local utilities has been singled out as a key to its success. Historian Bernard Carlson asserts that although the Edison companies took stock shares in

partial payment for equipment and patent licenses, Charles "Coffin was more conservative and accepted only utility bonds. That policy assured Thomson-Houston an immediate return on its investment in local central stations." Further, Coffin created investor pools to purchase the bonds from Thomson-Houston, thereby converting them into cash for working capital. Carlson 1991a, 214.

13. Not found.

14. James J. Wood (1856–1928), a pioneer of arc lighting, emigrated from Ireland as a boy and began a prolific inventive career in Brooklyn. There, in 1879, he designed a simple, efficient, and reliable arc-light dynamo, followed by a regulator and lamp. He entered into the arc business and famously lighted the new Statue of Liberty. He became connected at some point with the Thomson-Houston Electric Co. as a manufacturing supervisor in Brooklyn, and the firm purchased his arc light patents in late 1888. After a Thomson-Houston Electric Co. subsidiary, the Fort Wayne Electric Light Co., acquired rights to a different system, Wood relocated to Indiana in 1890 to oversee its development. Wood enjoyed great success in Indiana as an inventor and served for decades as a consulting engineering for General Electric. *DAB,* s.v. "Wood, James J."; "Noted Engineer, James Wood, Dies," *NYT,* 28 Apr. 1928, 17; Passer 1972 [1953], 52; Hammond 1941, 17–19, 72, 105, 163–64, 216–17.

15. The Schuyler Electric Co., a small arc-light firm based in Connecticut, was founded in 1881 or 1882. Having recently survived financial trouble, it was effectively acquired by Thomson-Houston for $200,000 in January 1889 as part of that company's strategy of buying up distressed rivals. Passer 1972 [1953], 52–56; Bright 1972 [1949], 88 n. 22; Carlson 1991a, 216.

16. The Excelsior Light Co. was a small New York firm based on the arc-light system of inventor William Hochhausen. Thomson-Houston acquired it about this time for $50,000. "The Electric Lighting System of the Excelsior Lighting Company," *Electrical World* 3 (5, 12, and 17 Jan. 1884): 1–3, 9–10, 17–19; Bright 1972 [1949], 83; Passer 1972 [1953], 53, 55.

17. The Jenney Electric Light Co. was formed in Fort Wayne, Ind., in 1881 to manufacture and install arc-lighting apparatus patented by James A. Jenney and Charles D. Jenney. It reportedly provided the equipment for the first nighttime baseball game in the United States, played at Fort Wayne in June 1883. In 1885, a disenchanted Charles Jenney launched the Jenney Electric Motor Co. in Indianapolis. "The Jenney Lighting Interests," *Electrical World* 5 (11 Apr. 1885): 142; "Obituary Notes," *Electrical World* 32 (31 Dec. 1898): 734; P. Morris 2006, 376; "Another Pioneer Passes Away," *Electrical World* 88 (14 Aug. 1926): 309.

18. The Van Depoele Electric Light Co. was incorporated in Chicago in 1881. Though the firm was intended to do arc-lighting work, its founder, Belgian native Charles J. Van Depoele, quickly turned his attention to electric traction. The company became a leader in that field but, lacking capital for further expansion, sold its assets to Thomson-Houston for $50,000 in March 1888. Passer 1972 [1953], 232–33.

19. The document prepared from Edison's draft (see note 1) was dated 1 April, but the editors conjecture that he likely was at work on it

several days before it was typed and sent to Henry Villard.

20. That is, the United States Electric Lighting Co.

21. Edison referred to text about "enhanced prices and reduced business expenses" nearly halfway through the final paragraph of the Thomson-Houston memorandum.

22. By the "leaden collar," Edison presumably referred to the patent licensing fees charged by the Edison Electric Light Co. to local utilities (cf. Carlson 1991a 280–81). Here and in Doc. 3327, Edison contrasts the limited financial rewards of licensing against the greater profits to be earned by manufacturing and selling machinery, whether for central stations or isolated plants.

23. The Western Union Telegraph Co., through its own lines and those of subsidiaries, dominated the domestic telegraph market in the United States. Western Union had entered the early telephone business but quickly sold out to the Bell interests in 1879.

–3333–

Draft Patent Application: Phonograph

[Orange,] Mch 24 1889

<833>[1]

The object of this invention is to produce ~~a~~ simple & effective recording and reproducing points for phonographs which while giving a true record & reproduction thereof will permit of being made cheaply and are of such a character as to be readily replaced by[a] inexpert persons ~~with~~ another object is the production of a record of such a character that ~~there will be no side walls to the record and the~~ the reproducing point will follow such record truely notwithstanding want of acurate workmanship in the phonograph or imperfections of the Record[a] cylinder

The invention consists 1st in causing the sound waves to be recorded in circular indentations[2] 2nd The reproducing point made circular as a ball. 3rd A circular Recording point for recording the circular waves. 4th Both points Removably connected. 5 The holder for same— 6th The weight fig. 4. lever, slot, Limiting stop m & Receiver generally[3]

Fig 1

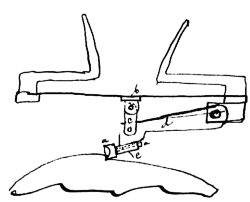


Fig 1 is Recorder to the usual lever I secure a holder for the record point a—This is a tube soldered to the lever The Record tool a slides into the tube & is secured by a cement preferably melted shellac. The tool is round and has a shank which slides into the tube this insures its ~~al~~being always put in to the same position. The recording end of a being perfectly cylindrical on the outside is Cupped[4] so as to give an exceedingly Keen Circular Cutting Edge all around with a phonograph having 100 threads to the inch the diameter of the Cutting Edge which I prefer is 40 thousands of an inch hence if one portion of the diameter gets dull the shellac may be softened by heat and a new[a] part of the periphery used & this may be done several times before the point is required to be removed as useless until reground hence the records will unlike previous phonographs be recorded circularly as in fig. ~~4 &~~ 8 ~~the~~ [-][b] fig 5 shews Reproducing ball point also fig. 7. The diameter of the ball is 35 thousands of an inch. The advantage of the Circular record is that it permits the use of the ball reproducer & this even when the lever carrying it is out of line relative to the record keeps in the record in such a manner as to reproduce perfectly

Of course the two points might be semicircular[a] or slightly oval without departing from the spirit of the invention—

fig 2

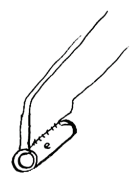


fig 3

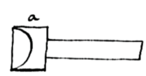


fig 4

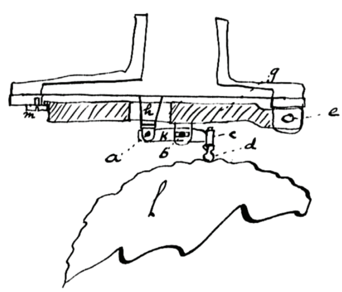


fig 5

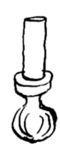


fig 6

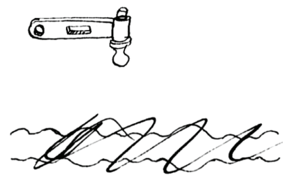


fig 7

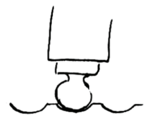


fig 8

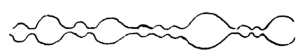
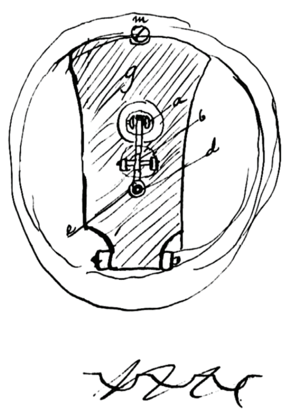
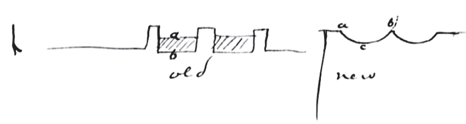


fig 9



Seeley— notice the Receiver is on same line as those patented lately but this is final form the weight being on point make claims in view of last patent taken out.[5]

Claim Broadly the circular record (you will notice that the whole of the material[a] cut forms a wave[6]



wave is from a to b old way & abc new way this gives no side walls to cut & for the reproducer[a] point to scratch against. The new way gives a greater surface for wear— The ball is always paralell to record while old way if point is not paralell don't reproduce exactly & wears out record

Get claim on Circular or semicircular Recorder—removably connected Turnable to be used several times etc.

Want this patent well drawn up with extra good claims as it is what makes the phono a silk finish to the sounds

TAE

ADfS, NjWOE, PS (*TAED* PT032ABU1). Document multiply dated; all but last drawing made on separate sheet (miscellaneous incomplete sketches not reproduced). [a]Obscured overwritten text. [b]Canceled.

1. This is the case number assigned to the patent application created from Edison's draft. Edison signed the completed application on 8 April. It was filed two days later and issued in June 1890 with thirty-two claims and eight figures, most of them closely related to Edison's sketches. The notable exception is Edison's last sketch, which had no analog in the final patent. U.S. Pat. 430,278.

2. The issued patent clarified the notion of a "circular" indentation, wave, or record as the profile of "a rounded groove…with curved sides sloping to the center." The idea is illustrated in Edison's final sketch, which was not used in the final specification. U.S. Pat. 430,278.

3. In the introductory paragraph of the final patent, Edison provided three rationales for these refinements: "to materially improve the character of the sounds produced by the instrument…; secondly, to make the instrument of a less delicate character and more readily manipulated and adjusted by inexperienced persons, and, thirdly, to enable the recording-point to be used for a longer period of time without having to be sharpened or reground or replaced by another." U.S. Pat. 430,278.

4. That is, concave.

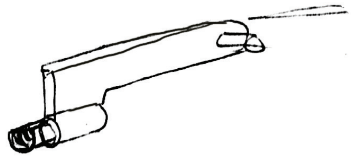
5. Edison had in mind his U.S. Patent 397,280, issued on 5 February 1889 (a reference to which was incorporated into the final specification) for a recorder and reproducer adapted to irregularities in the surface of the recording cylinder. The weight in question was simply the pivoted arm linking the reproducing point to the diaphragm (see fig. 1); it was designed to act as "a retarding device…since it does not move under the quick vibrations communicated to the reproducing-point by the sound-record, but under slow movements due to irregularities or inaccuracies of the surface of the phonogram. U.S. Pat. 430,278.

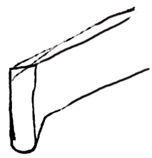
6. Figure labels are (left) "a," "b," and "old"; (right) "a," "c," "b," and "new."

[Orange,] Mch 24 1889[a]

Draft Caveat: Phonograph and Electric Lighting

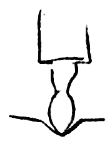
Caveat Phono & EL[1]

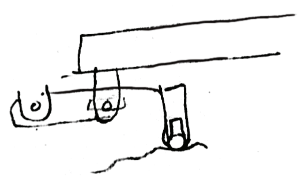




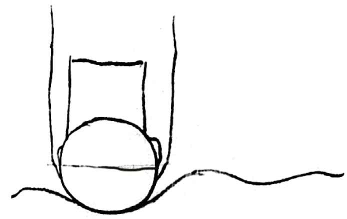
glass saphire etc

oval

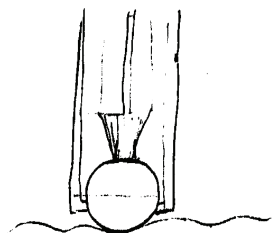


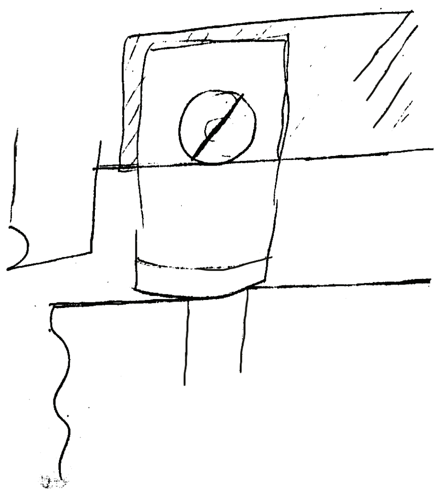


rolls—



Rolling ball Recvr





filiments for carbonization[b] squirted through a die like Macaroni can be made very perfect with proper material.[2] I employ pitchy asphaltic or Bituminous materials Either natural or produced artificially as in the decomposition of Organic Carbonaceous materials or salts or Compounds by chemicals or heat to produce tary substances The Various Asphaltic like materials if containing too much volitile matter ~~as H~~ Such as sulpheretted or Hydrocarbons containing a relative large quantity of Hydrogen should be heated for several hours in a sand bath to drive off as far as practicable the volitile constituents—and reduce the mixture to ~~Hydro~~ Carbon Compounds with Hydrogen sulphur or Oxygen to the minimum quantity of Hydrogen [-- ---][c] It being is nearly every case the Hydrogen combined with the Carbon that causes the Compound to fuse Easily. After thus diminishing the Carbon Compounds rich in Hydrogen there will remain an asphaltic like residue rich in Carbon & relative lean in Hydrogen— These residues are known to chemists & in commerce as pitch ~~Bitum~~ The pitches produced naturally as known as Asphalts, Bitumens etc These bodies can be squirted hot into filiments for Carbonization but cannot be carbonzed directly owing to their fusibility— To render them infusible while in the act of Carbonization it is essential to still further dehydrogenize ie[d] take out some of their combined Hydrogen to that point that the resultant is still a compound of Hydrogen or Oxygen with Carbon & Capable of being disolved by some solvent ~~but still not~~ when sufficient Hydrogen has been removed The final atoms are driven out of the Compound by heat leaving the filiment pure ~~charcoal~~ Carbon without being distorted or swelled. If the Hydrogen has not been sufficiently removed the material of the filiment [---][c] will semi fuse & the gas due to decomposition will act while escaping to puff the plastic portion & thus distort & ruin the filiment.

After the filiment has been formed from plastic Bitumens there are acted up by chemical reagents which primarily tend to displace some of the[e] Hydrogen from its combination with the Carbon. Some[a] of the reagents not only displace Hydrogen but enter into combination by a method Known to chemists as substitution, others remove no Hydrogen directly but penetrate the mass of the filiment & become active only during Carbonization of the filiment to displace the Hydrogen

If the filiments are placed in Kerosene oil containing say 1/20 part of chloride of Sulphur. The chlorine of the Compound will eliminate Hydrogen from the ~~C~~Bitumen, probably some of the sulphur may enter into Combination or remain mechanically in the pores—the latter may be removed by weak nitric acid ~~after being thus acted on~~ The filiments may then be Carbonized without distortion ~~about~~ they should remain in the Kerosene bath 200 hours and in the nitric acid bath 5 pct nitric 95 water for 24 hours then in water for 36 hours other Reagents can be used Nitric acid 5 percent 95 water gradually increasing the strength of the acid every day for 10 days until 75 percent acid is the final result. Pentachloride of Antimony disolved in Chloride Ethyl acts similarly to Chloride of sulphur but in this case ~~Oxy~~chloride of Antimony is deposited within the pores & must be removed by Hydrochloric acid—

Chloride of Bromine
" Iodine
Pentachloride Molybdeum—

~~Chlorine~~ & other carriers of Chlorine or Bromine when diluted by use of proper solvents act to displace Hydrogen Sulphur also act to displace Hydrogen in the act of Carbonization the heat causes the sulphur to abstract Hydrogen

Hydrogen may be displaced from the Combination with Carbon by the use of Oxidizing agents like nitric acid as before discribed, Iodic acid but in selecting the Oxidizing agent care should be taken that it will not oxidize the Carbon itself as for instance with Hydrochlorous acid ~~Aqua Regia~~ As nearly all [~~Ash~~?][c] natural Bitumens Contain ash it is best to purify the pitchy substance by disolving all that can be disolved by Chloroform as this solvent is the best solvent for ~~Hy~~ the ~~most highly~~ compounds richest in Carbon by thinning the solution in filtering most of the ash is caught by the filter paper. The solvent is then Evaporated off or better distilled off leaving it of the same consistency as before & then in Sand bath bringing it to the right constancy for the squirting press.

~~In addit~~ Another process is to act on the Bitumens by nitric acid or other oxidizing agent[f] until enough Hydrogen has been removed to render them infusible then disolving the Compounds in a proper solvent filtering to remove ash & Evaporate Solvent down to a point where[a] the residue is ready for squirting the filiments will [------ ~~dry wh~~?][c] dry hard & may be bent to shape of a loop etc while warm Especially just after they come from the press & carbonized without distortion. ~~S~~Ordinary Asphalt such as Syrian[a] or[g] Cubian is easily dehydrogenized & rendered infusible by nitric acid The powder after washing & drying is soluable in chloroform especially if a little methylic alcohol is added— to render the drying of the filiment slower & thus tend to prevent Cracking 15 or 25 per cent of Chloral Hydrate may be added to the powder which is soluable both in Methyl Alcohol or Chloroform—

~~All the~~ The exact nature of the reactions taking place on these Bitumens which ~~are on the~~ [------ ----][c] produce compounds[h] approach So closely to charcoal that they can only be distinguished from it by their capability of being either disolved or softened by Some Solvent or combination of solvents

[~~ca~~----][c] is not known by chemists, very little investigation has taken place & these are disjointed & contradictory, hence no acurate statement is possible & all that I can do is to point out generally— Neither is it possible to give exact quantities or times or temperatures, as all Bituminous residues are of very complex nature, most amorphous, change with every change of temperature or conditions under which they are produced ~~The general statement~~ But all can be resolved by heat into compounds [~~& onl~~?][c] Richer & Richer in carbon until a point is reached where the heat must be discontinued ~~f~~ to prevent final decomposition or carbonization, and that they are thus plastic & may be squirted into filiments and that by chemical agency which serves to remove Hydrogen be made infusible while being Carbonized[a] & that the final Hydrogen or other atom of matter combined with the Carbon ~~which~~ [----][c] is final driven of & the filiment is charcoal and that instead of acting on the squirted filiment after formation This action may take place previous to squirting but ~~it~~ [---][c] the filiments may still be squirted as the resultant Compounds [----][c] of the action of say Nitric acid on all the residues after driving of the most volitile constituents is the production of a compound infusible but soluable in Chloroform or mixtures of Chloroform with acid, Ethers, Methyl alcohol, Hot Aniline, Nitro Benzole, Chloral Hydrate Napthaline, Anthracene

~~Aspha~~ Bituminous bodies can be artificially formed from pure volitile[g] organic materials free from ash by passing the same through Red hot tubes & condensing the residue & evaporating to a pitch[a] which is solid like Asphalt when cold for instance Benzole gives what is known as Bitumene[3] The residues due to the distillation of nearly every organic substance not heated beyond Carbonization gives the Bituminous residue All the Carbons filiments produced by this process change their resistance while giving light ~~and~~ and although not so serious as to render the lamps unavailable for giving light commercially as against bamboo filiments it is a quality inherent in all Carbon filiments & while up to the present time no attempt has been successful to [-------][c] prevent[g] this change of resistance after long burning I believe I can accomplish the result by this process owing to its capability of ~~ma~~ being made in many ways & different conditions not possible with filiments from cellulose now generally used. ~~The Value of~~ filiments which change in resistance very little would be of high commercial value—

TAE

ADf, NjWOE, Lab., N-88-03-15.2 (*TAED* NA023119). Document multiply dated; miscellaneous calculations and sketches not reproduced. [a]Obscured overwritten text. [b]"for carbonization" interlined above. [c]Canceled. [d]Circled. [e]"some of the" interlined above. [f]"or other oxidizing agent" interlined above. [g]Interlined above. [h]"produce compounds" interlined above.

1. Edison drafted bits and pieces of a caveat covering the phonograph and artificial lamp filaments in mid-March and also began what seems to be an undated patent application about filaments (N-88-03-15.2:87, 89, 93, 91, 188; all Lab. [*TAED* NA023087, NA023089, NA023093, NA023091,NA023188]). From among those documents, the editors have selected this draft caveat on the strength of its coherence and breadth. Near the end of the month, Edison appears to have tried fusing some of the lighting-related ideas into a draft caveat with several unnumbered claims (N-88-03-15.2:207, Lab. [*TAED* NA023207]); see also Doc. 3349.

2. In what he appears to have begun as a draft caveat in late March (p. 221; see note 1), Edison stated that "Hollow filiments may be squirted in the same manner as lead pipe & hollow Maccaroni— The advantage of hollow filiments are great with Large Candle power Lamps as it gives a more even Carbonization throughout the mass." He had considered extruding phonograph cylinders by such a process—using similar materials—in 1887 (see Doc. 3101).

3. The Watts chemical dictionary defined bitumene as "the least volatile of the hydrocarbons obtained by passing benzene vapour through a porcelain tube heated to bright redness. On distilling the liquid portion of the product the bitumene remains in the retort, even at a red heat, as a blackish liquid, which solidifies on cooling." Watts 1872–75, s.v. "bitumene."

–3335–

To William Wiley

[Orange,] March 25/89

My dear Sir:

I have received from Mr Dredge samples of the first run which he has made with the Ore Milling Machine erected in London, and the results obtained are very poor.

I am aware that he has an excellent Engineer in charge of the plant, but it is quite impossible for any man who has not been specially trained to take hold of the Ore Milling process and operate it successfully.[1]

There are a great many details requiring attention—such as[a] the relation between the magnet and hopper, strength of current &c &c, all of which vary with different ores—and these demand the presence of a person thoroughly familiar with all the results and proofs of my own work. Any other man, no matter what may be his qualifications as an Engineer, is simply working in the dark and encountering all the obstacles which I was obliged to overcome during the Early stages of my Experiments.[2]

It is quite impracticable for me to send another man to England at this time. I have sent an Ore Milling installation to Paris, in competent hands,[a] which will answer every purpose I now have in view, and I have for these reasons written Mr Dredge asking him to take down the Machinery[3] in the yard of Messrs Vautin and Newbury[4] and box the parts of the apparatus belonging to me.

I regret that circumstances have obliged me to abandon the arrangement I originally intended carrying out.

Thanking you for the interest you have displayed in this matter I am Yours very truly

Thomas A Edison

LS (letterpress copy), NjWOE, Lbk. 28:810 (*TAED* LB028810). Written by Alfred Tate. [a]Repeated at bottom of one page and top of the next.

1. After the abortive effort to exhibit the ore separator at the Crystal Palace (see Doc. 3284), Osgood Wiley had the machine transferred to the Newbery-Vautin company in London (see below), where it was in operable condition by the second week of March. Who had charge of it by that time is unclear, because Edison recalled Wiley in mid-February. Wiley had been accused of public drunkenness (which he strenuously denied), overdrawn his salary, and attempted an unauthorized monetary draft against Edison. Edison didn't credit the report of drunkenness but came to believe, as he told Gouraud, that Wiley had "simply run wild in London, and used his connection with myself for the purpose of raising all the money he could obtain from my friends." James Dredge to TAE, 12 Mar. 1889; William Wiley to Alfred Tate, 21 Dec. 1888; O. Wiley to TAE (with TAE marginalia), 30 Dec. 1888 and 2 Jan. 1889; all DF [*TAED* D8952ABE, D8845AHI, D8845AHL, D8952AAB); Tate to O. Wiley, 29 Jan. 1889; TAE to O. Wiley, 16 Feb. 1889; TAE to Gouraud, 20 Feb. 1889; Lbk. 27:965; 28:245A, 293 (*TAED* LB027965, LB028245A, LB028293).

2. Edison made similar points in a letter to James Dredge the same day, emphasizing that his ore separator equipment required an experienced operator. TAE to Dredge, 25 Mar. 1889, Lbk. 28:814 (*TAED* LB028814).

3. Although Samuel Insull suggested sending the ore-milling machinery to Paris, Edison chose instead to ship a one-third scale plant from New York for the Exposition and asked Dredge on 22 March to disassemble and crate the London machine. Dredge replied that he had already arranged to demonstrate it to mine operators from Norway and Sweden, to which Edison agreed. William Hammer to Edison Machine Works, 31 Dec. 1888, Letterbook, p. 26, WJH (*TAED* X098C004); TAE to Dredge, 22 Mar. and 26 Apr. 1889, Lbk. 28762, 29:243 (*TAED* LB028762, LB029243); Dredge to TAE, 2 Apr. 1889, DF (*TAED* D8952ABK).

4. The Newbery-Vautin Gold Extraction Co., a gold and silver refining company, was located at 14 Old Broad St. in London. *Electrical Trades' Directory* 1889, 171.

–3336–

To John Pender

[Orange,] March 26, 1889

Dear Sir John:—[1]

I send you, under separate cover, a few of the plans of our new Philadelphia Central Station.[2] I am absolutely assured this is the proper way a station should be erected wherever underground conductors can be employed. I know that at present in England you have not the necessary parliamentary powers,[3] but as soon as you have them I shall be pleased to do anything in my power to assist you to make electric lighting the same success in England as in this country, and would have one of my engineers lay out the underground cable system for one of your stations.[4] As an underground station is going to be a permanent investment, put in plenty of copper, and no matter what the cost of the conductors is as long as they will pay 15% on the outlay, you may be certain it will pay. Yours very truly,

Thos A. Edison

TLS (letterpress copy), NjWOE, Lbk. 28:821 (*TAED* LB028821).

1. Sir John Pender (1815–1896) was a wealthy textile merchant who in 1864 founded the Telegraph Construction and Maintenance Co., which manufactured and laid most of the world's undersea cables, and he was deeply involved in other submarine cable enterprises. He also served in Parliament, most recently in 1885, and was knighted in 1888. Pender's indirect investment in Edison's automatic telegraph system was the subject of some dispute in the 1870s. *DNB (Supp.),* s.v. "Pender, Sir John"; see Docs. 381 n. 4, 1859, and 1935.

Pender was in addition the founding chairman of the Metropolitan Electric Supply Co., which had recently acquired a small plant on Rathbone Place in central London to distribute alternating current through overhead lines at 2,000 volts. It was planning an AC station on Sardinia St. and was seeking the rights to electrify large swaths of the City of London with a combination of alternating and direct currents. Parsons 1940, 74–75; Hinton of Bankside 1979, 24–25; "Metropolitan Electric Supply Company," *Teleg. J. and Elec. Rev.* (30 Nov. 1888): 608; "Electric Lighting in London," *St. James Gazette (London),* 4 Apr. 1889, 5; "Electric Lighting in London," *Times* (London), 8 Apr. 1889, 6; Foote 1889, 73–74.

2. The editors have not found the drawings, but Alfred Tate responded on this day to a 9 March letter from a Metropolitan Co. director (not found), advising that Edison had just received a full set of plans (about 300 drawings) for the Philadelphia station. "I have to-

day written to Sir John Pender the letter that you desired sent him," Tate continued, "and have to-day sent him blue prints of 20 tracings, and whenever it is necessary for you to have a further supply of these, we will obtain them for you." Tate to John Verity, 26 Mar. 1889, Lbk. 28:820 (*TAED* LB028820).

3. Edison presumably referred to the considerable powers delegated to local authorities by the Electric Lighting Act of 1882 to decide where—and by whom—conductors could be laid beneath public streets. An amended law passed in 1888 left those powers largely intact. Hughes 1983, 230, 238–39; Hannah 1979, 7–8.

4. John Verity was a director of the Metropolitan Co. and considered to be "an Edison man," so when the company recently contracted for AC equipment from Westinghouse he took pains to explain the circumstances:

> Conditions in London are very different to what they are in the States. It is absolutely impossible at the present time to run underground cables, although we hope to do so shortly. If we want to do Electric Lighting now, it must be done with aerial wires, these even, being only permitted on suffrance.… Therefore if any Electric Lighting from a centre is to be done in London immediately, the high tension system must be employed.…
>
> With regard to yourself you have a staunch adherent in our Chairman Sir John Pender K.C.M.G. who constantly mentions your name, and who also remembers Mr. Johnson very well. Doctor Hopkinson again who is our leading Consulting Electrician, is an advocate of the three wire system. [Verity to TAE, 3 Jan. 1889, DF (*TAED* D8942AAA)]

–3337–

From Harold Brown

[New York,] MARCH 27, 1889.[1a]

My Dear Mr. Edison:

The New York State authorities have authorized me to purchase for them alternating current dynamos made for electric lighting on the "converter" system for the electrical execution plants.[2] To get these it will be necessary to purchase at least one full complement of converters and lamps, the other dynamos to be extras. This will require an investment of $7,000 to $8,000, *until the first execution proves that the plant is suitable for the purpose.* I will then have to take my chances of selling the converters and lamps, as, of course, the State will pay for dynamos only. *The Thomson-Houston Company has authorized me to take up Westinghouse's advertised claims that fifty per cent.* more light for a given expenditure of power (fuel) can be obtained from W. alternating current apparatus and lamps than from any direct current system. I am to challenge him to send a 650-light plant to the electrical testing bureau at Johns Hopkins University,[3] to be matched against the T.-H. direct-current plant for a three months' test, the reports to be published, and the loser to buy the other's apparatus at list to present to the university.[4] Of course, Westinghouse will not dare accept, so I wish to have one of the plants bought for the State used for the purpose of a public efficiency test. *I am willing to undertake that both of these projects shall be carried through if $5,000 is made available to me for use, and it will be done apparently by the T.-H. Company. In view of the approaching consolidation, the people at* 16 *Broad street*[5] *do not feel like undertaking this matter unless you approve of it. Do you not think it is worth doing,* as it will enable me, through the Board of Health, to shut off the overhead alternating current circuits in the State, and will, by showing the lack of efficiency of the Westinghouse apparatus, *head off investors, and prick the bubble,* thus helping all legitimate electrical enterprises? A word from you will carry it through, and without it the chance will be lost. Is it not worth while for you to say the word? Sincerely yours,

Harold P. Brown

PL, *New York Sun,* 25 Aug. 1889, 6; photocopy in DF (*TAED* D8933AAN4). Date not that of publication.

1. This letter was among forty-seven pieces or excerpts of correspondence to, from, or about Harold Brown and his connections with various electrical firms that the *New York Sun* published in August 1889 under the headline "For Shame, Brown!" Contrasting them with Brown's posture as a disinterested expert in New York State's adoption of electrocution for capital punishment, the *Sun* editorialized that his actual motive

> has been a desire to throw odium upon the alternating current system of electricity, and this, naturally, to the commercial injury of the companies using the alternating current, and to the commercial benefit of the companies not using it; that so far from being an "independent investigator," Brown has maintained the most intimate and pecuniarily profitable relations with the electric lighting companies not using the alternating current; that Brown actually asked Thomas A. Edison…for $5,000 in cash for his (Brown's) services as a foe of the Westinghouse Company (alternating current)…. ["For Shame, Brown!," *New York Sun,* 25 Aug. 1889, 6; cf. Essig 2003, 192]

2. On the recommendation of the state Commission to Investigate and Report the Most Humane and Practical Method of Carrying into Effect the Sentence of Death in Capital Cases, the New York legislature passed a bill in April 1888 to substitute electrocution for hanging. Governor David Hill signed it on 4 June, and the law went into effect on the first day of 1889. Austin Lathrop, the superintendent of state

prisons, awarded a contract to Brown to purchase three alternating-current dynamos. The Westinghouse Electric Co. refused to sell its dynamos for this purpose, but through the intercession of the Thomson-Houston Electric Co., Brown managed to acquire three Westinghouse machines that he sold to the state. They were ultimately installed at Auburn, Clinton, and Sing Sing state prisons. One of the dynamos slated for the prisons was purchased under an arrangement with the Thomson-Houston Co. from the Oneonta Electric Light and Power Co. and was first sent to Johns Hopkins along with converters and lamps for the efficiency tests. "Electricity for Murderers," *Philadelphia Inquirer,* 18 Apr. 1888, 4; *General Statutes,* 162–63; "Surer than the Rope," *NYT,* 6 Dec. 1888, 5; "Electrical Executions," *NYT,* 8 May 1889, 4; "Tests Made at Sing Sing," *NYT,* 29 Dec. 1889, 12; "For Shame Brown!" *New York Sun,* 25 Aug. 1889, 6; see also Carlson 1991a (261) about an internal conflict at Thomson-Houston over this arrangement.

3. Henry Rowland and a former student, Louis Duncan, inaugurated the Electrical Testing Bureau at the Johns Hopkins University in the fall of 1888. Conceived as a standardizing institute, the bureau was charged more broadly with "carrying on tests of all kinds of electrical apparatus." Given the reputations of Rowland, Duncan, and the university, the *Electrical World* declared that "a report from Johns Hopkins will always be accepted as final." Rosenberg 1990, chap. 5, pp. 27–28; S. Morris 2013, 184; "Miscellaneous Notes," *Electrical World* 12 (20 Oct. 1888): 218; "The Electrical Testing Bureau of the Johns Hopkins University," *Electrical Review* 13 (5 Jan. 1889): 9.

4. Brown had made a different but related public challenge to Westinghouse in December (see Doc. 3292 n. 3). He formally issued his new invitation in a 4 April letter to Westinghouse, a copy of which he later sent to Edison and eventually made public. Brown stated that he wished to test the validity of the Westinghouse company's advertised claim that its AC system would provide "50 per cent. more light from a given expenditure of power (fuel)…than can be obtained by any continuous ('direct') current system." The Westinghouse Electric Co. had run ads throughout the late winter and early spring with this guarantee but explicitly stated that the energy savings was "By reason of an improvement in the manufacture of Lamps," making no attribution to the efficiency of its dynamos. Brown received no reply to his challenge but later pointed out in print that the Westinghouse firm withdrew its advertisement (Brown to Westinghouse, 4 Apr. 1889; Brown to TAE, n.d. [May 1889?], DF [*TAED* D8933ABA, D8933AAZ]; Westinghouse Electric Co. advertisement, *Railway World* 15 [30 Mar. 1889]: 303; Brown and Mitchell 1889, 24–25). Brown, apparently with the help of Edison and the Edison Electric Light Co., then arranged for the tests to take place without Westinghouse's participation. He also hoped the tests would confirm his theory that "there was a 'condenser action' between the conductors of an alternating current system and the moisture or conductive covering on the outside of the insulation" that could lead to a steady current leakage or a dramatic flashover. He said that Louis Duncan, while at first doubtful, "has come around to my position and the two deaths recorded in the inclosed clippings are frightful verifications of my theory." Brown's theory was consistent with Edison's suspicions about the condenser-like character of AC

transformers, and Edison, in directing Arthur Kennelly to reply, pointed out that "I always believed in large static charge loss in alternating as well as disturbance of pressure." In his own letter to Brown, Kennelly advised that potential charge loss might be determined "by measuring the current actually sustained between the insulated lead sheathing of a wire and ground, or at terminal of the machine. Whatever current is so supplied would of course be waste" (Brown to TAE, 13 May, 1889, DF [*TAED* D8933ABC]; see Docs. 3005 and 3008; Kennelly to Brown, 16 May 1889, Kennelly Letterbook LM-1:405, WOL [*TAED* LM111405]). Kennelly had the results of the Johns Hopkins tests by February 1890 and described them in separate letters to Brown and Edison. He noted that the Westinghouse 750-light plant lost 43.2 percent of electrical energy in its ten best hours of operation and 57.6 percent over twenty-four hours, whereas two no. 10 Edison dynamos lost 25.75 percent in their ten best hours and 35 percent over twenty-four hours. Kennelly considered the results "so overwhelmingly in the Edison favor" that the Edison Electric Light Co. should publish them on its own as "a much more powerful weapon in the hands of the Edison Co. than in Brown's," whose reputation had by then been damaged by the exposé in the *Sun*. Edison directed Alfred Tate to send the results to H. Ward Leonard, general manager of the United Edison Manufacturing Co., presumably for marketing purposes (Kennelly to Brown, 15 Feb. 1890, Kennelly Letterbook LM-2:245, WOL [*TAED* LM112245]; Kennelly to TAE [with TAE marginalia], 15 Feb. 1890; Leonard to Tate, 10 Mar. 1890, both DF [*TAED* D9064AAF, D9038AAD]; Tate to TAE, 3 Mar. 1890, Lbk. 38:106 [*TAED* LB038106]).

5. That is, the headquarters of the Edison Electric Light Co. at 16–18 Broad St., New York.

–3338–

From the New York World

New York, March 30/89

Dear Sir—

We are greatly bothered by letters and people, concerning the bright star to be seen every evening in the Western heavens. The belief has become universal that the star is an electric light designed by you and sent up every evening attached to a balloon.[1]

Will you kindly send by[a] mail [---][b] a letter on this subject, (not necessarily for publication), that we can show to the many who insist that the star is an invention of yours.[2] Very Respectfully

F. W. Shipman[3] for City Editor[4]

ALS, NjWOE, DF (*TAED* D8907AAX). Letterhead of *New York World* editorial rooms. [a]Interlined above. [b]Canceled.

1. The myth of the so-called "Edison star" had a long and tenacious life. The first known report of such a phenomenon seems to have ap-

peared in early 1886 when, according to the *New Brunswick (N.J.) Daily Times* of 19 January (p. 3),

> The brightness of the evening star during the past two weeks has been noticed and remarked by many, and one of our well-known citizens is laboring under the impression that it is an Edison incandescent light of great power suspended from a balloon somewhere in the vicinity of Philadelphia, as, according to his theory, Mr. Edison is probably making some experiments in this manner. Quite some merriment has been caused at the gentleman's expense, and we trust that he has discovered his mistake ere this.

Most explanations of the myth's origin connect it to Edison's exhibitions of electric lamps at Menlo Park (see, for example, F. Jones 1908, 123–24; "Notes and Queries," *Sci. Am.* 123 [6 Nov. 1920]: 486), but sightings of the "star" outlived Edison's work on electric lighting. The entry for "Edison Star Sightings" in Evans and Bartholomew 2009 (pp. 144–45) describes a "flurry of sightings" in 1897 attributed to a bright electric light on a balloon sent up by Edison. The same source attributes the initial rumors to balloons used in Edison's experiments with wireless telegraphy, which took place in 1885.

Denials and explanations failed to extinguish the myth. When Edison received letters on the subject, he denied responsibility and ascribed the light to the planet Venus (Edison, T. A.—Unsolicited Correspondence—Edison Star, DF [(*TAED* D8727, D8926]). The writer Frank Parker Stockbridge recalled in 1912 that when he worked as an editor for a New York newspaper (perhaps in the 1890s) he "could rely on getting an average of two letters a month from people who still believed in the Edison star myth" (Stockbridge 1912 [pp. 107–8)]). Edison continued to receive letters about it and most years of the Edison General File (NjWOE) in the 1920s contain a folder with inquiries about the star. In 1927, the International Feature Service serialized in American newspapers a history of the legend by astronomer and popular science writer Garrett Serviss, who attributed periodic reports of the Edison star to the appearance of Venus in the evening sky. Serviss noted that "during the last forty years there has not been, I believe, a single instance of the reappearance of the beautiful planet without a recrudescence of this modern myth, or without the sending of letters" (Serviss 1927). Not long after Edison's death, the citizens of Fort Myers, Fla., where Edison had his winter home, proposed that Venus be renamed the Edison star ("Edison Star," *Fort Myers News Press,* 7 Mar. 1932, 4; "Would Rename Venus," *Cincinnati Enquirer,* 25 Dec. 1933, 6). The myth survived even Edison's death (see, for example, "Mystery Light is Believed to be 'Edison Star' in Sky," *Fort Myers News Press,* 4 Feb. 1932, 1; "Edison Star," *Philadelphia Inquirer,* 7 Oct. 1938, 12; "Twinkle, Twinkle Edison Star!" *The Sky: Magazine of Cosmic News,* 3 [Jan. 1939]: 21). Some of these later iterations connected the star to Fort Myers and to the electrical works in Schenectady that became part of General Electric ("'Edison Star' Here? Some Claim It Is," *Fort Myers News Press,* 1 Mar. 1949, 1; "'Edison Star' Is Only a Mirage," *Munster [Ind.] Times,* 19 Feb. 1942, 20).

2. Alfred Tate replied to the *World* editor that "there is no truth in the story about Mr. Edison's star, it being simply a newspaper yarn. The light which you refer to is in all probability the planet Venus." Tate to James Graham, 2 Apr. 1889, Lbk. 28:923 (*TAED* LB028923).

3. Frank W. Shipman became assistant city editor at the *New York World* under Edward Grozier during the latter's brief tenure as city editor in 1887. Mulrine 2011, 31; Sumner 1923, 118–19.

4. Alfred Tate addressed James Frank Graham (1855?–1910) in this position in two recent letters. A native of Scotland, Graham served for several years as city editor of the *World* and also as managing editor of the *Evening World*. He subsequently was managing editor of the *New York Daily News.* In later years he was general manager of Pain's Fireworks Co., which created many large displays in Manhattan and Brighton Beach. Tate to Graham, 3 and 31 Dec. 1888; both Lbk. 27:253, 561 (*TAED* LB027253, LB027561); *New York, New York, Extracted Death Index, 1862–1948,* online database accessed through Ancestry.com, 17 Nov. 2017; Graham's 1890 testimony, New York State 1891, 2:1236; "James Frank Graham," *NYT,* 1 Feb. 1910, 9; "Mr. James F. Graham Is Dead of Pneumonia," *New York Evening Telegram,* 31 Jan. 1910, 16; Obituary, *Editor & Publisher* 9 (5 Feb. 1910), 8.

–6– April–June 1889

Electric lights continued to burn through the night at Edison's laboratory even as lengthening daylight marked the start of his second springtime there. Edison remarked on his own long hours, noting in early April that "During the past fortnight I have been able to take my clothes off but once or twice working night and day."[1] Mina Edison felt her husband's absence and complained to her mother, who offered some words of comfort.[2] The pace may have eased a bit in April, as Edison's workforce—always in flux—dipped modestly to 60–70 men (from 80–90) and his payroll to under $1,000 a week (from about $1,300).[3]

Much of Edison's thought and action involved the phonograph in one way or another. From early spring to early summer, he was continually seeking to improve the machine itself, the electric battery, and the recording wax (on which Jonas Aylsworth kept up a stream of experiments).[4] He gave specific instructions about the phonograph exhibit at the Exposition Universelle in Paris, rejecting the reported plans of George Gouraud, his foreign agent, and broadly criticizing Gouraud's intentions for marketing the machine. The Phonograph Works continued steady production of instruments for the North American Phonograph Company.

The basic design of the phonograph was stable. Its footprint and main mechanisms, including the drive train, were like those of the June 1888 model (Doc. 3209). The fine details, however—recording and reproducing points, cutting-off tools, and adjustments—were subject to constant revisions, at least on paper. Edison drafted several long caveats laying out dozens of such modifications.

Edison's inventive ideas are clear enough in his descriptions and sketches, but which of them made it into production is harder to understand. In April or early May, the factory began making a new phonograph spectacle with an improved mechanism for locking it into place. Its design broke with the practice of using interchangeable parts. It would be impossible, Edison concluded, for users to fit the new part to the old machine, and he anticipated recalling old ones and retrofitting them at the factory; it is again unclear if that happened.[5] There was also a new "determining device" (described in Doc. 3358), for incising the recording wax to the proper depth, and perhaps other changes visible only on close inspection. Whatever the instrument's virtues, ease of use seems not to have been among them. Edison felt obliged to send Gouraud detailed instructions, and he defended the need for "employing experts to teach and instruct" the public.[6] He settled on an improved battery design and began setting up a factory to produce it at nearby Silver Lake, New Jersey, where he planned to construct a manufacturing complex.[7] He also promoted the ideas of running the phonograph motor from electric lighting circuits or setting up dedicated subscriber-only electric lines for users.[8]

The slow trickle of finished phonographs across the Atlantic exasperated Gouraud, who declared himself ready to handle large lots of them for sale or rent. Ready, that is, until asked to commit to a standing order from the factory. Then he equivocated, putting off a decision until he saw the latest model; this frustrated Edison's side. Alfred Tate and Samuel Insull (who spent much of the spring in New York) began maneuvering to force Gouraud into taking a large number of machines in the evident hope that he would abrogate his contract.[9] Edison dispatched Tate to London at the end of June, in part to keep an eye on Gouraud and his negotiations with potential financial partners.[10]

The transatlantic tiff highlights a fundamental paradox in Edison's phonograph business. While Gouraud anxiously waited for instruments (at least until faced with their imminent arrival), he was incredulous about Edison's claim to have delivered seven hundred of them to American dealers by early May. That total may be somewhat inflated but is not far from an internal report of 636 machines sold by 23 May and is in line with later accounts.[11] The phonograph factory employed at least 220 men by the summer, and Edison was not one to keep paid factory hands idle.[12] Edison readily acknowledged battery problems but boasted of the phonograph's otherwise satisfactory operation, and the limited extant correspondence from agents in San Francisco (Louis Glass) and Detroit (George Gaston) supports the idea of a growing and more-or-less satisfied base of domestic customers. Correspondence that would create a more complete picture of the market came from subsidiary companies to the North American Phonograph Company in New York.

In hopes of making talking toys for a European market, Edison sent Albert Dick abroad in late April to investigate the doll trade. Philip Dyer, based in Antwerp, meanwhile looked into possible factory sites in Belgium and Germany and talked with managers of American factories, including Western Electric and Duke cigarettes. The miniature phonograph itself was still not equal to rough usage at a child's hands, however, and Dick relayed advice from European doll makers that it should be re-shaped and made smaller. Even the seemingly innocuous doll business was not without intrigue. The status of foreign manufacturing rights under Edison's phonograph patents was unclear, and he took steps to nullify rights granted earlier to William Jacques and his partners. Reports also circulated that Ezra Gilliland and John Tomlinson, both excommunicated from Edison's personal circle, were ready to step into the legal void by asserting their own rights to foreign manufacturing.[13]

The bitter break with Gilliland and Tomlinson in September 1888 cast a long shadow. George Gouraud, responding to Edison's sharp criticism of his business conduct, echoed a suggestion from William Hammer that the experience with Gilliland and Tomlinson had preyed on his mind and left him distrustful of old friends.[14] And when the first opportunity to do so arose in May, Edison sued his former friends in federal court.[15]

In an unrelated legal matter, Edison made a quick trip to Pittsburgh to sit in on a patent infringement lawsuit with major implications for the electric light business. The case was *Consolidated Electric Light Co. v. McKeesport Light Co.*, and its outcome promised to give control of the lucrative domestic market for incandescent lamps to either the Edison or the Westinghouse interests. With so much at stake, attorneys for the Edison interests worked quietly behind the scenes to ensure the participation of a particular judge on the three-judge panel. George Westinghouse, whose company brought the case, was also present in the courtroom crowded with lawyers and reporters.[16]

Edison's Patent Office caveats and drafts form the backbone of the record of his inventive activity at this time. For some months he had been shedding his practice of documenting laboratory work in notebooks, and during the springtime both he and his patent attorneys fully embraced the caveat form as a way of keeping his records.[17] He drafted a number of caveats, including one of epic proportions (Doc. 3353). They typically were wide-ranging documents, each skipping among the phonograph, ore milling, electric lighting, and other subjects. Among the intriguing ideas he put on paper was an electric brake for train cars (to rival the air brake of George Westinghouse) that some laboratory assistants worked on a few months later, and a lamp filament coated with a fluorescent substance.[18] One of his assistants made a detailed drawing in late June of a "½ HP. Octopolar Motor. For Mr Edisons Tricycle."[19]

Still without a dedicated income stream to sustain the laboratory, Edison continued laying the foundations to expand his manufacturing operations. In November 1888 he had started buying property in an area known as Silver Lake, a few miles east of Orange; he acquired several more parcels in the spring for what would soon become a small factory complex. Meanwhile, he was making phonographs, wax cylinders, and batteries and hoping to start production of the toy phonograph for dolls. An unrelated project—the magnetic concentration of iron ore—stalled in April when Edison ordered the trouble-prone experimental plant in Humboldt, Michigan, to suspend operations.[20]

Preparation for Edison's exhibit at the Exposition Universelle was another locus of activity. William Hammer had been on the scene in Paris since March, and his arrangements for presenting the phonograph to the public there created some misunderstandings and conflict with George Gouraud, exacerbated by competition between them for a limited number of machines.[21] Edison was adamant that the phonograph be shown—for free—to all comers without "any side show or Barnum methods," and he declined even to advertise in the Exposition catalog.[22] In the end, Edison's exhibit was one of the relative few completed when the Exposition officially opened on 6 May. A few weeks in, Hammer reported that "It is not saying a bit too much to say the Edison Depts. are attracting more attention than any exhibits in the show" and winning critical praise. The single phonograph he had was heard by "five to fifteen thousand people per day and I have arrangements completed for handling many times this when Mr. Edison sends us spectacles, cylinders &c."[23]

Among the satisfied visitors was Edison's daughter Marion. Instead of returning to Bradford Academy for the spring term, Marion had sailed to France in March with Mina's older sister, Jennie Miller, and boarded in Paris with two younger Miller sisters, Grace and Mary Emily.[24] She reported back that the journalistic reception of the American exhibits generally was lukewarm but "the Edison part of the Exposition certainly does Papa and America honor. . . . The people seem very enthusiastic over the phonograph. No matter where you go you will always hear the Phonograph … mentioned by people on every side."[25] Sixteen-year-old Marion had strong opinions about Paris ("the only draw back is the people and as I shall see very little of them I am perfectly delighted") but enjoyed the attention she got there. "[I]t is certainly nice," she confided to Mina, "to live in an age when it is much better to be the daughter of a genius than to be the daughter of a Prince."[26] Marion reveled in her experiences and hoped to venture with a chaperone to Great Britain, leaving the Miller sisters in France.[27] She cabled for permission—and the means—to go: "Papa may we visit London for fortnight send money reply today."[28]

Edison also sent $250 abroad for a proposed memorial in Munich honoring physicist Georg Simon Ohm, who codified the relationships among electrical current, voltage, and resistance.[29] One thing, at least, apparently came gratis: a pair of tickets for himself and Mina to the centennial celebration of George Washington's 30 April inauguration in New York City.[30]

1. TAE to Robert Cutting, Jr., 2 Apr. 1889, Lbk. 28:925 (*TAED* LB028925).

2. Mary Valinda Miller to Mina Edison, 4 Apr. 1889, MFP (*TAED* X018D1AQO1).

3. Time sheets, WOL.

4. See, e.g., Doc. 3362.

5. Doc. 3351.

6. See Docs. 3361 and 3364 esp. n. 2.

7. See Doc. 3372.

8. See Doc. 3368.

9.See Doc. 3361.

10. See Doc. 3381.

11. Those 636 machines were sold at $45 apiece (Alfred Tate to Samuel Insull, 22 May 1889, Lbk. 30:13 [*TAED* LB030013]). The overall number rose to nine hundred by the end of May, including fifty reportedly in the nearby Newark, N.J. region. In mid-June, Alfred Tate

claimed a total of 1,200 machines delivered, at the rate of 240 per week (see Doc. 3361; Gouraud to TAE, 18 May 1889; Tate to Reginald Gray, 18 June 1889; both DF [*TAED* D8959ABQ, D8956AAP]).

12. The count of factory workers comes from Arthur Kennelly's tests of the electrical resistance of their bodies on 19 July. Information about the factory's finances and revenues may be gleaned from ledgers and journal books. Kennelly Notebook #1:156, Lab. (*TAED* NM023156); Edison Phonograph Works general ledger #1 (1888–1892) and journal #1 (1888–1892); North American Phonograph Co. general ledger (1888–1893) and journal (1888–1893); all CR (*TAED* CK102, CK105, CK202, CK204).

13. See Doc. 3354.

14. Gouraud to TAE, 4 May 1889, DF (*TAED* D8946ABI).

15. See Doc. 3347.

16. See Doc. 3359.

17. See Doc. 3365.

18. The fluorescent filament is in a caveat draft of 12 April (N-88-02-02, Lab. [*TAED* NA022AAD]). Work on the electric brake spanned several months (see Docs. 3358, 3391, and 3399).

19. Kennelly Notebook #2:64, Lab. (*TAED* NM024064B).

20. See Doc. 3344.

21. Gouraud had his own plans for smaller exhibitions, including at the French Observatory in Meudon. TAE to Gouraud, 4 Apr. 1889, Lbk. 28:912 (*TAED* LB028912).

22. TAE to Gouraud, 8 Apr. 1889, Lbk. 29:10 (*TAED* LB029010); Alfred Tate to Armstrong, Knauer & Co, 26 Apr. 1889, Lbk. 29:245 (*TAED* LB029245).

23. Hammer to Francis Upton, 22 May 1889, DF (*TAED* D8946ABQ).

24. Mary Miller to Mina Edison, 14 Feb. 1889; Grace Miller to Mina Edison, 25 Feb. 1889; Lewis Miller to Mina Miller, 28 Feb. 1889; all MFP (*TAED* X018C9AK, X018C3A, X018C6AC2); Jane Miller to Mina Edison, 24 Feb. 1889, FR (*TAED* FM001ABF); *Summit County (Ohio) Beacon,* 31 July 1889, 3.

25. Marion Edison to Mina Edison (p. 3), n.d. [June 1889], FR (*TAED* FB004AAE).

26. Marion Edison to Mina Edison, n.d. [Apr. 1889], and n.d. [June 1889?], pp. 2–3; both FR (*TAED* FB004AAA, FB004AAE).

27. Marion went with Miss S[arah?]. W. Brigham, the first of two chaperones on what turned into a three-year sojourn abroad. Marion Edison to Mina Edison, n.d. [June 1889], pp. 6–9; FR (*TAED* FB004AAA, FB004AAE).

28. Marion Edison to TAE, 17 June 1889, DF (*TAED* D8915AAV).

29. Tate to E. Lommel, 27 Apr. 1889, Lbk. 29:275 (*TAED* LB029275).

30. Tate to Mina Edison, 13 Apr. 1889, Lbk. 29:92 (*TAED* LB029092).

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[Orange,] Apl 2/89

To Robert Cutting, Jr.[1]

My dear Cutting:

During the past fortnight I have been able to take my clothes off but once or twice working night and day and have only just had an opportunity to read your letter regarding Mr Sterling's boiler.[2]

Of course I will be glad to give you any assistance I can but I do not consider myself a competent judge of boilers so far as their construction is concerned. Any opinions I have ever[a] expressed in this connection have been based entirely on results of practical operation.

If you want a first class opinion on construction let me have Mr J. H. Vail, Gen'l Supt. of the Edison Elec. Lt Co examine Mr Sterlings invention and make you a report. He is an expert in such matters and I have confidence in him. What do you say? Yours very truly,

Thos. A. Edison T[ate]

L (letterpress copy), NjWOE, Lbk. 28:925 (*TAED* LB028925). Written by Alfred Tate. [a]Written at bottom of one page and top of the next.

1. Robert Livingston Cutting, Jr. (1836–1894), a New York broker and financier, had been associated with a number of Edison concerns since the late 1870s and was among the incorporators of the Edison Ore Milling Co. He also became a founding director of the Edison Phonograph Works in 1888. Docs. 2724 n. 1, 2784 n. 19, and 3182 n. 2; Edison Phonograph Works minute book (1888–1916), p. 15, CR (*TAED* CK101010).

2. Cutting had asked Edison to evaluate a new boiler design by Allan Stirling in which he had just invested and hoped to bring Stirling to Orange (Cutting to TAE, 29 Mar. 1889, DF [*TAED* D8905ACK]). Stirling was a Scottish mechanical engineer who immigrated to the United States in 1860. Having designed and built his first boiler in 1883, he patented new designs for water-tube boilers in 1888 and 1889. He established the Stirling Boiler Co. in New York City in 1888 to manufacturer and promote his inventions (*MEABD,* s.v. "Stirling, Allan"; U.S. Pats. 381,595; 407,260). Stirling's original boiler had slightly bent water tubes, which led him in 1893 to a bent water tube design that was more compact and free of the leaking that had plagued earlier boilers. Stirling's reputation was made by the design, and all subsequent bent-tube boilers were called Stirling boilers regardless of their specific manufacture (American Society of Mechanical Engineers 1997, 202–3; Heselton 2005, 210).

–3340–

From Alfred Andreas

CHICAGO. Apl 2 1889[a]

Dear Sir.

I have been desirous for years to produce the sounds of battle in the several panoramas I am interested in.[1]

Have experimented a great deal with Mr Johnson Pres of Edison Co New York with your old phonograph.

It did not produce sounds loud enough and was to monotone.

Have done the same thing here with your last invention But what Genl Raum[2] has promised me is a machine that will throw the sounds out in a room. But he has been sick and not been able to attend to business for some time past. If anything can be done in the matter it must be now as the season opens

I can produce the sounds by various instruments very easily, but they are to loud, harsh, and freighten people. I want these sounds to be combined in one instrument and mingled pls. The phonograph gives the distant sound that is necessary.

If this effect can be carried out it will open a new field for your invention and give it great publicity[3]

Please let me hear from you Yours Trly

A T Andreas[4]

ALS, NjWOE, DF (*TAED* D8955ABG). Letterhead of Cyclorama of the Merrimac and Monitor Naval Battle. [a]"CHICAGO." and "188" preprinted.

1. "The Cyclorama of the Merrimac and Monitor Naval Battle," billed as "the most enchanting and wonder inspiring of all cycloramas," opened on 28 March 1888 at a cyclorama building on Michigan Ave. between Madison and Monroe Sts. in Chicago. Painted in 1886 by the French artist Théophile Poilpot with assistance from students of the École des Beaux-Arts, it debuted in New York City before coming to Chicago, where it replaced a panorama of "The Battle of Shiloh." Panoramas or cycloramas, as they are sometimes called, were independently invented in the late 1780s by several European artists, but the first to exhibit was Robert Barker, whose view of Edinburgh (painted by his son Henry) was first displayed in the Scottish capital in 1787. That same year, Barker also took out a patent for what would later be called the "panorama." Panoramas became popular attractions in both Europe and United States in the nineteenth century, with interest booming during the 1850s and again from 1880 to 1900; in 1888, Chicago had three buildings dedicated to such displays. "The Monitor and the Merrimac," *Chicago Daily Tribune,* 29 Mar. 1888, 5; "Panoramas," *Chicago Inter-Ocean,* 1 Jan. 1888, 12; "Monitor and Merrimac" (advertisement), *Chicago Daily Tribune,* 15 Apr. 1888, 11; "Mr. Poilpot Returns to Paris," *NYT,* 14 Mar. 1886, 3; "Theophile Poilpot Dead," *NYT,* 7 Feb. 1915, 12; Oettermann 1997, 5–6, 100–101, 314; "Jerusalem the Golden," *Chicago Inter-Ocean,* 21 Aug. 1887, 12; "The New Cyclorama," *Chicago Daily Tribune,* 4 Mar 1888, 12.

2. Green Berry Raum, Sr. (1829–1909), a lawyer born in Golconda, Ill., was commissioned a major in the 56th Illinois Volunteer Regiment early in the Civil War. He rose through the ranks to brigadier general. Although he had served as an alternate delegate to the 1860 Democratic National Convention, Raum was elected as a Republican to Congress in 1866 and voted to impeach Andrew Johnson. He served as a U.S. commissioner of internal revenue from 1876 to 1883 and, from 1889 to 1893, as commissioner of pensions, in which office he was found guilty of official malfeasance by a congressional committee. *BDU,* s.v. "Raum, Green Berry"; "Illinois Veteran Dies at Eighty," *Philadelphia Inquirer,* 19 Dec. 1909, 1.

3. On 5 May 1889, a phonograph was used to play music and a narration of the European arrival in America in conjunction with the Gettysburg Panorama in Union Square, New York City. According to a report in the *Electrical World,* "The exhibition was so successful that the management have decided to make the phonograph a standard feature of the show until further notice." "A Phonograph at the Gettysburg Panorama," *Electrical World* 13 (1 June 1889): 308.

4. Alfred Theodore Andreas (1830–1900) was a compiler and publisher of state atlases. Born in Amity, N.Y., Andreas moved to Dubuque, Iowa, when he was eighteen and later to Illinois. At the outbreak of the Civil War, he enlisted in the 12th Illinois Infantry and served in the Union Army throughout the conflict, including Sherman's campaigns in Georgia and the Carolinas, rising to become a division commissary. After the war, he became a salesman for the Thompson & Everts Co., a publisher of maps. He organized his own publishing firm, A. T. Andreas Co. of Davenport, Iowa, by 1869 and produced some two dozen atlases in the 1870s. Andreas also wrote and published (1884–86) a three-volume *History of Chicago,* still regarded as the definitive history of the city for the nineteenth century. Andreas organized a number of panorama exhibitions in addition to the Merrimac and Monitor, including "The Crucifixion of Christ," "Bull Run," and "Gettysburg." *BDI,* s.v. "Andreas, Alfred Theodore"; "Alfred T. Andreas Dies," *Chicago Daily Tribune,* 9 Jan. 2018, 4.

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Alfred Tate to Reginald Fessenden

[Orange,] April 2, 1889.

Mr. Fessenden,—

All material which is obtained from our Store Room[1] for use in various experiments conducted in this Laboratory, is charged against each of the experiments for which it has been used. In order to keep a proper account of our stock, it is absolutely necessary for us to have a memorandum of material taken from the Store Room, indicating what experiment the same is chargeable against.[2] Otherwise it means nothing more or less than a direct loss to Mr. Edison. I understand that you obtain material from the Store Room at night and do not leave a proper record behind. I wish that in future you would be very careful to make an accurate account of anything which you take away for your experiments, so we can charge it out as above. Yours truly,

A. O. Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 28:932 (*TAED* LB028932).

1. A large stockroom was fitted out on the first floor of the main laboratory building, between Edison's library and the heavy machine shop. An elevator and dumbwaiter connected it with the light machine shop and experimental rooms upstairs (see Doc. 3127). Reginald Fessenden recalled that Edison had previously gone "through encyclopedias of chemistry and technical dictionaries and [made] lists of substances" he wished to have on hand (Fessenden 1925, 156). These included "all kinds of ores, metals, fabrics, gums, resins, and samples of every imaginable material," among them a vast array of plant and animal matter, all kept in thousands of small cubbies and hundreds of drawers. *Scientific American* characterized this resource as a "dream of Mr. Edison's since his youth." A popular magazine pointed out that the stockroom served Edison's intense style of work by doing away with delays to acquire materials. In the printed words of one unidentified assistant, "in five minutes he can have anything in reason that he wants" (Millard, Hay, and Grassick 1995, 1:20; "Edison's New Laboratory," *Sci. Am.* 57 [17 Sept. 1887]: 184; Townsend 1889, 604). On one occasion in 1888, it even doubled as an emergency pantry for hungry assistants snowed in by a blizzard (Chapter 1 introduction). Thomas Ebdell was hired as storekeeper in January 1888 on the strength of his experience in accounting and stocking pharmaceutical chemicals (Ebdell to Tate, 3 Feb. 1889; Tate to Ebdell, 11 Feb. 1889; both DF [*TAED* D8814AAT, D8815AAO]).

2. For a short while in 1887 and 1888, tools and other materials taken from the laboratory were recorded in notebooks each day (N-87-12-07, N-88-01-07, N-88-01-14, WOL). More generally, the flow of materials and men through the facility was tracked in several ways in addition to the time sheets discussed in the headnote accompanying Doc. 3129. One was a series of ledgers for the running total of costs for each line of experiment (e.g., Ledger #5; Labor & Materials Subledger #6; both WOL [*TAED* NL011, NL013]). Daily expenditures were tracked in journal books (e.g., Journal #5, WOL [*TAED* NL016]). Beginning in June 1890, monthly breakdowns of labor, material, and overhead costs for various experimental categories were entered into another set of books (e.g., Abstract of Expenses #6, WOL [*TAED* NL020A1]). At about the same time, another set of books was used to compile information from individual time sheets about employees' hours and the projects to which their time was charged (e.g., Distribution of Labor #6, WOL [*TAED* NL023A1]). Underpinning the entire records system was an ever-expanding authoritative list of experimental projects identified by both a number and descriptive name (e.g., N-87-11-24, WOL [*TAED* NL002]).

Draft Patent Application: Electric Light and Power

[Orange,] April ~~10~~8 1889

<Recd Apl 10, 1889 H. W. Seely> [a]

The object of this invention is to obtain a tough flexible non inflammeable material for insulating Electric wires[1]

The invention consists in ~~Chlori~~ displacing the Hydrogen by a Halogen preferably Chlorine to substitution of the Halogen being carried to just that Extent necessary to make the resultant material non inflammable The best substances are the gums of the gutta family Gum Balata on account of its cheapness Is the gum which I prefer as a base for Chlorination

The method I use is the solution of the gum in Chloroform & passing Chlorine through the solution until properly Chlorinized— This is ascertained by making films on glass from time to time & igniting them which test serves not only to determine the flexibility of the material but its inflammability—

~~The~~ too[b] highly chlorinated ~~small~~ residues are not so tough as when the material is not so fully chlorinated. The Reaction may be stopped at certain points or it may be carried so far that the film is somewhat brittle & then the solution may be mixed with chloroform containing Balata not chlorinated but the addition of unchlorinated Balata should not be so great as to cause inflammability

The liquid can be concentrated by Evaporation or distillation to a thick syrup and the wires covered with cotton or other insulating material are passed through the solution & thence through Heated[c] drying tubes the Chloroform on Evaporation leaves a film [~~leave~~?][d] thus rendering the wire not only waterproof but non inflammable The cotton is preferably made non inflammable by the ordinary processes now used for rendering fabrics non inflammable—[2]

The liquid may be evaporated to a putty like consistency & put[c] on the wire by a die & press in the usual manner

Claim— The formation for[c] insulating or other purposes of flexible non inflammable material by the action of a Halogen on ~~material~~ gum Balata or analogous gums having similar properties

2nd Disolving the gum in a solvent not Effected by the Halogen & then acting on it by the Halogen

3rd The Use of Chlorinated gum Balata for insulating purposes

TAE

ADfS, NjWOE, PS (*TAED* PT032ABV1). [a]Marginalia written by Henry Seely. [b]Interlined above. [c]Obscured overwritten text. [d]Canceled.

1. Edison's attorneys closely followed this draft (except for the claims) in preparing a patent application (Case 834) that Edison signed on 25 April. It was filed on 11 May and issued as U.S. Patent 438,309 in October 1890 with five claims and two drawings.

Edison's insulation experiments were influenced by contemporaneous experiments on squirted filaments and phonograph cylinders. Experiments on squirted filaments in late February included one with chlorinated balata; when discussing its applicability for phonograph cylinders in late April, he noted its tendency to become brittle when used as insulation (PN-88-05-01, Lab. [*TAED* NP033C]; Doc. 3349). Information about the insulation work may generally be found in correspondence between the laboratory and the Machine Works rather than in laboratory notebooks. In addition to preventing electrical leakage and resisting ignition (by electric current or direct flame), the objectives for insulation included being waterproof, flexible, easy to apply, and non-reactive with fabric coverings or the wire itself. Experiments were still ongoing in early June, when the laboratory sent at least its 150th numbered sample of the year to Schenectady for testing (see, e.g., Arthur Kennelly to Samuel Insull, 9 Apr. 1889, Kennelly Letterbook LM-1:376, WOL [*TAED* LM111376]; Insull to West Orange Laboratory, 28 May 1889; DF [*TAED* D8930AAV]; Alfred Tate to John Kruesi [sample no. 429], 5 Jan. 1889; TAE to Kruesi, 13 Mar. 1889; West Orange Laboratory to Edison Machine Works, 11 May 1889; Tate to Insull [sample no. 579], 5 June 1889; Lbk. 27:623, 28:634, 29:372, 30:229 [*TAED* LB027623, LB028634, LB029372, LB030229]).

2. Saline substances such as borax, alum, or phosphate of soda typically were soaked or starched into cloth to make it resistant to flame. One contemporary source noted that "A weak solution of chloride of zinc has long been employed by stage-dancers to render their dresses incombustible." *KAMD,* s.v. "Fire-proof Fabric"; *JUC,* s.v. "Fireproofing."

–3343–

To George Gouraud

[Orange,] April 12, 1889.

My Dear Sir:—

The proposition which you make in your letter of 26th ult., in regard to the exhibition of the phonograph in Paris,[1] has marked a period beyond which I cannot go without expressing to you very fully the impression which you have made upon my mind, and upon the mind of the public at large, by the course you have pursued and are continuing in your business relations with myself. Had I yielded to my inclinations I would long ago have made this matter the subject of a communication to you, but the hope that you would eventually realize the impropriety of your methods and correct them without interference on my part has caused me to refrain hitherto from discussing the question personally. This letter is the evidence of my disappointment. I feel that in justice to myself and my interests I can no longer maintain a passive resistance—for while I have not before commented very freely upon your actions I have said enough to convey to you something more than a suggestion of my real opinion.

That my opinion is well founded and my judgment sound is proven very clearly by the results which your policy has brought forth. From every quarter, directly and indirectly, by letter and personally from travelers returned from Europe, are borne to me expressions of popular opinion as to the way the phonograph is handled in Europe,[2] and all alike condemn a system which takes the instrument out of the realm of commerce to make it an adjunct to an advertising scheme which has but one equal in contemporary history—a reference which my cablegram of 8th instant will make quite clear.[3]

From a purely business standpoint, and apart entirely from any personal feeling which I may have, your policy is susceptible of the gravest criticism. I am perfectly familiar with and appreciative of the beneficial results to be derived from advertising but there is a limit to this as to everything else—a time when it is well to drop the sensational and deal with the practical side of business, and this period you reached and passed long ago, and the public which, for a while, listened respectfully to all that was to be said about the phonograph, is assuming now a very different attitude—an attitude expressive more of amusement as to personal motives than of interest in a practical and scientific novelty.

Under cover of existing public interest in the phonograph you have adopted a plan which retards the progress of real business and keeps the instrument before people as a curiosity with which they may make themselves familiar for a slight consideration, and so long as this preliminary system continues to pay, it appears to be your intention to sustain it. Nothing of the kind was contemplated by me when I consented to your handling the business. I believed that you would pursue genuine business methods and never dreamed that you would side-track the whole enterprise for the purpose of gaining time to indulge in a series of picayune sideshows which do far more harm to your real interests than can ever be compensated for by the temporary gain which they ensure.

I do not now refer to any one particular effort which you have made—some of your plans have been excellent, others just the opposite— and it is the latter which result in rendering nugatory all of your better and higher endeavors and produce a general effect that savors too much of the style of enterprise peculiar to a certain class of phrenologists and ventriloquists. You have simply let your desire to make quick money run away with your better judgment.

Your proposition in regard to the Paris Exposition is a step too far. It cannot be that you are so blind to all sense of propriety as to be unable to see the position in which I would be placed were you to have carried out your intention in this connection, but you were evidently quite prepared to sacrifice me so long as an opportunity was afforded you of making a little money. Your suggestion is capable of no other explanation, and it is of just much inconsiderate action in your relations with me that I complain.

I simply wish to say in conclusion that when I gave you permission to use my name in Europe, in connection with the introduction of the phonograph, the permission was bounded by limits of reason and propriety and conveyed no license to take undue or uncalled for liberties with it. My associates acting in my name must understand that my personality is a factor demanding respect and consideration and that there are no bonds of any nature whatever strong enough to bind me to a business relationship from which these elements have been eliminated.[4] Yours truly,

Thomas A. Edison

TLS (letterpress copy), NjWOE, Lbk. 29:76 (*TAED* LB029076).

1. Gouraud's letter was his reply to Doc. 3326. In it, he agreed to share the expense of the phonograph display in Paris, though he did so on condition that William Hammer should "receive his instructions from me as to the details and general policy of that exhibition." More to the point of Edison's reply here, Gouraud proposed:

> As it is desirable to have the Phonograph exhibited in circumstances of absolute quiet, and with every convenience and comfort, I am of opinion that the noise of your exhibits would be very prejudicial to it in this respect.— In this Mr Hammer agrees with me, and I purpose providing for this—and indeed have already taken steps to that end—by either finding or erecting some suitable place at a distance from the general Exhibition.— This, of course, will entail further heavy expenses, which I expect to be covered by a small charge of admission to the general public, and complimentary tickets can be issued to the nobility and other people of importance. [Gouraud to TAE, 26 Mar. 1889, DF (*TAED* D8946AAW)]

Gouraud offered to take both the risk and the profits of such a venture. He also corresponded with Hammer about it and offered him part of a possible "large surplus" of income. In a letter that Edison would not yet have received, Hammer called the idea of an outside exhibition an "excellent scheme" in principle but thought it unwise to risk disappointing 22 million visitors "if they cannot see & hear the Phonograph in the Exposition." An outside display, he also feared, would jeopardize Edison's chances to win the Volta Prize and various Exposition medals (Gouraud to Hammer, 2 Apr. 1889; Hammer to TAE, 6 Apr. 1889; both DF [*TAED* D8946ABA, D8946AAZ]). Fauser 2005 (298) suggests that fees were charged for admission to telephone exhibitions.

2. The editors have not attempted to verify this sweeping claim, but among the criticisms to reach Edison was John Verity's aside in September that "Gouraud is making a nice old advertisement <u>for himself</u> out of <u>your</u> phonograph." In December, Hugh de Coursey Hamilton complained about the amount of time he spent "to simply manipulate the Phonograph for Colonel's demonstrations etc. & glorification." In between, Samuel Insull reported his father's view that "Gouraud is making a 'great deal of money' by exhibiting the phonograph"; he thought it improper that "Gouraud should drag Edison into the show business and pocket all the proceeds" and suggested "This is a point we must go for the Gallant colonel on when the time comes." Philip Dyer also weighed in more recently against Gouraud, and Edison may have been sensitized as well by Osgood Wiley's reports of Gouraud's proposed ore milling demonstration in London. Verity to TAE, 5 Sept. 1888; Hamilton to TAE, 18 Dec. 1888; Insull to Alfred Tate, 16 Oct. 1888; Dyer to Tate, n.d. [Apr. 1889?]; all DF (*TAED* D8805AGH1, D8850AEJ, D8850ADO1, D8946ACB); see Doc. 3284.

3. Edison cabled: "Phonographs can be exhibited to full advantage in space allotted for all my inventions. Ear tubes exclude all outside noise. Refuse absolutely to permit charging entrance fees or the introduction of any side show or Barnum methods at Paris." Gouraud reportedly answered (at least in part) by cabling: "Protest needless; no such intention." TAE to Gouraud, 8 and 12 Apr. 1889, Lbk. 29:10, 89 (*TAED* LB029010, LB029086).

4. Gouraud's response is Doc. 3350.

–3344–

From Walter Mallory

Chicago, 4/12 *188*9[a]

My Dear Mr Edison

Your telegram "better shut down for a month,[b] so we can experiment—ship two bbls crude ore, and two bbls crushed ore just as in hopper. Express twenty five pounds of latter immediately and few samples original ore" is just at hand & noted:[1] I will send the necessary money to mill today & shut same down tomorrow:[2] the ore as per telegram will have shipped at once— We shipped three bbls sometime ago and should think that they ought to be at laboratory before this—

I will close matters up here and reach the laboratory sometime next week—coming via Akron. Respectfully yours

W S Mallory

ALS, NjWOE, DF (*TAED* D8950AAI). Letterhead of W. S. Mallory & Co. [a]"*Chicago,*" and "*188*" preprinted. [b]Partially obscured by ink smear.

1. Edison's telegram regarding the iron ore plant in Humboldt, Mich., was sent on 11 April (TAE to Mallory, 13 Apr. 1889, Lbk. 29:102 [*TAED* LB029102]). It was prompted by Ira Miller's letter from Akron, Ohio, relaying a report from Mallory about his inability to produce a concentrate of 65% iron, the minimum needed for profitability. According to Miller, Mallory was "pretty badly stuck and has written us whether he better not shut down the mill and discharge the men until we can get a reply from you advising us what to do" (Miller to TAE, 10 Apr. 1889, DF [*TAED* D8950AAH]). Mallory had been grappling with other operational problems as well, including an immense amount of dust that created an almost impossible atmosphere for the workers. He installed blowers to ameliorate the dust but found that they also removed a good deal of the iron. Workers also had trouble regulating the flow of ore from the hopper and preventing the iron from sticking to the magnet. On top of all that, Mallory found that Bessemer furnaces in Chicago were "very much against the very fine ore" that he was able to turn out (Mallory to TAE, 19 Feb. and 1 July 1889, DF [*TAED* D8950AAD, D8950AAK]; Israel 1998, 344–45).

2. Edison worked at the laboratory to address the problems that vexed Mallory (developing a water separator as a way to deal with the dust, for instance), but the plant remained closed until June 1890 (TAE to Mallory, 13 Apr. 1889, Lbk. 29:102 [*TAED* LB029102]; Mallory to Lewis Miller, 7 June 1890, Mallory Letterbook LM-261:638, Mallory [*TAED* MD002638]; Mallory to TAE, 30 June 1890, DF [*TAED* D9045AAY]). Operations were promising enough by August 1890 that Mallory hoped to enlarge the plant and told Edison that "we all feel now that we have run long enough to prove that the separator is a success." By the beginning of December, it was producing concentrates bearing between 69.85 and 71.5 percent iron with phosphorus content suitable for the Bessemer process. Then on 3 December 1890, the plant burned to the ground. It was never rebuilt, nor did the Edison Iron Concentrating Co. erect another mill elsewhere or successfully license the technology within its territory. The company was dissolved in 1902 (Mallory to TAE, 16 Aug. and 5 Dec. 1890, both DF [*TAED* D9045ABJ, D9045ABS]; charter cancellation record of Edison Iron Concentrating Co., 30 June 1918, ISSS).

–3345–

To William Hammer

Orange, N.J. April 19, 1889.[a]

Dear Sir:—

I beg to confirm the following cablegrams sent you:—[1]

NEWARK, PARIS.[2] April 18, 1889. "Phonograph must be exhibited same as all my inventions. Forbid absolutely charging admission fees. Use your judgment. Edison."

NEWARK, PARIS. April 19, 1889. "Take absolutely no instructions as to phonograph exhibit except from me. Make no arrangement with Gouraud about sharing expenses. Pavilion must not cost more than three thousand.[3] Intend exhibit shall be my own, at my own expense, and under my control. EDISON."[4] Yours truly,

Thos. A. Edison T[ate]

TL, DSI-AC, WJH, Ser. 1, Box 1 (*TAED* X098A029); a letterpress copy is in Lbk. 29:155 (*TAED* LB029155). Letterhead of Edison laboratory; initialed for Edison by Alfred Tate. [a]"*Orange, N.J.*" preprinted.

1. Edison's cable was in answer to a 6 April letter from Hammer that was in part a reply to Doc. 3331. Hammer enclosed George Gouraud's 2 April letter to him about setting up the phonograph outside the Exposition Universelle (Hammer to TAE, 6 Apr. 1889; Gouraud to Hammer, 2 Apr. 1889; both DF [*TAED* D8946AAZ, D8946ABA]). Edison's cables quoted below (the first one dated 19 April on receipt in Paris) are both in Ser. 1, Box 1, WJH [*TAED* X098A030, X098A031]).

2. Hammer had recently registered the cable address "Newark," the New Jersey city where he went to school and began his career. Hammer to TAE, 6 Apr. 1889, DF (*TAED* D8946AAZ); *DAB,* s.v. "Hammer, William Joseph."

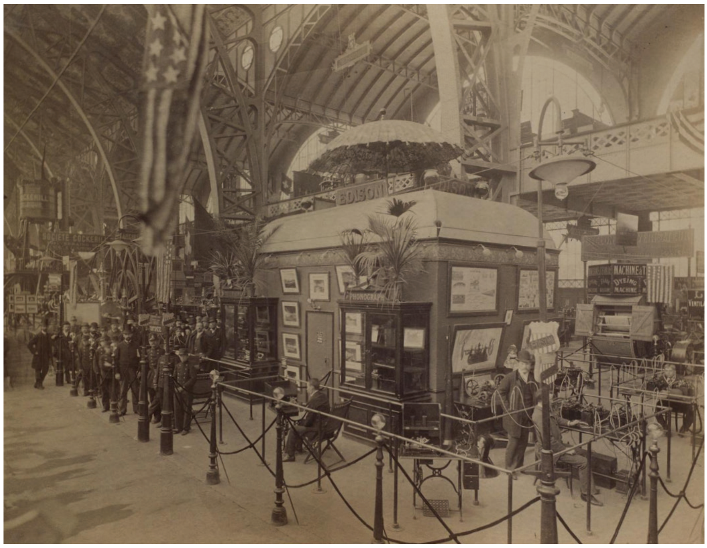
3. Edison meant $3,000, though there was some confusion about whether he was using dollars or French francs. The editors have not determined how much the pavilion actually cost, but it would have been a small fraction of Edison's overall expenses for the Exposition. His account books show an outlay of about $20,500 by the end of May, the great majority of it ($19,816) between New Year's Day and the end of March. These records show he spent about $36,400 on the event in total through July 1890. TAE to Hammer, 20 Apr. 1889, Lbk. 29:177 (*TAED* LB029177); Laboratory Ledger #5:510, 535, WOL (*TAED* NL011A1; images 178, 190).

4. Edison reiterated these messages in a signed letter on 20 April. Directly referencing Hammer's 6 April letter, he emphasized that the phonograph (and his other inventions) could be shown in Paris only "upon a purely scientific basis" without an admission fee. He also cabled to Gouraud on the nineteenth: "Have concluded that Paris phonograph must form portion of my exhibit, at my own expense and under my control," and he followed that message with a letter the next day. The chain of correspondence continues in Doc. 3350. TAE to Hammer, 20 Apr. 1889; TAE to Gouraud, 19 and 20 Apr. 1889, Lbk. 29:177, 156, 180 (*TAED* LB029177, LB029156, LB029180).

Hammer ended up making the phonograph accessible to Exposition visitors at two principal and two subsidiary locations. One main site was in the open amid Edison's vast display in the Galerie des Machines. Brass railings guided eight lines of visitors to the same number of phonographs, where ear tubes accommodated multiple listeners on each one. Also on display there were different forms of the phonograph, including treadle and cabinet models and the compact military phonograph, intended for officers to dictate orders. The *Electrical World* noted that "There is as great a crowd about the phonographs as there is on the Eiffel Tower," and Hammer later claimed that this was the most popular spot in the entire Exposition. The display was set up around the outside of a small building (sometimes called a pavilion) that Hammer used as his office. The structure was isolated from heat and noise by foot-thick walls filled with sawdust. Its ample furnishings included a grand piano and, of course, a phonograph for entertaining or recording special guests. The other main phonograph area was a pavilion in the American section of the nearby industrial hall (a space from which Gouraud claimed to have excluded a planned graphophone exhibit), where visitors could hear recordings in foreign languages as well as vocal and instrumental musical performances. That location appealed to those "who prefer the quiet and comparative seclusion of this miniature crystal palace to the noise, confusion and publicity of the exhibit in machinery hall," said the *Western Electrician.* Additional phonographs, also under Hammer's control, were available in the telephone pavilion and, with Edison's specific approval, in that of the French Edison lighting company. More than twenty thousand visitors poured into the combined exhibits on most days, with an estimated four million people coming through over the course of the Exposition. "Paris Exposition," *Western Electrician* 5 (5 Oct. 1889): 177; "The Edison Exhibit at the Paris Exposition," *Electrical World* 14 (16 Nov. 1889): 323–25; Gouraud to TAE, 4 May 1889, DF (*TAED* D8946ABI); TAE to Hammer, 20 May 1889, Lbk. 29:483 (*TAED* LB029483); see also Doc. 3355.

Interior of the insulated phonograph pavilion. A large recording horn sits astride the piano.

Exterior of Edison phonograph pavilion.



–3346–

From William Jenks

New York, April 22nd, 1889.[a]

Dear Sir:—

Will you kindly consider with care the correspondence here enclosed?[1]

The call for some sort of a direct current Transformer[2] is getting louder and louder every day. You will notice Mr. Kruesi's statement of what the Machine Works are ready to do, and what Mr. Johnson is ready to indorse, provided you deem it best that for the present we shall use this apparatus, already practically perfected instead of waiting for the time when your many duties and other interests will allow of the development of the new type which we hope to receive in due season. Yours very truly,

W. J. Jenks Director.

<I think the Machine works transformer will fill the bill in every respect= all that I could do was toward Cheapening not improving as the Machine Wks transformers is more[b] perfect than any known transformers>

TLS, NjWOE, DF (*TAED* D8935AAU). Letterhead of the Edison Electric Light Co. Standardizing Bureau, W. J. Jenks, director. [a]"New York," and "1889." preprinted. [b]Interlined above.

1. The editors have not identified the enclosures, which Alfred Tate returned to Jenks with his reply on Edison's behalf. Tate quoted in full

Edison's marginalia below (Tate to Jenks, 29 Apr. 1889, Lbk. 29:215 [*TAED* LB029215]). The enclosures presumably included correspondence with Edward Johnson and John Kruesi. In a recent letter to Edison, Jenks stated that Johnson had declined to allow the Edison Electric Light Co. to make any commitments "regarding our ability to transform from high to low potential for central station work until we received your assurance that apparatus could be given at short notice." He added that "there has come a demand for direct current rotary transformers from 1000 volts to 100" and he expected an inquiry from the Edison United Manufacturing Co. "as to whether we can promise him a transformer of this kind of a capacity of 500 16 candle power lamps, within three months" (Jenks to TAE, 8 Apr. 1889, DF [*TAED* D8935AAQ]).

2. Jenks had in mind a rotary converter (see note 1). Edison had directed work on such a device for some time (see Docs. 3002 [headnote], 3008 n. 15, 3011, 3069 n. 2, 3090, 3099, and 3142 n. 17). Arthur Kennelly had worked intermittently on such designs around March and September 1888 and, with machinist Walter Thompson and a few other staff members, again late in the year, but the project seems to have entered a hiatus at the end of January 1889 (N-88-01-19:73–74, 79; N-88-08-28:27, 68–69, 74–77; Lab. [*TAED* NB019073, NB019079A, NB019082, NB051027, NB051064, NB051073]; Time Sheets, WOL).

–3347–

Alfred Tate to Sherburne Eaton

[Orange,] April 25, 89.

My Dear Sir:—

Mr. Edison has asked me to say to you that Messrs. Tomlinson and Gilliland have engaged passage for Europe on a steamer leaving New York on the 15th of May.[1] He wishes you to know this, so that you can take such action as may be necessary in regard to commencing suit.[2] Yours very truly,

A. O. Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 29:239 (*TAED* LB029239).

1. Alfred Tate reported in Doc. 3381 that John Tomlinson and Ezra Gilliland sailed from New York on 13 July. The editors have not determined if their journey was repeated or delayed from the planned crossing in May.

2. Edison had promised Jesse Lippincott in October 1888 that he would wait at least six months to take legal action against Ezra Gilliland for his role in the sale of Edison's phonograph stock, and Lippincott did not stand in the way after that period expired on 5 April. In early May, Sherburne Eaton reported that famed attorney Robert Ingersoll "thinks you have a good case, and warms up to it," and Edison approved the disbursement of $1,000 for legal expenses (Eaton to TAE, 8 Apr., 9 May [with TAE marginalia], 11 May 1889; Tate to Samuel Insull, 11 Apr. 1889; all DF [*TAED* D8955ABI, D8955ABQ, D8955ABS, D8946ABI]). Eaton and his partner Eugene Lewis, with Ingersoll's assistance, brought an equity suit in federal court in New York against Gilliland and John Tomlinson on 11 May seeking the

return of $250,000. The filing was widely reported in the newspapers. Gilliland and Tomlinson promised to break their public silence but their side of the story remained hidden from the public at this time (see, e.g., "Edison Is Kicking," *Pittsburgh Dispatch,* 12 May, 1; "Edison Says He Was Swindled," *Chicago Daily Tribune,* 12 May 1889, 10; "What the Defendants Say," *NYT,* 13 May 1889, 2; Edison's amended bill of complaint, dated 25 October 1889, is in Miller [*TAED* HM89ABU]). In April 1890, the court ruled that Edison had failed to show that his contract with Lippincott had been consummated by a transfer of stock, and therefore Gilliland's actions, however dishonorable, had not deprived him of property or caused any demonstrable loss (*Edison v. Gilliland et al.,* 42 F 205 [S. D. N. Y. 1890]). The judge did permit Edison to file a further amended complaint to keep the suit alive (Eaton to TAE, 10 and 30 Apr. 1891, both DF [*TAED* D9051ABB, D9004ABZ]). The defense then requested a series of postponements before submitting its answer in January 1891, in which Gilliland reportedly denied having ever had any contractual arrangement with Edison. With these delays and the grave illness of Lippincott, the case dragged on for at least two more years, and the editors have not learned its eventual outcome (Eaton to TAE, 28 June 1890, 10 Jan., 7 May, and 9 Sept. 1891; Tate to TAE, 26 Jan. 1893; all DF [*TAED* D9051ABK, D9143AAD, D9143AAR, D9151ABR, D9343AAO]; Tate to Eaton, 12 Jan. 1891, Lbk. 46:404 [*TAED* LB046404]; "After Edison," *Rochester (N.Y.) Democrat Chronicle,* 22 Jan. 1891, 1). In August 1893, Eaton and Lewis sent Edison a fourteen-page typed resume of their actions in the matter dating back to September 1888, along with a bill for $3,286.70. The sum remained unpaid until June 1897, when they accepted Edison's promissory notes for $2,750 as full payment (Eaton and Lewis bill to TAE, 1 Aug. 1893 [with 1 June 1897 addendum]; Eaton and Lewis memorandum to TAE, 1 Aug. 1893; both Vouchers [*TAED* VC97073B, VC97073C]).

–3348–

To Sherburne Eaton

[Orange,] April 26, 89.

Dear Sir:—

I beg to confirm the following telegram received from you to-day:—[1]

"General Company board met to-day. Organization completed and every contract approved and ordered executed.[2] Will visit you to-morrow. S. B. Eaton."

To which I replied as follows:—

"Will be in New York to-morrow and will call at your office. T.A.E."[3]

Yours truly,

Thos. A. Edison M[aguire].

TL (letterpress copy), NjWOE, Lbk. 29:251 (*TAED* LB029251). Signed for Edison by Thomas Maguire.

1. This is the full text of Eaton's 26 April telegram as it was typed for Edison's files. The editors have not found another copy of the reply. DF (*TAED* D8938AAM).

2. The Edison General Electric Co. reportedly was incorporated in New Jersey on 2 January (*Orange [N.J.] Herald,* 3 Jan. 1889, Clippings [*TAED* SC89002D]; Passer 1972 [1953], 103; see Doc. 3303). After questions arose about the ability of the company and its directors to meet New Jersey statutory requirements for issuing stock, Sherburne Eaton recommended in March that the firm be established in New York State instead. He drafted incorporation papers and side agreements for the transfer of ownership interest from the antecedent firms in late March, and Edison General Electric was incorporated anew in New York on 23 April with a capital stock of $12,000,000 (Eaton to Charles Coster, 26 Mar. 1889; Eaton to Henry Villard, 30 Mar. 1889 [with attached drafts], Miller [*TAED* HM89AAJ, HM89AAK]; "Consolidating the Edison Companies," *New York Tribune,* 24 Apr. 1889, 1; Edison General Electric circular letter, 26 Apr. 1889, DF [*TAED* D8938AAN]; "A Large Incorporation Fee," *NYT,* 24 Apr. 1889, 3; for a detailed breakdown of the value apportioned to the old entities and the stake taken by new investors, see Edison General Electric Co. report, 28 Mar. 1889, Miller [*TAED* HM89AAP]). The final stumbling block was an agreement for the company to acquire Edison's future patents in electric lighting and power. Eaton drafted one that Charles Coster, representing Drexel, Morgan & Co., found unsatisfactory. Coster and Henry Villard, both citing the daunting complexity of any such contract, ultimately agreed to proceed without one (Coster to Eaton, 19 Apr. 1889; Villard to Eaton, 22 Apr. 1889; both DF [*TAED* D8938AAK, D8938AAL]; Eaton to TAE, 19 Mar. 1889; TAE draft agreement with Edison General Electric, Mar. 1889; both Miller [*TAED* HM89AAF, HM89AAS]; see Doc. 3294 n. 3).

The company's directors consisted of Edison, Villard, Charles Coster, Jacob Herrick, Samuel Insull, Edward Johnson, Arnold Marcus, William Marks, Carl Schurz, Francis Smithers, and James Hood Wright. Its officers were Villard (president), Herrick (vice president), Edward Edes (treasurer), Marcus (secretary), Frank Hastings (assistant secretary), and C. E. Eckerson (transfer agent). Edison General Electric 1890a.

3. The editors have not determined whether this meeting took place.

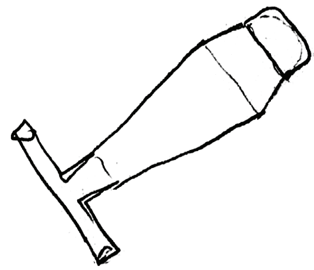
–3349– [Orange,] April 29—89—

Draft Caveat: Phonograph, Electric Lighting, and Ore Milling

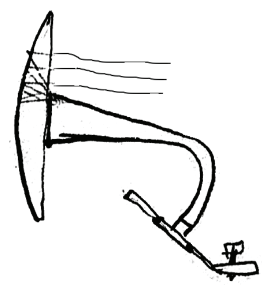
Caveat[1] Phono EL & Ore Mlg

leverage

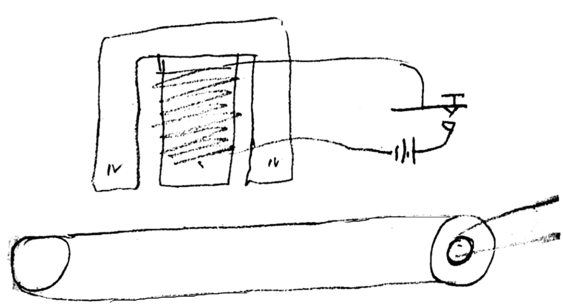
open



glass funnell.

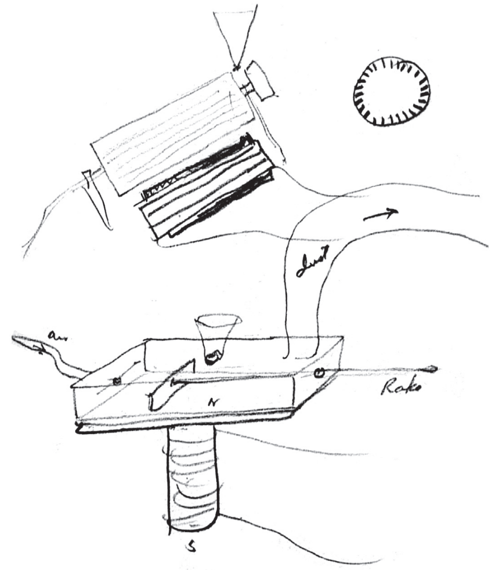


Indenting by streatching & use of ball both for indenting & Reproducing

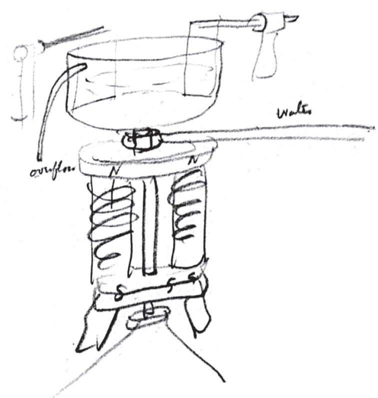


Lift & drop—

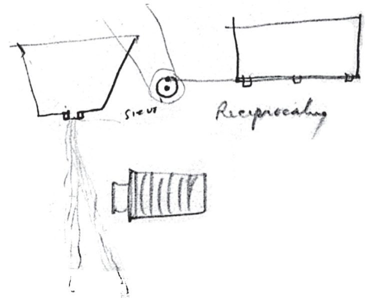
[A][2]



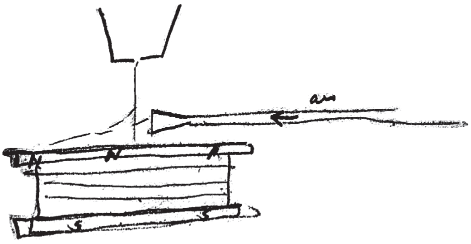
Mag— Washing in magnetic field[3]



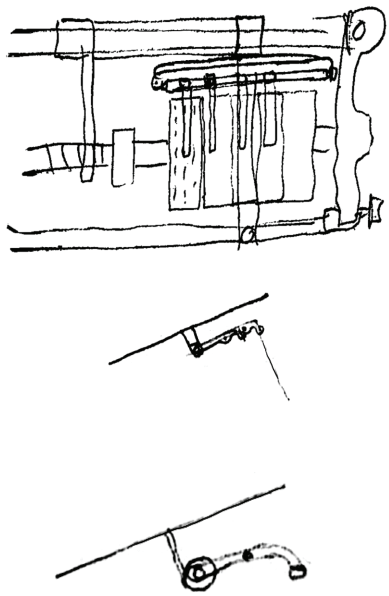
[B][4]



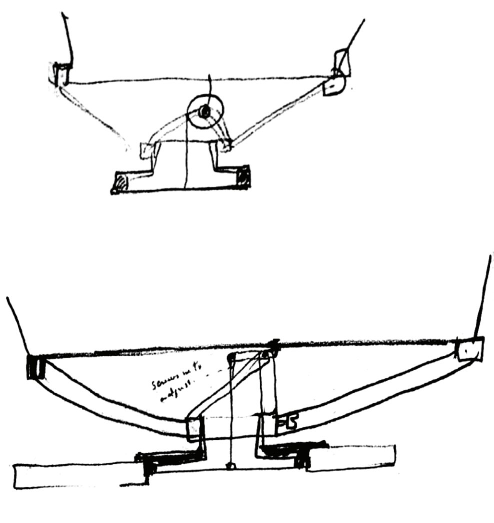
[C][5]

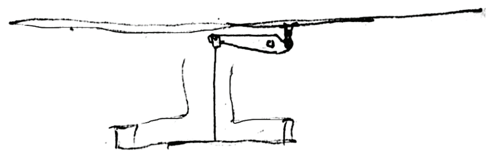


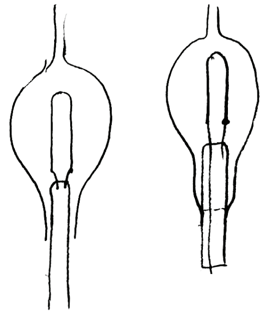
Multiple Duplicator ~~for~~[6]

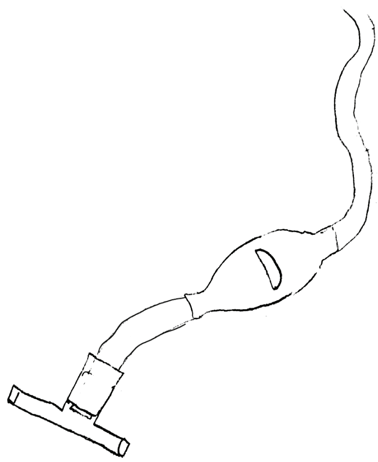


Amplifier[7]









screen to screen[a] off the scraping sounds [—–][b] Longer waves lengths pass around but short scrap waves the screen throws shadow & stops them

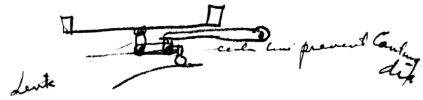
Rotating Spectacle also put Recorder & Reproducer on same dia & by twisting slightly throw [—–][b] them[c] in & out of line to operate with.

instead of spectacle we could have single arm & hole & use removeably connected Recorders & Reproducers also there

Could be 2 arms one with Recorder one with Reprodu & both move independently

Claim. Clamped diapm preferably glass between Lapped [----][b] disks without yielding materials

[D][8d]



for phono[e] Brush whose hairs are stiff & run to a point. Deer hair.[f]

Closed funnel filled with a heavy Vapor like Chloroform, with or without pressure.[f]

A Turned surface on a phonogram— A turned surface on a phonogram in Situ—

a cylinder of Halogenized Balata or similar gum coated[9] with photographic Recording material for mailing Cylinders[f]

also a flexible—

Making a phonogram of a soft material adulterated with or composed wholly of a material which by a subsequent treatment Chemically etc will harden Say a wax in which aniline oil will mix. Record on it & harden by Sulphuric Acid with form solid Sulph[a] [Anilic?][g]

Mix parafine with a Hydrocarbon or some hard wax or stearate which will mix with the Hydrocarbon so that it can be worked in the phono & then after record is made chlorinate the surface of the Cylinder to make the liquid Hydrocarbon a Solid derivative

Asphalt mixed with such a Hydrocarbon like Benzol can be so proportioned as to be recorded upon & when Chlorinated by Chlorine or by immersion in an inert solution Containing a Chlorinating Compound will become hardened

Chlorinated Balata when used for non[a] inflammable Insulating purposes is apt to become brittle, after the solvents have evaporated to prevent this I propose to put Linseed oil with the balata & chlorinate, also Linseed oil & chlorinate with Chloride Sulphur—mix Camphor with it—free balata—Rubber—also gutta percha also Syrian asphalt [----][b] waxes already Chlorinated. filiments ~~of~~ carbon can be made[h] from finely divided graphite mixed with a Carbonizable locking material like asphaltene or highly dehydrogozed asphalt like substance like that produced by oxidizing asphalt by nitric acid or by chlorine which removes the Hydrogen largely or by mixing Sulphur by a solvent with the asphalt disolved in the Solvent—the asphalt being or not previously chlorinated[i] The dough is squirted as a filiment & carbonized

I act on pulverized magnetic iron ore which have been concentrated as far as possible by an acid to remove the last traces of phosphorous which occurs in the form of phosphate of Lime. I use warm sulphuric acid diluted—also nitric. get the acid back by a centrifugal drier & then work the ore with water to remove the products of the reaction—

For phonograph points I used ~~p~~chemically pure iron reduced by Hydrogen, form the same into shape[a] & then form the outer surface into sheet by Concentration.

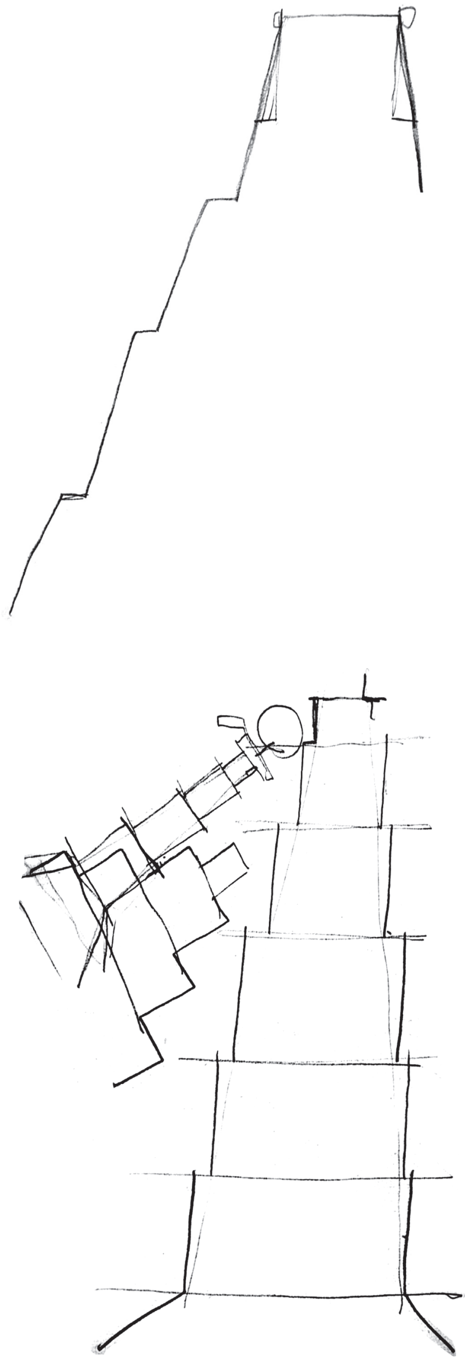
I propose to use Saphire for the shaving tool & Recording & Repdcg points. am Conducting Experiments to obtain proper machinery to make them acurately & economically[10]

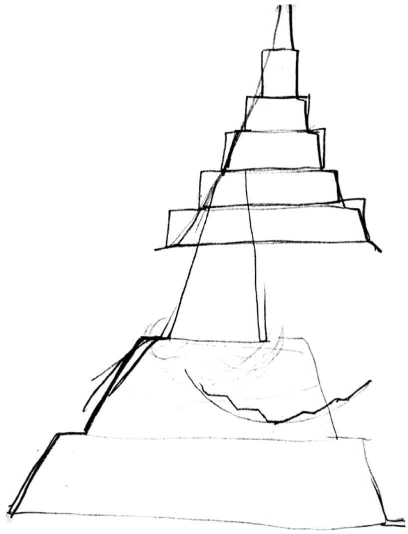
One process I am experimenting on to mould cheaply phonogram blanks Is to use a screw or hydraulic press and force the cylinders out like Lead pipe[11] Cut them into proper lengths & then put them ~~on a mandril~~ in a forming mould while plastic & with a proper mandril inside having a taper surface set them to shape by a blow withdraw from the mould & cool on the mandril—

another method is instead of pouring the material in a[j] liquid state in a proper mould withdrawing the mandril & forcing the cylinder out as now I force the material while[a] in a plastic condition into the mould by a hydraulic press the moulds being removeably connected to the press the press being hot so the material is plastic

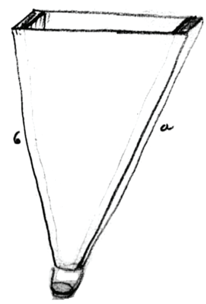
For rapid Turning off the cylinders so they may have a true surface I use several shaving Knifes following each other but all connected together rigidly allowing each Knife to take such a depth of chip as not to chip the surface out for instance if I have 4 Knifes I am enabled to take [~~a chip~~?][b] off 6 times the depth of surface as one Knife The first Knife takes a comparatively deep chip the 2nd one not so deep & so on the last Knife does the smoothing. by this means going ~~of~~ over the cylinder several times to true its surface is unnecessary—

[E][12]

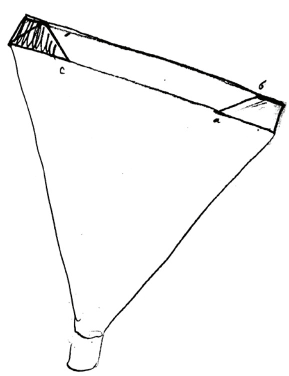


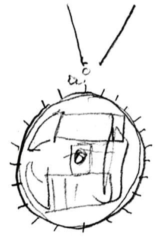


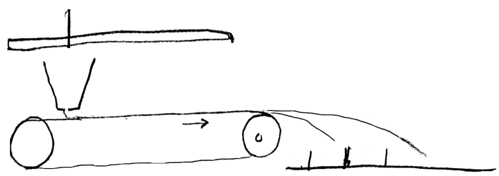
Funnel made of [~~f~~---][b] spruce wood, the sides quite[a] thin—so that the sides form a sound prism some portion of the wood form a to b is always in unison in its vibrating period with [Some?][g] sound waves   Hence amplification of nearly all the sounds[13]

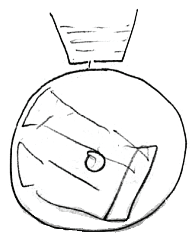


by this means one side is responsive to all waves below a certain pitch while the other side is responsive to all above a certain pitch—[14]

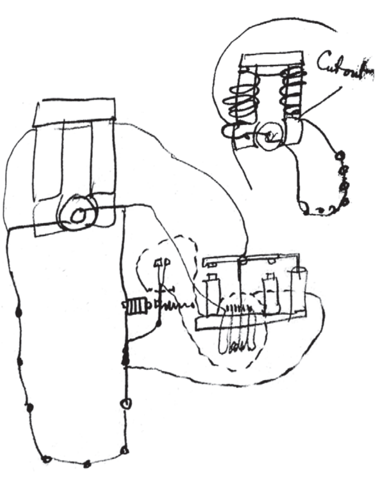


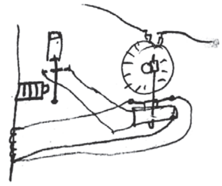




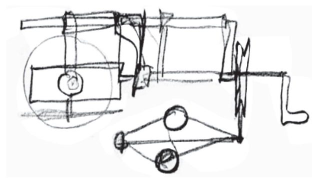


arc auto Reg[15]





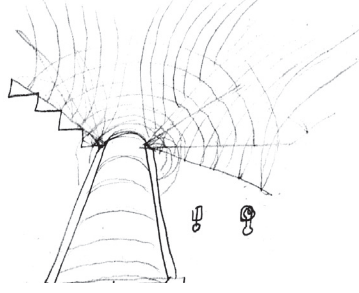
To remove the nonmagnetic particles which cling to the magnetic by cleavage planes I tumble the ore with large rocks often or before Concentration to remove the clinging particles & if concentrated I run through the concentrator again—

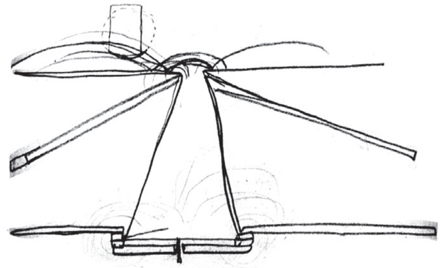


Hand turning phono for toy figures

The ~~plastic m~~ material which I propose for the base of the veneered cylinder may be poured out in sheets & whole plastic rolled taper cut in strips & formed into a cylinder around a mandril by butting or Laping[a] or a round disk somewhat thick may while plastic be forced over a mandril to shape or it may be spun over a mandril or the sheets may be forced out when in a plastic state by a press to side & wrapped around a mandril & then trued or narrow strips can be forced from the press & be wound while plastic around a mandril just as if it was paper & a cylinder formed & while still soft have the outer surface of the cylinder paralelled ie same diameter [---][b] outside over whole of the cylinder by a hot iron or tool travelling along while material is rotated If squirted like Lead pipe The thickness of the cylinder walls as well as diameter will be the same but as a Taper inside is required to fit the taper of the phonogram holder of the phonogh & a Straight outside, The sections of plastic material as they come from the press must be thicker than they are to be used when the phonogram is complete, hence by cutting the tube in sections ~~p~~shorter than the finished phonogram & [pulling?][g] on a taper made mandril the taper is made but the outside is now not same diameter. This is made right diameter of its whole length & the phonogram lengthened by [~~spreadi~~?][b] spinning by a tool while the mandril is rotated

I make a battery by using say Zinc containing a small per cent of [----][b] mercury. this I immerse in an acid or alkaline Solution Such as Sulphuric acid or Sodic Hydrate. The depolarizing Electrode I form of Red Oxide of Lead mixed with water or some Soluable salt of Lead like the acetate or nitrate Just sufficient to moisten it then mould it by hydraulic pressure into flat plates. These are sufficiently coherent to be handled. They are then put into a peroxidizing solution say a soluable[c] Hypochlorite ~~of a~~ or Chlorate of Potash & Hydrochloric acid—or dry hyperchlorous gas is passed over them & in fact many methods of[a] raising the lower oxide to a higher one can be used—The warm Hypochlorite ~~of a soluable~~ is perhaps the most convenient. The plate after peroxidation is suspended in the liquid in a lead frame which makes contact with the plate around all except the top Edge= If the liquid is say[a] a 30 per cent solution of Sodic Hydrate, the results are very good while the battery is at work but lead gradually goes into solution when the circuit is open & is deposited on the Zinc— my improvement consists in immersing the plates before use in water or an alkaline Solution or even weak ~~acid~~ acetic for[a] several weeks so that all of the unchanged red Lead is disolved out and then when the plates are put in the Regular battery by means of an External conductor [~~short~~?][b] Keep the battery always working ie[k] doing just enough work internally while not being used for useful purposes to counteract the disolving rate & thus prevent fouling the Zinc— I am now engaged in experimenting to produce plates chemically which are equal in all respects to the peroxide of Lead plates produced Electrolytically as in a storage battery— The peroxide produced electrolytically acts very different from that produced chemically and this is due probably to the intimacy of contact between the particles of peroxide and probably also the possibility that the chemically prepared peroxide is a hydrate. to produce an anhydrous peroxide of Lead I use a plate of red lead made by hydraulic pressure & peroxidize it while in a powerful dehydrating Solution like hot Concentrated Sulphuric acid=saturated solution of chloride Zinc strong Hydrofluoric acid phosphoric acid[l] & other dehydrating agents[16]





AD, NjWOE, Lab., N-88-01-03.2 (*TAED* NA021AAB). [a]Obscured overwritten text. [b]Canceled. [c]Interlined above. [d]Drawing followed by dividing mark. [e]"for phono" interlined above. [f]Followed by dividing mark. [g]Illegible. [h]"can be made" interlined above. [i]"the asphalt… chlorinated" interlined above. [j]"material in a" interlined above. [k]Circled. [l]"phosphoric acid" interlined above.

1. Edison wrote "Caveat" and the date as a running head atop all but the first page of this draft. Much of the content of this caveat is related to Doc. 3334.

2. Figure labels are "dust," "air," and "Rake."

3. Figure labels above are "overflow" and "water."

4. Figure labels are "sieve" and "Reciprocating."

5. Figure labels are "air," "N," "N," "N," "S," and "S."

6. This mechanism appears to be intended to duplicate a recorded cylinder, on which the indentations are represented here as dashed lines, onto several blank cylinders.

7. Figure label is "Screws in to adjust."

8. Figure labels are "Link" and "center line prevent Canting dia."

9. Cf. Doc. 3342.

10. Artificial forms of sapphire and similar stones were not unusual at this time for jewelry and decorative purposes but were not being manufactured on the industrial scale that Edison evidently contemplated (Reinbold 1886). Descriptions of the process for producing sapphire recording and reproducing points can be found in Dickson and Dickson 1894a, 142, 145; see also "The Edison Phonograph Works," *Electrical Age* 11 (18 Mar. 1893): 166, and Doc. 3399.

11. Edison had included such a process in a phonograph caveat that he drafted but did not file in 1887. See Doc. 3101 esp. n. 6.

12. Edison made the large drawings below on three successive left-hand pages facing his text from the paragraph starting with "For phonograph points." On the supposition that they represent phonograph funnels (note the round reproducing point and square cutting point), the editors have chosen to reproduce them together at this related point in the text.

13. Figure labels are "b" and "a."

14. A sheet of unlined loose paper, apparently torn from a notebook, was placed between the pages at this point. Edison wrote on it:

> Shaving off Knife with determining bob—so always take right depth chip & not guess which causes sometimes thin chip not enough to shave previous talking off & other times more than necessary is taken off—

New clamp to clamp swing arm—
New double nut 100 thread arm on specticle to lift it [up?—]

At least several words appear to have been torn from the bottom of the page.

15. Figure label is "Cutout."

16. The drawings below seemingly have no relation to the preceding text, and the editors can only speculate that perhaps they have something to do with phonograph funnels. Edison made similar drawings a few pages later in this notebook, after the 15 June start of a draft caveat for an electric brake device. N-88-01-03.2, Lab. (*TAED* NA021AAC).

–3350–

From George Gouraud

LONDON, 4th May, 1889.[a]

My Dear Edison:—

Your letter of April 12th reaches me on my return from Paris.[1] If it were not that what you write is based upon a total misconception of the facts, I should feel deeply grieved, and obliged in justice to myself and to you equally, to enter into a lengthy explanation and defence of the policy which I have pursued, and the motives underlying it, both of which have been questioned by you. Considering, however, the second paragraph of your letter—page 2—where you give particulars concerning the information which has reached you, and in consequence of which you felt it necessary to write me as you have, it is certainly not surprising you should feel it as a grave necessity to place your views before me. I may add right here, that again considering these statements as the basis and occasion of your letter—unpleasant as it is to me to receive it—I am free to say that I can take no exception to it. It is a perfectly plain, straightforward expression of perfectly natural feelings resulting from such a statement of facts, and does credit to the writer of it. I only use the word "facts," because the feelings and opinions to which you give expression are made upon the assumption that the information which has reached you has been accepted as "facts": With this preface you will permit me to say that as the information in question is absolutely devoid of all semblance of fact either as regards my intentions or my actions, or my conception of your interests or my own, or my regard or disregard for your "personality," I exceedingly regret that you could not have first written to me the substance of what had reached you, and waited until my side of the question was before you before coming to a conclusion which reflects upon my judgment, my common sense, my self interest, my self respect, my honor, and, what

I value no less than all these combined, my sense of duty and loyalty, as well as my respect, which amounts to veneration, for the genius and character of the man who has trusted me with the placing before the world his greatest production—than which no other man has produced its equal—and over and above all this, his good name and reputation as well. It positively sickens me to think that you could suppose, or be led by anybody to suppose, that I held what you call your personality at the weight of a grain of sand less than you do yourself, or even than I do my own personality,[b] and which is as valuable to me as yours is to you; and which is so closely identified with yours as it make it utterly impossible that I could do any thing to injure you without to a far greater degree injuring myself. You will pardon my expressing myself so strongly, but I do so with the greater freedom after saying what I said in the beginning and now repeat, that stronger language than you have used would have been justified, and in fact, I could not have presumed to question or answer your criticisms were there slightest ground for making them; and thus I pass from the subject only thanking you for your moderation considering the supposed grounds from your observations, and I will at once proceed to tell you as fully as I can the true facts of the case.

I have from the first had the one thought actuating me, viz: to keep this Phonograph up to the high plane which it deserves as at once a masterpiece of Scientific accomplishment and an instrument of unequalled practical utility. I have over and over again refused large sums of money for the exhibition rights of the Phonograph for so-called "entertainment purposes," ~~for the simple reason~~. Notwithstanding that it might have put large sums of money into my pocket far beyond the large expenses which I have cheerfully incurred and of which also I have made no complaint to you, they have always been refused by me. To be more specific upon this point, I was offered £5,000 for one Phonograph with my duplicate copy of Gladstone's message to you,[2] for the purpose of making an exhibition of it, and it only, throughout the country at sixpence admission. I refused it. Is this consistent with the policy and action which have been attributed to me by your kind informant? Then, less than a week ago, I refused in Paris 100,000 francs, or 20,000 dollars, for one Phonograph to be used exclusively in France for the purpose of [reproducing][b] a speech to be made in England by Boulanger,[3] ostensibly for the edification and amusement of his admirers in France, but which would have been equally an attraction to many persons indifferent, or even hostile to him, who would have gone not to[b] hear Boulanger's voice so much as to hear and see the Phonograph. This offer I refused for reasons which concerned you personally, and in a manner on which no personal considerations on my part could possibly have entered, viz:—that had the first use of the Phonograph in France been used to circulate the speeches of a man who is trying to upset the Government of France, the Authorities would have been so prejudiced against you as that you must certainly have failed to get from your magnificent exhibit, honors, which otherwise will be conferred, and which I feel certain will be the highest that any one will receive. Was this disregarding your personality? Was this 'thinking only of myself and my pocket'? Is anything more needed, and could anything more be stated to show the absurdity of such a proposition? I am fortunately in possession of written evidence concerning this aspect of my policy in the shape of written proposals for the acquisition of the exhibition rights of the Phonograph. I can send you specimens of these when I look up my files for them. Theatrical Managers, and show-men generally, to the number of more than a score have plied me with proposals, offering me all sorts of sums from £100 to £1,000.

When you first telegraphed me that Edmunds sailed, and that he intended bringing the Graphaphone before the Scientific Societies, as I advised you at the time before I went to bed that night a courteous letter embodying the offer of the Phonograph for that purpose to be presented either by a member of the Society or myself was posted to every society of any importance in England.[4] For this all sent a grateful acknowledgment, many accepting at once, and others for the ensuing Season. I myself as you have been informed presented the subject in person where, and only where, I was especially desired to do so. Nearly 100 invitations subsequently reached me, asking me as a professional matter to lecture on the Phonograph before Scientific and Literary Societies. Lecturing, however, being neither my business nor my inclination, and feeling that these Societies should be gratified in the interests of the Phonograph and its author, I, after great care, finally settled upon a gentleman as Lecturer, an M.A. of the University of Oxford, Professor E. Douglas Archibald,[5] who had for many years occupied a chair in the Government Educational Department of India at a salary of £1,500. He is a gentleman of manners and appearance, and I paid a large salary and expenses for several months and finally give him the use of the Phonograph with an expert of Hamilton's education and selection to accompany him and be responsible for the condition and operation of the Phonograph. That arrangement has resulted in lectures having been delivered before nearly all the Public Schools, and very numerous Scientific and Literary Societies in all parts of the country. In all, I think over 100 lectures have already been delivered in this way.[6] During the Christmas Holidays the Phonograph was lent to Hospital and Charitable Institutions for the benefit of their charities, only the lecturers fee and expenses of attendants being deducted from the receipts.[7] In a word I am not aware of any instance in which the Phonograph has been set up, as your informant implies, as a "Punch and Judy Show."[8] In all these exhibitions and lectures the press comments have been uniformly all that could be desired with the single exception of the "New York Herald" which was truly unjustifiable, and for which the Editor apologised by saying that it had escaped his notice or it would not have been published.[9] All this time the London Stereoscopic Company[10] were advertising broadcast "Edison's Phonograph" in the most sensational way in the city, the West End, and worst of all at the Westminister Aquarium[11]—a veritable English Barnum show[12]— where for a sixpence the Phonograph of 1877 was whistling and screeching in a chorous of monkeys, and in the company of Swimmers, Boxers, and Circus performers generally.[13] I have to-day paid an advertising bill of £134-4-7, a great portion of which was spent in cautioning the public against mistaking the Phonograph advertised, 29109, 1877, with the Phonograph of to-day, in which interest is so universal.[14] I was hearing adverse comments on every hand, prejudicial to yourself and the Phonograph, resulting from the disappointment which people experienced in going to see this widely advertised "singing, whistling and talking machine"[15] at 8d admission. I could do nothing more than caution the public as I did, plus having the Phonograph, as it now is, shown as widely and as constantly as possible under the dignified circumstances of explanations by Scientific men with diagrams illustrative of its principles and practical applications to be used in the day-time, and lantern illustrations by lime-light at night. Although something is said at the beginning regarding the laws of Acoustics and the Scientific features of the apparatus, its practical utility and commercial uses are made the chief subject's of the Speaker, and I am perfectly certain that no man or woman have heard any of these lectures without being impressed with that aspect of it above all others. Its musical side of course is of great interest Scientifically, and cannot help at the same time being amusing, but the cock-crowing and whistling are made the least prominent features of the whole. Besides the London Stereoscopic Company there is, and has been, going over all the country a company of Bell-ringers, who advertise an exhibition of "Edison's Phonograph" ringing in the changes[16] chiefly on singing and whistling. I cannot prevent them because anybody who is in possession of an old Phonograph is perfectly free to do with it what he likes. It is Edison's Phonograph, and I cannot enjoin them against so calling it. I have written them cautioning them against deception, and have also written to the local papers of the districts where they were advertised to exhibit, pointing out that this was not Edison's latest Phonograph. The latest advertisement by this same Bell-ringers was styled "Edison's Improved Phonograph." Of course they were at once threatened with legal proceedings unless they withdrew it, and they have now done so. Now you will see from all this that mine has not been a bed of roses, and I hope you will have the fairness to see, and the justice to acknowledge that you have been mistaken in your conclusions.

I will now conclude by saying that when the time comes that I so change my nature as to be capable of conducting either myself or my business other than as a gentleman and only as a mountebank, or when I can forget what is due to you in every particular under the important and responsible relation between us, you will be justified in your observations and be entitled to seek remedies which will be always open to you; but should any such occasion again arise—as I sincerely trust may not be the case—before being influenced by others and forming conclusions upon one side only, you will do me the favor and the justice of asking from me any explanations you may desire, and you may rely[c] upon my readiness to inform you, and to take equally the responsibility and consequences of my acts, which you would be the last man to doubt or question under any other circumstances.[17] Yours sincerely

G. E. Gouraud.

TL, NjWOE, DF (*TAED* D8959ABD). Letterhead of Edison's Phonograph Co. [a]"London," preprinted. [b]Interlined above by Gouraud. [c]Repeated at bottom of one page and top of the next.

1. Edison's letter is Doc. 3343. Gouraud also replied separately on this day to a related letter from Edison about phonograph arrange-

ments in Paris. Gouraud to TAE, 4 May 1889, DF (*TAED* D8946ABI); see Doc. 3363.

2. William Ewart Gladstone (1809–1898), British author, orator, and former prime minister (1868–1874, 1880–1885, 1886) remained a prominent member of the opposition Liberal party. He recorded a greeting to Edison in December, perhaps not for the first time. Noted late in life for his friendly views of the United States, Gladstone praised Edison and the nation extravagantly. Gouraud's copy of that recording was among the cylinders that Hugh de Coursey Hamilton played multiple times for the Prince and Princess of Wales and other members of the royal family in January (*Oxford DNB,* s.v. "Gladstone, William Ewart"; Gladstone to TAE, 18 Dec. 1888; Gouraud to TAE, 22 Jan. 1889; both DF [*TAED* D8850AEI, D8959AAF]; see Doc. 3221 n. 5). Gouraud recorded a number of cylinders for Edison at that December affair. Most are at NjWOE (accession E-2339) but Edison reportedly kept Gladstone's at Glenmont, though a transfer copy made later is also at NjWOE (Quinn n.d.; accession EDIS 561).

3. A French general and leader of a popular political movement, Georges Ernest Jean-Marie Boulanger (1837–1891) fled his homeland on 1 April 1889 under threat of arrest for treason. After a stay in Brussels, he arrived in London on 24 April amid reports that he would soon "issue a manifesto, probably in the form of an electoral letter, explaining the reasons which induced him to leave Brussels, and indicating his immediate intentions." *Ency. Brit. online,* s.v. "Georges Boulanger"; "General Boulanger in London," *Reynolds's Newspaper* (London), 28 Apr. 1889, 5; "General Boulanger's Arrival in London," *Birmingham* (England) *Daily Post,* 25 Apr. 1889, 8.

4. See Doc. 3231.

5. The son of a lawyer and judge, Edmund Douglas Archibald (1851–1913) completed his bachelor (1874) and master (1879) degrees at Oxford, apparently in mathematics. He went to India, where by 1881 he appeared in the civil service lists as a professor at Patna College. He took up meteorological research in India, using kites in measurements of wind speed, developing a kite balloon, and (he later claimed) experimenting with aerial photography. He also worked on the report of the Royal Meteorological Society (of which he was a fellow) on the eruption of Krakatoa. He was elected to the British Association for the Advancement of Science in 1884 ("Obituary," *Quarterly Journal of the Royal Meteorological Society* 40 [1914]: 79–80; India Office 1881, 72a–73; Foster 1888, 29; British Association 1889, 8; Archibald 1897, 185). Archibald may have begun lecturing for Gouraud in October 1888, though Hugh de Coursey Hamilton, who trained him, recalled his debut at an Inventors' Institute lecture in London on 7 November. Archibald continued to lecture in England, Scotland, Ireland, and the Continent until early 1890, when he left for the U.S. in preparation for a tour that would introduce Edison's perfected phonograph to Australia and eventually to New Zealand, India, Burma, Ceylon, Singapore, and Java. After attending the 1893 Columbian Exposition in Chicago, he returned to his previous career as a meteorologist and educator (Archibald to TAE, 22 Apr. 1891; Hamilton to TAE, 18 Dec. 1888; both DF [*TAED* D9149AAV, D8850AEJ]; "The Phonograph,"*Engineer* 66 [11 Nov. 1888]: 400, Clippings [*TAED* SC88117A]; Alfred Tate to

Archibald, 25 Mar. 1890, Lbk. 39:72 [*TAED* LB039072]; Burgis 1990, 4; Suryadi 2006, 273–4; Reese 2017).

6. William Lynd, an electrician and former editor of the *Electrical Review,* was also lecturing for Gouraud in Scotland. Gouraud to TAE, 4 May 1889, DF (*TAED* D8959ABC).

7. A form distributed by Gouraud for Edison's Phonograph Co. (London) required organizers of such events to "name the sum they are willing to guarantee in order to meet the Lecturer's fee, exclusive of travelling expenses, and transport of apparatus. It is Colonel Gouraud's desire that the remainder of the next proceeds" should go to "some charity to be mutually agreed upon," and the promise of a donation was part of the advertising for each event. Archibald's presentations for such programs included "Explanations and Practical Demonstrations, Illustrated by Lantern Slides, &c." One such event was held on 21 December at the Westminster Town Hall to benefit the local branch of the Metropolitan Association for Befriending Young Servants. Another, on behalf of the Wesley Scientific Society in London in early 1889, resulted in "a serious loss to the funds of the Society." These programs attracted criticism in the newspaper *Truth* because the financial arrangements seemed more advantageous to the phonograph interests than to the charities. Yet they continued, and one such event in 1890 led by William Lynd was advertised as "a sure draw when church funds are required." Edison's Phonograph Co. circular letter, n.d. [1888?], DF (*TAED* D8850AFC); "Phonographs At Homes for Christmas Charities," *Morning Post* (London), 15 Dec. (p. 4) and 27 Dec. 1888 (p.1); "Edison's Perfected Phonograph," *Morning Post,* 17 Dec. 1888, 4; "The Wonderful Talking Machine," *The Standard* (London), 16 Mar. 1889; "Edison's Perfected Phonograph," *The Wesley Naturalist: Monthly Journal of the Wesley Scientific Society* 3 (Mar. 1889): 28; "Entre Nous," *Truth,* 25 (11 Apr. 1889): 662; "Miscellaneous," *Guardian* (London), 1 Oct. 1890, 1546.

8. Punch and Judy shows were hand-puppet entertainments popular in the United States and Britain in the nineteenth century. The adult versions could skirt the edges of subversion and anarchy, to the offense of some moral opinions. The editors have not found similar allusions to Gouraud's phonograph demonstrations as Punch and Judy shows, though years before the phonograph had been part of programs with minstrel and Punch and Judy performances in Reno, Nev., and Salt Lake City, Utah. Howard 2013, s.v. "Robertson, Mr."; *OCTP,* s.v. "Punch and Judy."

9. The editors have not found the *Herald* article, to which Gouraud referred again in acknowledging Edison's reply (Doc. 3363). Gouraud to TAE, 14 June 1889, DF (*TAED* D8959ABW).

10. The London Stereoscopic & Photographic Co. started during the stereoscopic photography boom of the 1850s and remained a source of photographic imagery, apparatus, and chemicals. It acquired the rights to Edison's original phonograph patent in the British Isles in 1878. The status of its licensing rights fell into dispute and was unresolved in December 1887 when its clerk inquired about Edison's improved phonograph and reminded Edison of its potential claims on any new business. The company relaunched its advertised demonstration of the old tinfoil phonographs in late 1888, when it also filed a notice of

opposition to Edison's new British patent. It withdrew its opposition in January 1889. Hannavy 2008, s.v. "London Stereoscopic Company (c. 1854–1922)"; Docs. 1237 nn. 1 and 7, 2909 esp. nn. 15, 17–18; "Advertisement," *Morning Post* (London), 19 Dec. 1888, 1; Samuel Clark to TAE, 8 Dec. 1887; London Stereoscopic and Photographic Co., notice of opposition," 18 Dec. 1888; Gouraud to TAE, 22 Jan. 1889; all DF (*TAED* D8751AAM, D8850AEK, D8954AAG).

11. That is, the Royal Aquarium and Summer and Winter Garden, a palatial entertainment complex on Tothill St., near Westminster Abbey. The developers were publicly humiliated when the unfinished Aquarium opened in 1876 without an exhibition of fish; at that time, a portrait studio of the London Stereoscopic & Photographic Co. was among the many as-yet-unready features. Subscribers who had paid for the inaugural season quickly lost confidence in the Aquarium's intentions as an institution of arts and education; it soon became mainly a place of popular entertainments and so-called sensational attractions, although it was not devoid of reputable events, such as an 1883 electric lighting show that included Edison equipment. By the late 1880s, the Aquarium was a magnet for sex workers and the target of anti-vice crusaders. J. M. Munro 1971, 8–26, 32, [39] fig. 6, 53–55; Dickens, Jr. 1879, s.v. "Royal Aquarium"; "Royal Aquarium," *Sci. Am. Supp.* 1 (1 Apr. 1876): 216–19; "European Topics," *NYT,* 12 Feb. 1876, 1; Doc. 2342 n. 11; Hutchings and Hueffer 1909, 2:557.

12. The Royal Aquarium was more than a colloquial example of Barnumism. In 1877, P. T. Barnum himself appeared at its theater to lecture on "The World, and How to Live in It." The original human cannonball act, Madame Zazel, was the first big money-maker for the Aquarium before Barnum signed her for his own show. Showman and whale-catcher Zack Coup performed with both the Royal Aquarium and Barnum. Dickens, Jr. 1879, s.v. "Royal Aquarium"; Barnum 1882, 328–29, 340; Slout, s.vv. "Coup, Zak" and "Zazel."

13. Attractions at the Royal Aquarium in late February, when the London Stereoscopic offered daily demonstrations there, included "the Baldwin Monkey, descending 100 ft. with a parachute," "Quickman, the champion whistler," and "Professor Beckwith's Troupe of Young Lady Swimmers." In at least one instance, the newspaper advertisement for Archibald's "Popular SCIENTIFIC LECTURE" was sandwiched between announcements of the London Stereoscopic's shows at the Aquarium. "Advertisement," *Times* (London), 25 Feb. 1889, 1; "Advertisement," *Morning Post* (London), 25 Feb. 1889, 1.

14. The London Stereoscopic Co. advertised that the phonograph of Edison's original British patent (no. 2,909 of 1877) was the only one to have patent protection in Britain. Gouraud had by this time responded with his own advertised "CAUTION" that "numerous instruments of the old familiar type of ten years ago are extensively being advertised and exhibited, to the disappointment of all such as naturally expect to see 'the Latest Phonograph.'" In June, he obtained an opinion from London solicitors Bircham & Co. to the effect that although "the license to the Stereoscopic Company and everything in it is at an end," there were no legal grounds to challenge the ongoing exhibitions. "Advertisement," *Morning Post* (London), 19 Dec. 1888, 1; "Advertisement," *Standard* (London), 15 Mar. 1889, 1; "Advertisement," *Times* (London), 10 Jan.

1889, 1; Gouraud to TAE, 16 May and 11 June 1889; Bircham & Co. to Gouraud, 4 June 1889; all DF (*TAED* D8959ABM, D8954ACH, D8954ACI).

15. Gouraud quoted from the London Stereoscopic Co.'s advertisements. See, e.g., "Advertisement," *Morning Post* (London), 25 Feb. 1889, 1.

16. To "ring the changes" was a contemporary slang expression for trading good money for bad, and it was sometimes used as a pun specifically in connection with bell-ringers giving small change for larger coins. *DSUE,* s.v. "ring the changes."

17. Doc. 3363 is Edison's reply to this letter and the other sent by Gouraud the same day (see note 1).

–3351–

Memorandum to Charles Batchelor: Phonograph

[Orange,] May 7, 1889.

NOTES FOR MR. BATCHELOR in replying to attached letter from Milwaukee, dictated by Mr. Edison.[1]

The battery now sent out with the phonograph is only temporary.[2] The amount of work necessary to get the phonograph out has been stupendous, and we had no time to fool away on getting a proper battery; hence we were compelled to send out an ordinary type of battery, which we know is not of much value. Your people should I think be notified that the battery is only a temporary makeshift, to permit them to get into business. I am now putting up a building, and making the machinery, to turn out a proper battery for the phonograph.[3] This battery is about twice the size of the present cell, and instead of lasting ten hours—or a couple of days in ordinary practice—it will last 30 days, and by renewing the fluid will last 20 days longer.[4] In other words, it will give fifty days good ordinary service, and the renewal process is very much simpler than with the present battery.

Regarding the warping of thick cylinders, I wish to say that the thick cylinders do not warp. The error comes from the fact that the inside of the cylinder gets dirty from wax and other things, and the thread ends[5] becoming loose, produces an eccentricity, apparently, but not real. If the cylinders are kept properly cleaned inside, they will not be eccentric. I might say in respect of phonograph blanks that we have had to pay more attention to the phonograph than the blanks. We fully appreciate the fact that the Company should be supplied as soon as possible with single record blanks, and we are getting everything ready to turn them out in large quantities, and if your people will exercise a little more patience, every complaint and defect will be remedied. We are well aware that there are defects in the phonograph, and we are striving to eradicate them, and to do the best for all concerned, as rapidly as human flesh can stand it.[6]

The class of complaints that we would like to get, would be not generalities, such as the battery is not good and cylinders are defective—facts which we know already—but mechanical and little defects in the mechanism of the phonograph. These are defects which we cannot find out ourselves, and which practice alone will bring out. These are the kind of complaints that we are anxious to get hold of.

The following are my answers to the questions asked in the Milwaukee letter:—

(1) The battery which is being sent out at present is only a temporary one.

(2) One charge of the battery, as per directions, should run the phonograph up to speed for 12 consecutive hours.

(3) Battery does not need to be given a chance to recuperate. If the solution has been made and used as directed, it will run 12 hours in the aggregate, whether run continuously or otherwise.

(4) We have been to work on a new battery, and have got it perfect, and are getting ready the apparatus for manufacturing it. The battery will last 25 days, 4 hours a day, and on second renewal, 20 days, 4 hours per day. The battery retains nearly its full strength up to the last hour.

(5) Will not discuss this question re present battery.

(6) D[itt]o Do Do

(7) Do Do Do

(8) Implies that the battery will fail &c. &c., and suggests treadle attachment. This is entirely unnecessary, as with a proper battery the phonograph will not give out more than once in a year. The parties remark that three glasses from the recorder and reproducer[7] were broken in shipping the machines, and asks if you will please send him three more. I suggest in this connection that it is a great mistake in the case of a recorder and reproducer to order broken parts, and have the parties, who do not understand the little fine points put them in. The proper way to do when the glass of a transmitter or receiver is broken, is to put it in a small box and mail it to us, when we will return it in good order; otherwise through carelessness &c., half of transmitters being put together badly, will give very poor results. They ask for two spectacles of the

latest style phonograph to place upon two old machines. This cannot be done. I have understood that the old phonographs should all be recalled, and after they are recalled we can fix them ourselves and send them out as new phonographs.

(9) We shall be able to ship some of these single record cylinders in a couple of weeks.

(10) With single record cylinders it will never be necessary to set the reproducer, therefore it is not necessary to raise the jig-back.[8]

(11) The recorder and reproducer adjusting screws; in adjusting these you will never cut the record, providing you do not leave more than one record on the part of the cylinder and forget to turn it off, or if the drum of phonograph is kept so dirty and the interior of the cylinder so dirty, that it runs it badly. A properly worked phonograph will never have its record cut. We understand perfectly that these machines are to go into the hands of "green horns" ultimately, and we would also like to call your attention to the fact that even the parties in Milwaukee are "GREEN HORNS," and they are just as green as the public. After a while, of course, they will become EXPERTS. I wish you to say that I cannot for the life of me understand how these Milwaukee parties can do as well as they have done with the new phonographs, without receiving some explanation.

(12) It has been the habit to run the cylinders at 150 for music. Hereafter, all music will be taken at not higher than 125 revolutions. The amount of words that can be recorded on present cylinder, depends on the speed. If the Milwaukee people will slow their phonograph down to 75 or 80, they will find their talking just as good, and they can get double the number of words on the cylinder.

Replying to the remarks on the "annex" to the letter, I would say that we will not discuss the battery; that has been explained. He says that the utmost care is required not to cut the record out. There must be something radically wrong with the Milwaukee parties, because every phonograph sent out from the factory is so adjusted that if a customer fails to trim down the latter half of the cylinder, the adjustment is such that it will turn that off without cutting record. In addition to this, it will not only permit them to turn off half the cylinder, but it will allow a very considerable eccentricity in the cylinder. He makes a statement and says, "Suppose he sets the spectacle down a little hard." Now, allow me to state that an expert teaching an outsider—if he taught him properly—with the universal joint screw at hand,[9] there is no possible way he could set it down hard, as stated. The little dent is not necessary to be made, for the reason that if the party is told that when he sets it down to be careful and have the cylinder tight &c., the dent is prevented from being made.

I think I will stop here. I could go on for a week answering this kind of a letter, but it would be useless. The letter is simply the judgment of a man who does not know how to work the machine. I should advise the Wisconsin Phonograph Co.,[10] if they want to work the phonograph properly, to send on a man up here.

Thomas A. Edison M[aguire].

TD (letterpress copy), NjWOE, Lbk. 29:325 (*TAED* LB029325). Signed for Edison by Thomas Maguire.

1. The letter to which Edison was replying was forwarded to him on 6 May by Jesse Lippincott with his own letter; the editors have found neither of them nor a response from Charles Batchelor. It apparently was from the Wisconsin Phonograph Co. in Milwaukee, which again protested to Lippincott about the phonograph battery a short time later; theirs was among a number of complaints that the battery was essentially "worthless" (Henry Goodwin to North American Phonograph Co., 15 May 1889; Michigan Phonograph Co. to TAE, 29 May 1889; both DF [*TAED* D8963AAN, D8963AAP]). Edison responded to Lippincott on 7 May, assuring him that he had delegated the reply to Charles Batchelor. He also promised that the battery being shipped with phonographs was only a temporary stand-in and a better version would soon follow, as would improved "Single Cylinders," presumably meant to be recorded on only once. And he took the opportunity to impress upon Lippincott the value of trained experts:

> The phonographs are being shipped all over, and to parties who know nothing about the late devices. Several paragraphs in the Wisconsin letter show me that the writer doesn't understand the machine. No one but the Almighty can tell a man how to work a machine by mail. You will have lots of this for several months to come, and instead of being an immediate success, it will take time. About $10,000 spent by the North Am. Phonograph Co. in experts would have saved $50,000, and made a success. I have brought out too many things in the last twenty years not to know that on the start, experts are everything. [TAE to Lippincott, 7 May 1889, Lbk. 29:323 (*TAED* LB029323)]

The North American Phonograph Co. published a series of instructional sheets for using and adjusting the phonograph in or about 1889, the complexity of which would seem to justify Edison's opinion (all CR [CA028A, CA028B, CA028B1, CA028C, CA028D]).

2. In drafting a response about a week later to a similar complaint, Edison wrote that the present battery was "simply a Grenet cell & has all the defects of ordinary batteries" (John Butterfield to TAE [with

TAE marginalia], 13 May 1889, DF [*TAED* D8963AAM]). It is unclear if the bichromate battery provided with the phonograph incorporated any improvements to the standard Grenet cell resulting from Edison's experiments on chromic acid batteries, but likely there were changes to the proportion of chromic acid, sulphuric acid, and water in the solution, as well as the percentage of mercury in the zinc-mercury electrode (the other electrode was carbon). The exact proportions of those used in the standard phonograph battery were described in a journal entry by Charles Batchelor at the beginning of February 1889. He also indicated that the battery suffered from defects in the zinc electrode, and soon after Arthur Kennelly noted that "the agglomeration of zincs is I fear inherent in all forms of chromic acid batteries that are long at work" (Cat. 1235:91 [item 1400, 1 Feb. 1889], Batchelor [*TAED* MBN012091A]; Tate to Kennelly, 12 Feb. 1889; Kennelly to Tate, 12 Feb. 1889, DF [D8968AAB, D8968AAC]; for experimental work on chromic acid batteries see Doc. 3136. Edison had decided by 21 March that chromic acid batteries were too unreliable (see Doc. 3329). However, he had not yet developed a replacement battery, and the Edison Phonograph Works continued to supply chromic acid batteries with the phonograph. In fact, as late as the end of July, the North American Phonograph Co. offered its subsidiary companies a choice among the chromic acid battery, the new Edison-Lalande battery, and the Pummelly storage battery (North American Phonograph Co. Price List of Supplies, 28 May 1889, DF [*TAED* D8962AAG]; North American Phonograph Co. Price List of Supplies, 1 July1889, PPC [*TAED* CA027A]; Pumpelly Storage Battery and Electric Motor Co. to New Jersey Phonograph Co., 18 July 1889; North American Phonograph Co. to New Jersey Phonograph Co., 29 July 1889; both DF [*TAED* D8963ABC, D8962AAM]).

3. Edison referred to the new plant at nearby Silver Lake, N.J.; see Docs. 3372 n. 10.

4. Edison meant the Edison-Lalande battery (see Doc. 3353 fig. 94). He soon planned to make it in several sizes to last from one to six months, with the addition of fresh water to extend the life another thirty days. TAE to Louis Clark, 11 June 1889, Lbk. 30:294 (*TAED* LB030294).

5. Edison probably meant the large end of the tapered wax cylinder, which fit over the thread end of the solid mandrel; that is, where it attached to the threaded spindle.

6. In August, the Edison Phonograph Works compiled dozens of known operating problems, together with their causes and remedies, into a printed "Inspector's Handbook of the Phonograph." The booklet was based in part on Edison's two undated handwritten drafts (75 and 13 pages in length) of problems and likely solutions. Edison Phonograph Works, Aug. 1889, PPC (*TAED* CA025B); Edison drafts, n.d. [Aug. 1889?], DF (*TAED* D9899AAS2, D9899AAS3).

7. The "glasses" were the diaphragms, which continued to be made of glass for years. Cf. Docs. 3186, 3201, and 3202; Tewksbury 1897, 81–85.

8. That is, the mechanism for engaging the recording or reproducing head with the feed screw to return it to a different point on the cylinder.

9. Edison probably meant the swinging adjustment screw on the new spectacle, intended to automatically set the recording or reproducing

point at the correct depth. North American Phonograph Co. instruction sheet, 1889, CR (*TAED* CA028A).

10. The Wisconsin Phonograph Co. was incorporated in August 1888, part of the first wave of regional affiliates of the North American Phonograph Co. Chartered to lease and sell phonographs, graphophones, and similar equipment, it was based in Milwaukee and managed by Henry Goodwin. Wisconsin Secretary of State 1888, 282; "Western Notes," *Electrical World* 14 (2 Nov. 1889): 300.

–3352–

From George Gaston

Detroit, Mich. May 9" 1889.[a]

Dear Mr. Edison:—

Indications are that nearly the entire demand in cities will be for motors run from Light current, especially business offices. A number of machines are now in operation here, and the first objection is to the battery. Believe it would be a good suggestion to hurry this form of motor. Our Company has placed an order for forty this style.

<We shall soon fill your order>

A minor complaint is that the listening tubes hurt the ears. Shall you ~~finish~~ FURNISH[b] head pieces with ear caps for typewriters?[1] It will help.

<We will be able to furnish a number of accessories as soon as we supply the[c] Howlers[c] with phonoghs>

I think some are going to prefer thin cylinders, so that they will not have the bother of adjustment. With the exception to the above objections the machines that are now in use are giving satisfaction. And I believe that with the improvements that are to come, the future is very bright.

<The second thousand machines will have auto adjustments.—>[d]

<Please keep us posted on defects in details— E[dison]>[2]

Yours truly,

Geo. B. Gaston[3]

Dictated to the Phonograph.

TLS, NjWOE, DF (*TAED* D8963AAL). Letterhead of Michigan Phonograph Co. [a]"Detroit, Mich." preprinted. [b]Interlined above by hand. [c]Obscured overwritten text. [d]Followed by "over" as page turn.

1. That is, for typists.

2. Alfred Tate used Edison's comments as the basis for his own typed reply to Gaston on 16 May. Lbk. 29:430 (*TAED* LB029430).

3. George B. Gaston (1858–1942) was the son of a prominent Indianapolis physician. His sister, Grace "Daisy" Gaston, had social

connections with Ezra and Lilian Gilliland and met Edison at the Gillilands' summer cottage in 1885. George had relocated from Chicago with his business partner, Converse Marsh, to enter the phonograph business in Detroit about thirteen months earlier. Docs. 2824 n. 3 and 3275 n. 10; Find A Grave memorial no. 45905738, online database accessed through Findagrave.com, 13 Feb. 2018.

–3353–

Draft Caveat: Miscellaneous[1]

Orange NJ May 12[–]15 1889[2]

Phonograph Caveat

Fig 1 shews a modification of Sir William Thomsons Tray battery[3] arranged to run the phonograph continuously[a] for a number of days which it will not do as at present constructed 1 is the phonograph 10 is the lead lined trough 9 wooden seperating strips 4 the Zinc grid 12 parchment paper[a] between the grid and the Leaded bottom & arranged just under the Zinc grid & wooden pieces. 11 is an open chimney which is keep full of blue Vitrol Crystals 3 is an overflow tube leading into an overflow chamber 2— 5 is a reservoir of fresh water with a fine Capillary End over the trough, 6 is an arm Supporting the reservoir, 8 is an electro magnet & lever which serves to close a Valve of soft rubber. The Reservoir being filled with water the spring[4] on the magnet lever holds the valve closed & thus prevents water passing from the Reservoir to the battery. The battery is at first filled & short~~ed~~ circuited a few hours before using— If now the phonograph is started the magnet 8 lifts its lever off the Valve opens air is admitted & water is supplied to the battery any Excess being prevented by the overflow pipe. by this means the water surrounding the Zinc grid is prevented from becoming saturated with sulphate of Zinc & the battery is constant

<Fig. 1>[b]

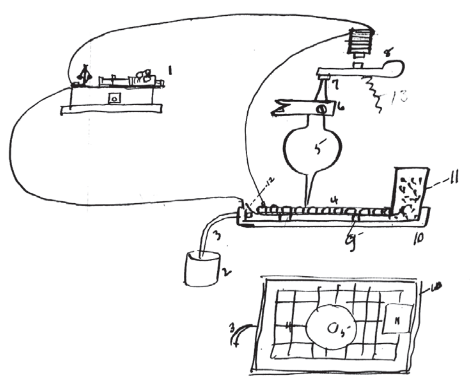


Fig 2 shews a phonograph arm containing the Recorder & Reproducer arranged to shift & be brought into position not by the swinging of a spectacle as now but by rotation.

fig 2

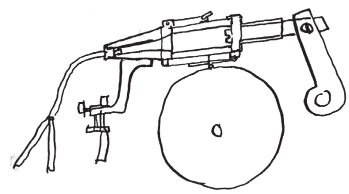


Fig 3 shews the Recorder & Reproducer rotated like a monitor of a screw machine[5] so as to bring one or the other into position for work quickly—

fig 3

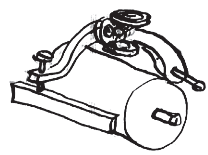


Fig 4 shews a partial rotation or side swing spectacle like movement of the Recorder & Reproducer.

fig 4

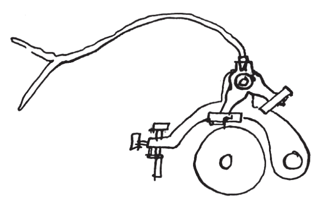


Fig 5 shews the position screw for determining the rotation between the Record blank & the points on the Reproducer or Recorder—a spring X between the revolving point & blank prevents indenting & thus[6]

fig ~~4~~5

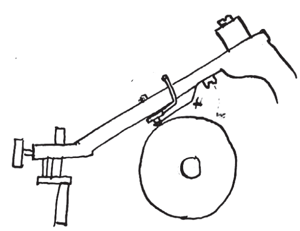


fig 6[7]

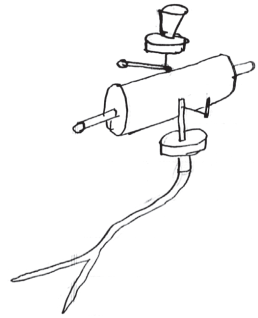
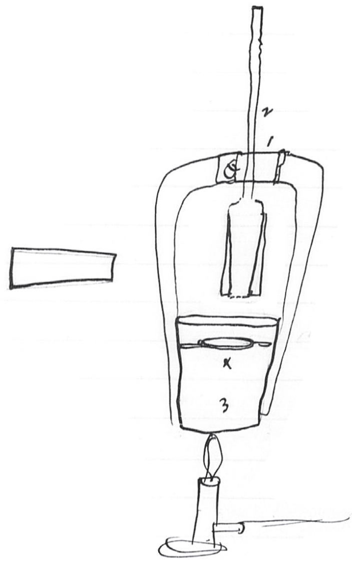


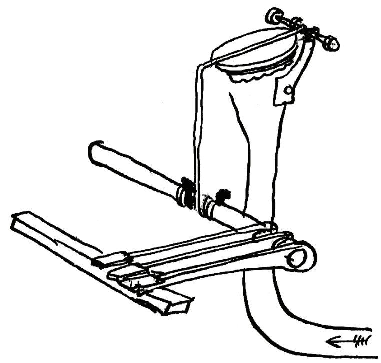
fig 7[8]



by a hinge serves to permit the shell to descend acurately through the ring X without touching 3 is the reservoir of melted material

Fig 8 is a musical instrument[c] Operating one of Helmholz artificial Larynx's[9] It is provided with a Constant source of air like an organ. The two Cords which form the edges of the slit are the vocal cords and their tension is controlled by Keys. The Keys being depressed to different depth as shewn in fig 8½ Vibration of every Kind of[a] pitch within the human Voices limit are producable by the keys—

fig 8



8½

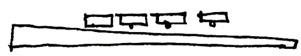


Fig 9 shews a Siren worked by explosions of small quantities of oxygen & Hydrogen mixed in explosive proportions. A[a] rotary wheel 3 is provided with chambers— a Tube 2 leads to the Reservoir of Explosive gas under slight pressure The chambers are filled with gas as they successively pass the tube 2 but the gas is Liberated at 1 where it is exploded by the incandescent platina wire

fig 9

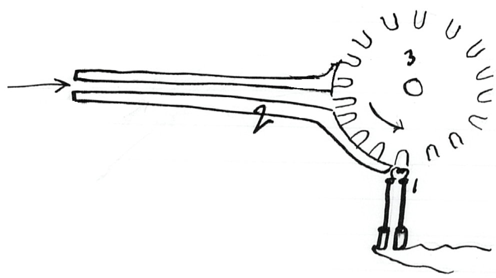


fig 10 shews a device for projecting sound waves to a distance without spreading & in a straight Line—on the principle of smoke rings from apertures. The Voice direct or any Sources of Sound or a magnet making Vibrations Corresponding to sound give motion to the bottom of the chamber which is a diaphragm— two pipes lead into the[a] chamber; from bottle 1 comes Hydrochloric acid gas from No 2 comes ammonia gas the two gases meeting within the chamber form clouds of chloride of ammonia which resembles & acts like tobacco smoke. sound waves acting on the diaphragm form smoke rings which are projected to considerable distances with great rapidity & in a straight line.

fig 10

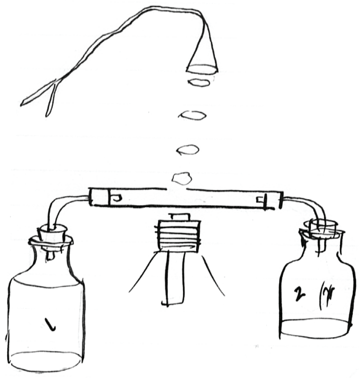


Fig 11 shews a battery. 2 is the Zinc formed of Zinc mercury alloy suspended in a glass jar & extending down into a parchment paper porous [--][d] cell secured to the opening in the bottom of the jar E C is a Carbon Cylinder immersed in a solution of an oxiding agent like Bichromate of Potash in sulphuric acid— The latter liquid is filled up to the same heighth as the liquid in the inner glass jar & porous Cup which liquid is a 15 percent solution of Sulphuric acid in water.

Very Little tendency to diffusion takes place & a powerful Element is obtained owing to the low resistance of the parchment paper pores.—

fig 11

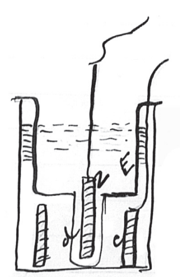


fig 11

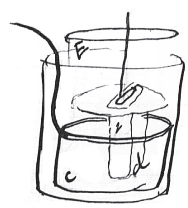
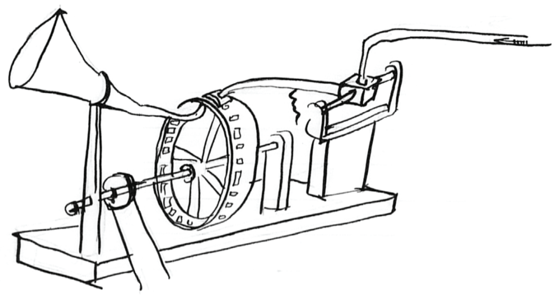


fig 12 shews another form of siren which can be made to give Vocal sounds, music or articulate speech. a Revolving which[10] a foot or more in diameter is coated with Lamp black & with a tracing point connected to a diaphragm a sinuous wave on the surface of the cylinder near the edge is obtained A[a] workman translates these curves into perforated slits through the rim some narrow some wide. over the surface & resting on it is a plate[a] fitting close to the cylinder & is provided with a slit leading to a pipe in which there is steam or air under great pressure. a similar plate [--][d] runs under the Rim & is provided with a slit & connected to a large funnell The whole is run by power

fig 12



~~F~~fig 13 shews the same device with a long perforated strip of paper or thin metal.

fig 13

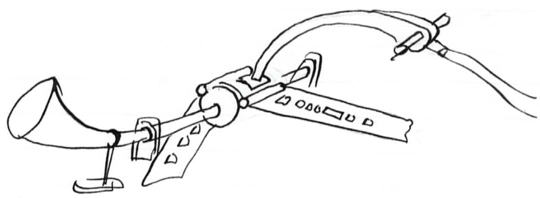


fig 14 shews the method of laying out the slits or orifices to correspond to the sinuous waves Originally traced by the point & diapram vibrated by sound of any character.

fig 14

~~F~~fig 15 shews a device similar to fig 13

fig 15

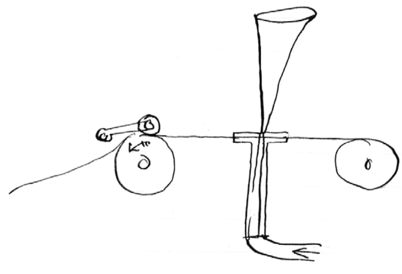


Fig 16 shews a method of continuously indicating on a galvanometer the depths of the ocean the Log being supplied with a continuous Current from a few cells of constant battery forms one pole & the ship the other. The Resistance of Earth being greater than equal quantity of water the gradually interpolation in the circuit of Earth as the boat approaches shallow water is indicated on the galvanometer[11]

fig 16

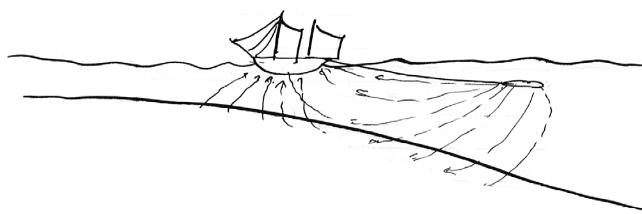


Fig 17 shews a method of preventing in a great measure friction of the water against the hull of ship & thus Either increases their speed or diminish coal consumption & incidentally prevent fouling by barnacles— It consists of a Dynamo in the steamer one pole being connected to the ~~h~~Iron hull of the steamer & the other to a long piece of sheet iron fastened to the Side of the vessell & offering its ends only to the water thus preventing retardation. It is essential that Hydrogen should be eliminated on the hull of the ship— If [---][d] then [------][d] Zinc sheet is substituted for iron the strength of the current is greatly increased—

Fig 17

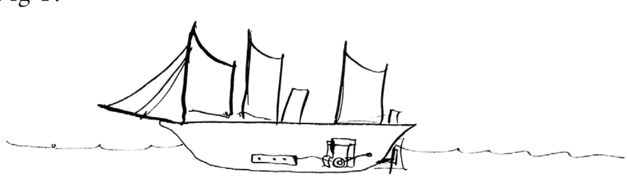


Fig 18 shews a long soft iron magnet charged by a Dynamo or magnet the armature of which is [--][d] an iron or steel shaft or bar the object being to test for flaws by disturbances of equal magnetic field any disymetry of distribution of magnetic field is detected by the magnetometer or by a revolving Coil giving induced Currents & thus a flaw in the steel or iron can be Located if any there are—[12]

fig 18

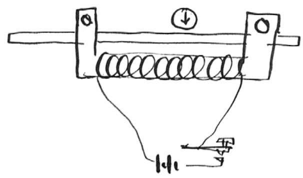


Fig 19 shews a form of telephone Receiver wherein the slight expansions & Contracted a la Trevellyn Rocker[13] at the points of Contact between two metals due to the heating of the juncture by passage of electric waves corresponding to sound waves is amplified by leverage so that considerable amplitudes are given the Receiver diaphragm X is the material say Tellurium—a Sulphuret a phosphide, Zinc Bismuth & antimony & various combinations of metal & conducting compounds

fig 19

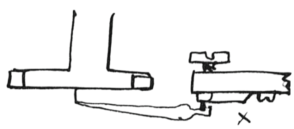


Fig 20 shews method of telegraphing at Sea Each steamer is provided with a ~~clo~~ port hole closed by a diaphragm & flush with the sides of the ship so there is no disturbance of water. Back[a] of the diaphragm is a chamber containing a steam whistle, having a high note & controlled by a lever similar to a Morse key so the whistle may be thrown into intervals of dots & dashes near this porthole is another on somewhat larger & closed with a diapragm & small chamber & provided with stethoscopic Ear pieces so as to be very sensitive any vibrations Coming from the sea from a distance Vibrate the diapragm & can be heard if necessary the very small amplitudes of the receiving diaphm may be amplied on a smaller one by leverage.[14]

fig 20

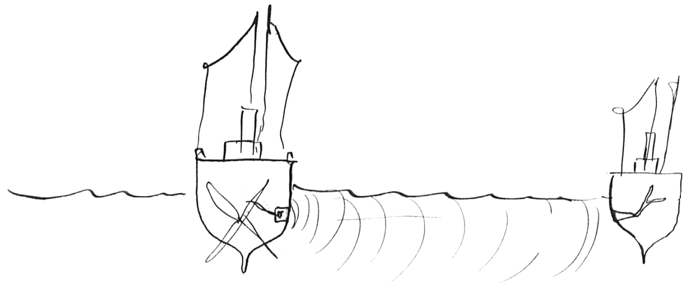


Fig 21 shews a method of teleghg at sea by pencils of Electric Light (arc light) thrown upwards at an angle ~~and~~ preferably on a high clouds The cloud acting as a reflector to the distant ship. by means of a shutter Operated with a Morse Key the beam is thrown into dots & dashes—

fig 21

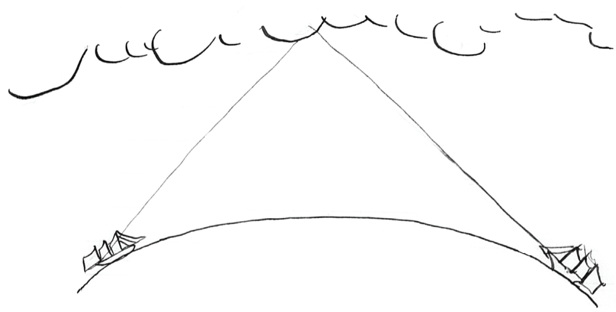


Fig 22 shews a String telephone The string or wire of which there can be many being strung on poles but preferably in tubes placed underground, the very small vibrations of the wire being amplified by leverage to a very thin & sensitive diapragm— the lever of amplification is composed of a thin wire & streatched on each side by a Silk thread this gives great stiffness to the beam lever & makes it very light.[15]

fig 22

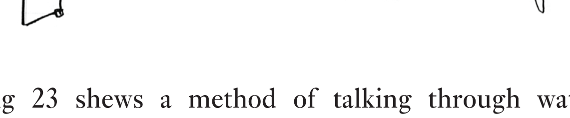


Fig 23 shews a method of talking through water for considerable distances Funnels are entirely immersed except the listening end the immersed Ends are closed by diaphragms.[16]

fig 23

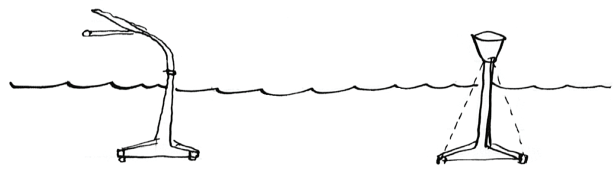


Fig B 23 has an amplifying device leading by a thin wire to a very sensitive diaphragm outside of the water, the water also in this Cases touches the immersed larger diaphragm—

B

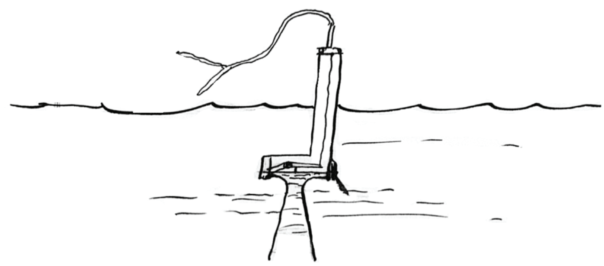


Fig 24 shews phonograph arranged so a number of stethoscopic listening tubes can be attached to a common Chamber in connection with the phonograph thus permitting a number of persons to listen Simultaneously[17]

fig 24

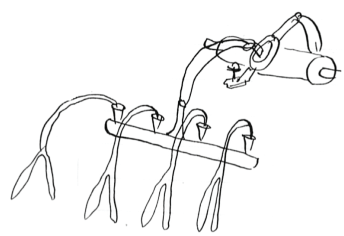


Fig 25 shews a telephone Receiver with a conducting rod connected to the center of the diaphragm composed of Lamp black & sulphur mixed. The heat on the passage of the Current expands the sulphur & gives motion to the diaphragm owing to the great power of expansion the motion of the rod can by a proper lever be amplified on the diaphragm—

fig 25 <Telphn Lampblack mixed with Sulphur>

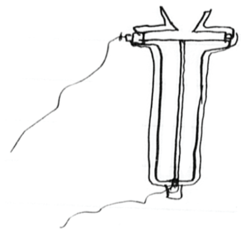


Fig 26 shews a method of recording & Reproducing[e] sounds phonographically by using a highly polished Hard Rubber Cylinder or Electroporous material or such other material which is easily electrified by rubbing— The Diaphragm point is provided with a fine pointed rubber which runs Continuously on the cylinder the Vibrations produce a greater & lesser electrification of the surface,[f] & the Reproducer having a point either in contact & works by a difference of friction or electrification attraction or the point is placed within an extremely small distance from the Cylinder is attracted by electrification—

fig 26 <Recdg by electrify by pressure on hard Rubber etc.>

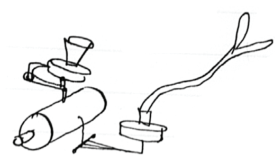
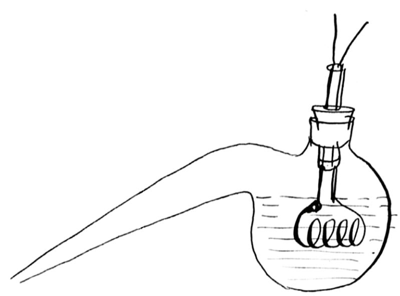


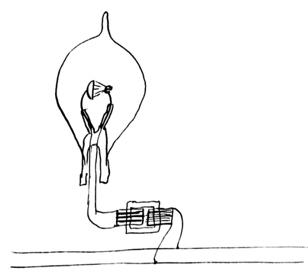
Fig 27 shews a method of distilling Liquids which result from decomposition of liquids by incandescent electric conductors immersed in such liquids & kept hot by a Current, or simple distillation by a hot conductor immersed in the liquid & not brought up to such a degree of heat as to result in a decomposition of the liquid—

fig 27



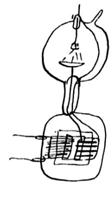
Figs 28 29 30 31 32 33 34 & 35 Shew Various Electric Lamps[18] which give a high potential arc a la Geisler[19] in partial Vacua through or against fluorescent or phosphorescent material or by impinging or the infusible earth oxides raise them by heat evolved to a high degree of incandescence for this purpose I used small pin heads of highly porous Lime, Zirconia etc made extremely light & porous by igniting say the acetate of the metal. Owing to great porosity & smallness of weight in proportion to the size,[a] the heat cannot be Conducted away except very slowly hence a small amount of Current Causes these light fluffy oxide balls to become brilliantly incandescent. another method of preparing them is to soak cotton cloth thread or other Carbonizable material in an acetate of the metal[a] & burn it to drive off the Carbon thus leaving a fine frame work of oxide similar to that of the Welsbach burner[20] but in my Case very small— It is well Known that in Lamps Containing Carbon filiments one pole gets very hot sometimes sufficient to melt platina, While the other pole is quite cool. The same action takes place in a Giessler[a] tube. Hence by making a Lamp as in fig 28, The reflector of metal converges the electric stream against the small ball of porous finely divided oxides through the center of which the [electrode?][g] passes it is brought up to very high incandescence— I use a very small transformer with each Lamp the primary Connected to the Electric Light system may have say 200 volts while the secondary connected to the Lamp electrodes has several thousand Volts.

fig 28



In fig 29 the Transformer is in ~~one~~ Vacuum while the Lamp is in another

fig 29



In fig 30 both are in the same vacuum
fig 30

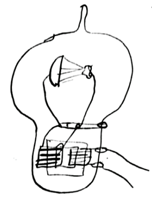


fig 31 shews a condenser in circuit The transformers Can be made exceedingly small so as to be put in a Vacuum
fig 31

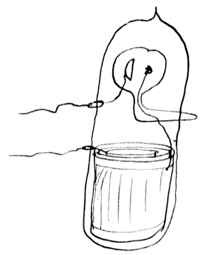


Fig 32 shews a Lamp with narrow connecting tube filled with phosphoresing or rather fluorescing material. 33 the same
fig 32 <filled acetate [leave?][g] dry & while on pump heated>

fig 33

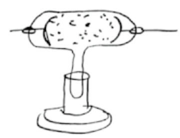


fig 34

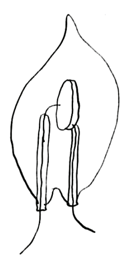


fig 35 a bridge of nonconducting material with fluorescent facing

fig 35

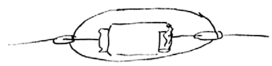


Fig 36 shews ~~an~~a Loudspeaking telephone but with a quartz cylinder & a beam of ultra Violet light passing through the quartz impinging on the platina surface resting on the quartz alters the friction. This beam of energy beyond the ultra Violet & which causes phosphorescence Can be thrown into a waves of dots & dashes & thus provide a means of obtain sounds & motion or rather Control of energy & hence motion or the beam can be thrown into waves of any kind like sound waves & by this means rendered audible for Telephonic teleghic ~~or~~ phonographic & other purposes—

fig 36

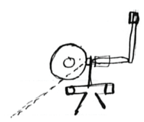


fig 37[21]

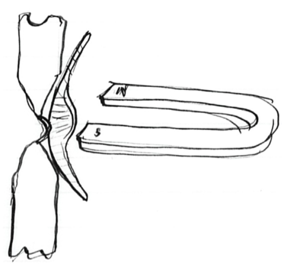


fig 38 shews an ordinary arc Light the non[c] wasting electrode being surrounded with a helix which keeps the arc central. The lines drawn in circles represent lines of force; the helix is over an iron shell through which the Carbon passes= The helix if necessary may be rotated by an electric Engine.

fig 38

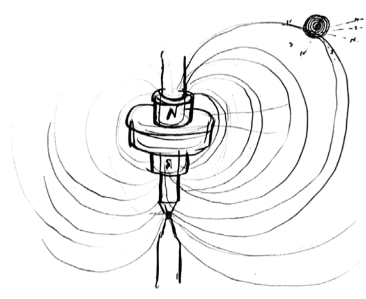


fig 39[22]

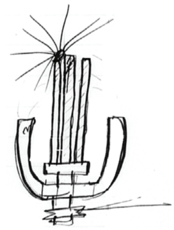


fig 40[23]

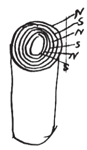


Fig 41 shews a thermostatic bar of two different metals & are heated by passage of the Current by proper [~~make an~~?][d] contacts etc. bowing can be made to work a ratchet & Counter & vibrate by Contacts worked by its own motion & the whole act as a motor in an electric Light System.

fig 41

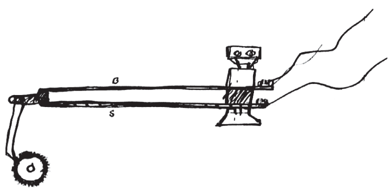


Fig 42 shows a method of obtaining Electricity direct from Coal.[24] a fire brick chamber contains at the bottom an iron plate. over this is placed anthracite coal or coke   this is kept incandescent by an Exterior fire box. a tube right over the coal or coke within the chamber permits of steam being let in. above this pipe is trays of ~~oxi~~ iron or Copper Containing oxide of Copper or Lead. this forms one electrode the coke & iron bottom the other= The steam being decomposed The Oxygen combines with the coal to form CO & CO_2 while the Hydrogen reduces the Oxide of Lead or copper to metallic state to form H_2O [----][d]

fig 42[25]

Fig 43 shews a magnetic seperator suitable for large pieces of magnetic ore and is useful to seperate the crude material before it enters the fine crushing machinery for final pulverization & Seperation. H is a hopper N a revolving drum with leaves running paralell along its face like the leave of a paddle wheel a magnet is placed inside secured to a fixed shaft. The ore is held by the leaves & the pieces which are magnetic are made to cling to the surface of The drum until it passes to a point where the magnetic lines of force is too weak to hold it against the drum when it drops off this is beyond the partition .c.

fig 43

fig 44 is an Electric Incandescent Lamp having a peculiar seal where the inside part is joined to the bulb or globe—[26] The seal instead of being fused to melting & blown to shape—I made when the glass is only plastic and about a full red and it is spun together either by a rotating clamp like [--------][g] revolving against the joint or The clamp is fixed & the inside part & globe are revolved—no blowing is necessary fig 44 shews the two preparatory to sealing fig 45 shews the two sealed & fig 46 shews a diagramatic plan of the machine used. 1 is a [~~rel~~?][d] revolving shaft 2 a hub on the end of which the globe is centered 3 a sliding arm provided with a ring 5 which produces accurate Centering of the whole globe—9 is also a revolving head. both 1 & 9 revolve together by Connected gearing 8 is a piece of carbon passing inside of the inside part upon which the glass joint is spun o are the ends of the spinning clamp— the wires from the inside part pass through a hole in the carbon rod unskilled persons can make good seals by the plan of spinning

fig 44

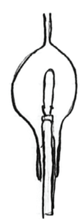


fig 45

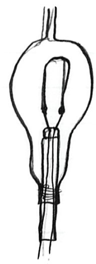


fig 46

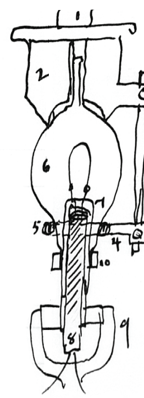


Fig 47 shews an automatic Regulator for arc light machines shunt wound
fig 47

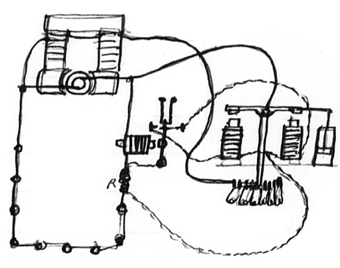


fig 48 shews 47 applied to a series wound by short circuiting.
fig 48

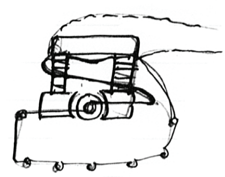


Fig 49 shews Regulator where the back & forward movement of the Resistance is done with a Double[a] field Coil motor the relay making the field either a positive or negative direction field & thus reversing direction of the motor according to the position of the relay point a worm & wheel connects the motor shaft to Resistance box shaft & ~~ar~~contact arm—

fig 49

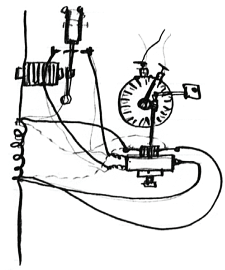


Fig 50 shews a ball Recording point for that class of phonographs which use foil or thin material & act by streatching the same in grooves previously put in the Cylinder— The Receiving point may be a ball smaller but this is not compulsory

fig 50

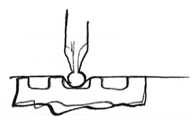


Fig 51 shews a method of duplication phonograph Records. both[a] the master cylinder & the cylinder to be duplicated being on the same shaft. The master cylinder being made in situ by Recording devices which are removed & the duplicating device put on this ensure the surface being true. The duplicate to be made has its surface turned true in situ, two arms connected together one arm provided with a ball runs in the grooves & is given vibration by the undulations The other arm is provided with a Recording point & records these vibrations & makes a duplicate. The recording arm may have a greater movement if required by means of leverage & thus amplify the sounds or depths of Indentations[a]

fig 51

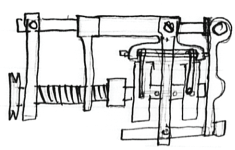


Fig 52 shews the arrangement of a Reproducer wherein the bearings on diaphragm are in line with the ball & the connection made to the diaphragm by a link motion.

fig 52

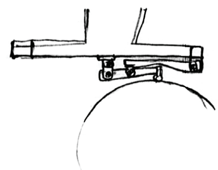


Fig 53 shews a method of amplifying the sound from a phonograph by leverage instead of a funnel— The leverage is such that the movement of the larger diaphragm is many times less than that of the phonograph diaphragm but the area of the large diaphragm more than makes up for loss of amplitude and it strikes a better blow towards the air.

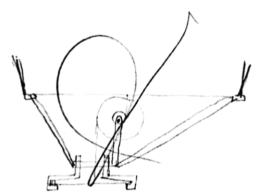


fig 53

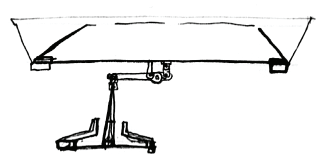


Fig 54 is a chamber in the listening tube of a phonograph with a Reflecting Cup. This Cup stops the short waves due to roughness of the surface but does not affect[a] the long waves of the record—

fig 54

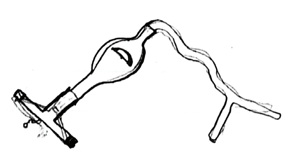


Fig 54½ <u>shews</u>[h] a small short glass funnel with Cup shape reflector in front of it—This reflects back the scratchy sounds & they are not made audible in the room—

54½

Fig 55 & 56 shews sounding board funnels. 56 is arranged prism like so that some part of the sides is in tune with some of the Vibrations passing through it hence amplifies the sound[27]

fig 55

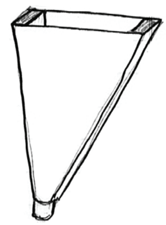


fig 5~~5~~6

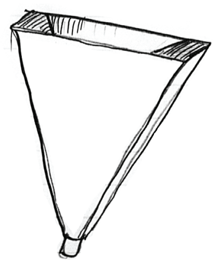


Fig 57 shews a slit closed by a jarring sieve. fig 59 shows the sieved stream passing before the magnet.

fig 57

fig 59

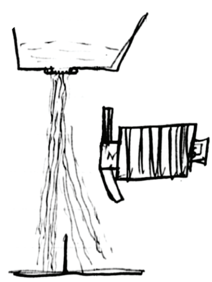


Fig 58 shews travelling belt having magnetic ore the magnetic being charged & discharged while passing so that none of the magnetic material touches it yet the whole of the magnetic material will be on top of the tailings after it passes the field of force. It then may fall vertically & be seperated by alteration of trajectory by another magnet.[28]

fig 58

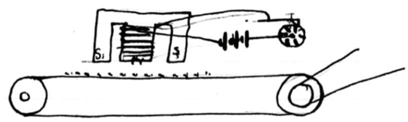


Fig 60 shews a tumbling barrell filled with magnetic ore. with air passing through the fine non magnetic dust is blown out but the iron particles are held by the magnet. inside the barrell are paralell strips of wood so that material can be rotation ½ a revolution

fig 60

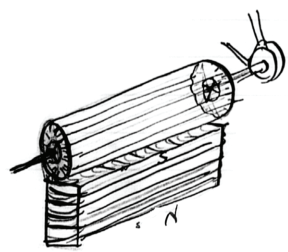


Fig 61 shews a raking chamber over a magnet & provided with a blast of air to blow the fine non magnetic dust away the workman raking the ore to allow the air to catch such particles

fig 61[29]

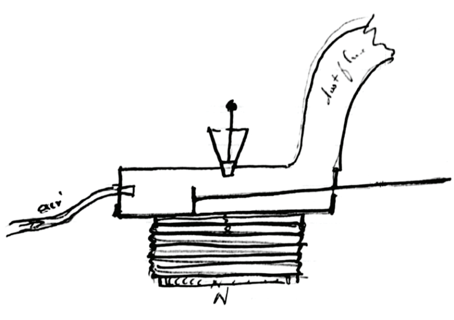


fig 62 shews ore falling from a square hopper through a slot onto a very rapid moving belt dividing it into various sizes into the dividing bins—

fig 62

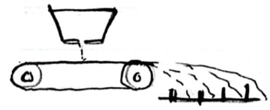


Fig 63 shews a revolving pan with magnetic ore & fixed Vanes. water passes up through the bottom & overflows the nonmagnetic material is carried off by the water while the powerful magnet underneath prevents the iron particles from going into the overflow—[30]

fig 63[31]

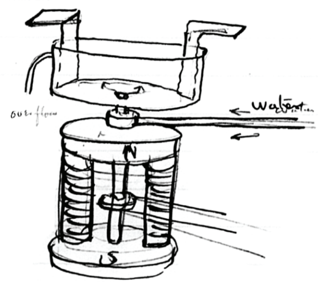


Fig 64 shows a shaking slit to prevent fine ores sticking [~~whole~~?][d] in[c] magnetic Seperators.

fig 64

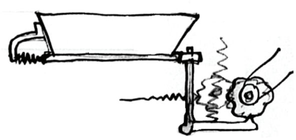


Fig 65 shews a stream falling from a hopper directly over a magnet~~i~~ of great surface   the blast of air is sufficient to blow all the non magnet away but not the non magnetic[32]

fig 65

Figs 66, 67 68 69 70 71 72 73 74 are devices on Recorders & Reproducers for phonographs: fig 75 shews record made by a cylindrical gouge recorder a ball running in the record for reproducing

fig 66[33]

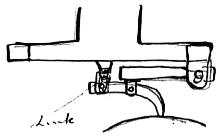


fig 67

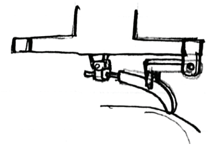


fig 68[34]

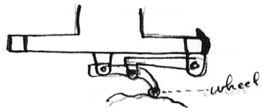


fig 69[35]

fig 70

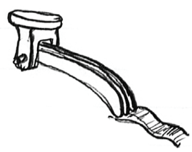


fig 71[36]

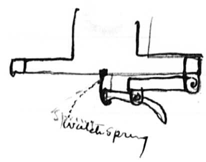


fig 72[37]

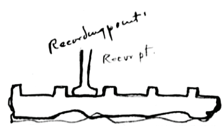


fig 73

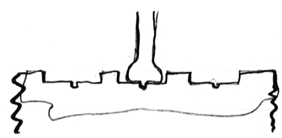


fig 7~~5~~4

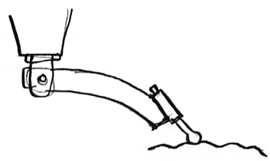


fig 75

Fig 76 is a ½ gouge recording point which makes a record of [circules?]—[38g]

fig 76

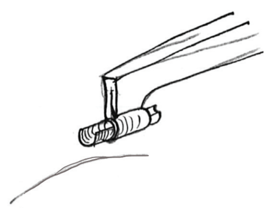


fig 77 also makes a round record as 75 in which a ball reproducing point can be used figs 78 79 80 & 81 a Reproducing points to run in records of corresponding shape—

fig 77

fig 78

79 is a wheel & hence does not scrape the record & give clear reproduction ~~F~~ a ball could be used

fig 79

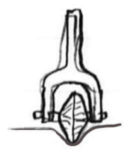


fig 80

fig 81

Fig 82 shews a ball which is arranged so it acts like a universal joint— fig 83 shews the ball arranged in a reproducer.

fig 82

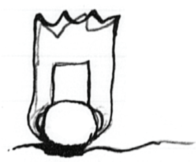


fig 83[39]

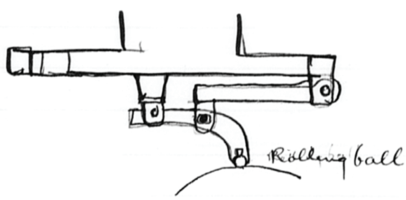


fig 84 another way of holding the revolving ball—

fig 84

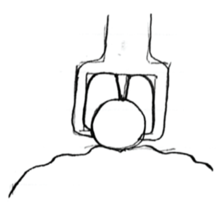


Fig 85 & 86 shows the shaving tool used on phonograph instead of having a square ~~su~~Cutting surface. The Cutting Edge has[a] the segment of a circle of 6 inches in diameter as shewn by dotted Lines fig 86. This gives a chip always the same width according to depth & is has considerable latitude of adjustment.

fig 85

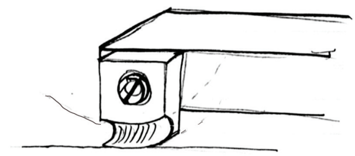


fig 86

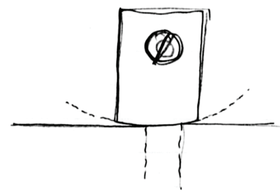


fig 87 shews an incandescent Lamp with Carbon filiment spiral—and an opening tube on the side of the bulb fitted with a thin sheet of quartz Crystal Cemented so as to be air tight. Quartz permits vibration beyond the ultra Violet to pass through while glass entirely Cuts them off— Hence we here have a continuous source of this Vibrational energy at our Command.[40] This energy has the property of diminishing polarization of electrodes and produces attraction & repulsion & other curious phenomenon which may be of value in the arts

fig 87

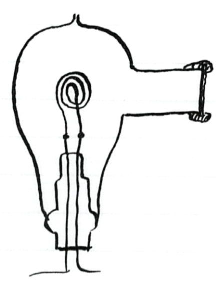


fig 88 is a Vacuous chamber containing a beam held by a fibre or by bifilar suspension it is provided with a mirror for indicating movements of the beam—& a small piece of iron or magnetized steel & an exterior magnet controls the tension on the Suspensary filiment & the position of the beam; on the End of the beam is a disk facing an aperture closed by a plate cut from quartz Crystal The impinging of the Vibrations beyond ultra Violet produce a deflection of the beam—

fig 88

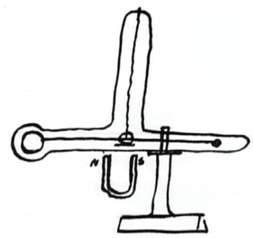


fig 89 Shews a mill which is rotated by this form of energy & is a true Radiometer—[41]

fig 89

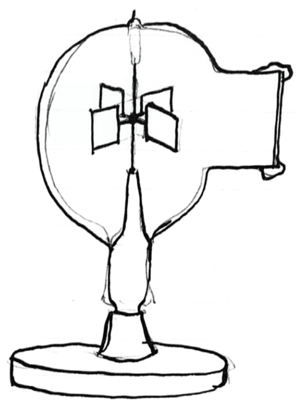


Fig 90 shews an engine worked by Steam produced by the hydration & dehydration of metallic salts like sulphate of Copper Soda etc— a single fire box is used one boiler filled with the hydrated salt is heated while the other boiler filled with the[c] dehydrated salt is shut off from the fire box by a damper— There is now water as the deyhdration point of the salt is so high that it is high temperature steam at the moment of dehydration. This passes into the Engine & does work its temperature is lowered until it is near say 220 when its exhausted into the boiler containing the wholly dehydrated salt & there hydrate it= after a certain period, The heat is shifted & the reverse action takes place. this produces great economy

fig 90

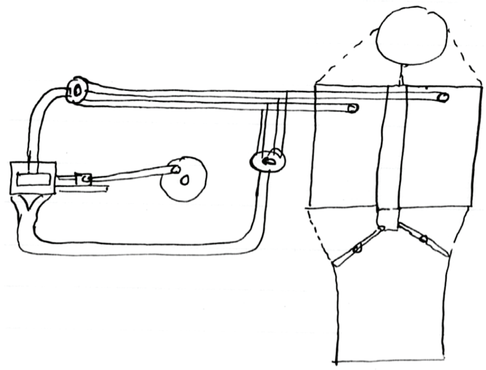


Fig 91 shews a method of teleghg photographically long tubes laid straight of 3 or more inches in diameter are all connected together & made air tight. at intervals of a mile or less are Vacuum[a] pumps for exhausting the air which may have leaked into the tube the Vacuum being maintained in the whole conduit to say one millimetre of mercury The pumps are run by small electric[a] motors all connected in series & worked from same station. a brilliantly illuminated object situated at one end may be perceived at the other end many miles distant & may be photographed— messages etc illuminated can be rapidly photographed at the distant end. Corners are turned by one or more prisms as at X & reflectors, there being very little air & no dust very little loss of light in 50 miles is had— the Curvature of the Earth is Corrected at intervals by Quartz prisms as in turning a Corner—

fig 91

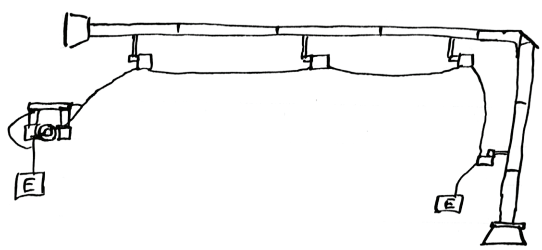


Fig 92 shews an Ampliphone for amplifying sound & is suitable for deaf people in theatres churches etc— a closed chamber provided with a shellacd silk diaphragm & central strengthening web fig 93 of spruce[a] pin shellacd on gives stiffness without adding much weight. a silk thread from the center of the large diaphragm passes down to the short end of a lever the long end of which is connected to a small diaphragm of thin gold beaters skin[42] also connected to the lever by a thread— the tube carrying the small diaphragm pulls in & out hence the connecting mechanism can be put under tension a listening tube connects with the small diaphragm— Sound waves striking the large diaphragm are greatly amplified in the small one & rendered more audible than if received direct by a person somewhat hard of hearing

fig 92

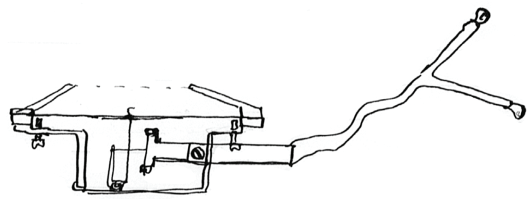


fig 93

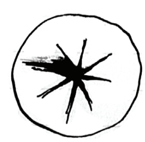


Fig 94 ~~shews a battery~~ 95 96 102 104 103 105[i] shews a form of battery[43] fig 94 shews the top=two Zincs—& supporting [~~the~~?][d] triple clamp. fig 102 a copper frame for holding the Copper Oxide X being a piece to hold it central in the glass jar as in figs 103 104 fig 105 shews the two plates of Copper oxide, which are formed by mixing CuO with a slight amount of alkali water say soda moulding the same onto a plate & then exposing the same to a red heat until locked together. fig 96 the box for holding several cells the box being lined with Lead The solution used being at 25 per cent solution of Caustic soda

fig 94

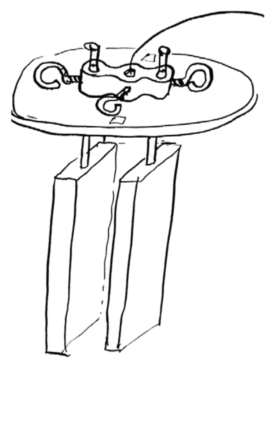


fig 95

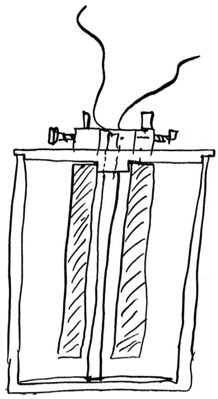


fig 96

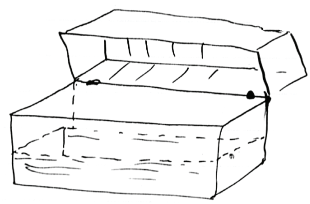


fig 102

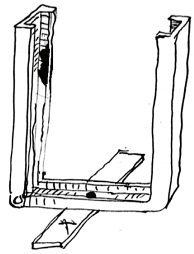


fig 103

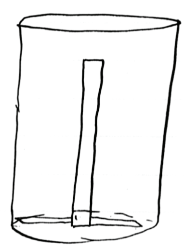


fig 104

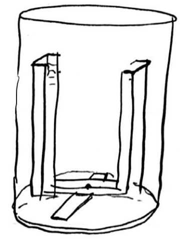


fig 105

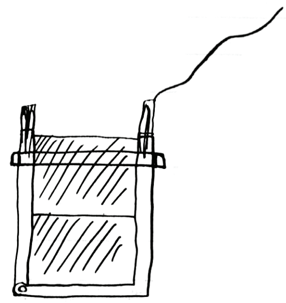


Fig 97 shews a tumbling barrell with fixed delivery tube under which is a powerful Electro magnet finely divided magnetic iron ores are tumbled in the barrell through which a gentle stream of air passes this takes the dust out of the ore but at the same time in certain ores a large quantity of fine iron oxide[a] passes outwardly & would be lost but cannot pass the magnet

fig 97

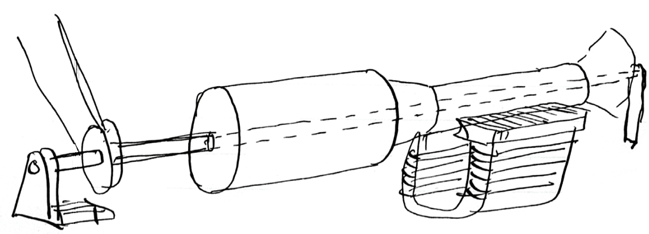


fig 99[44]

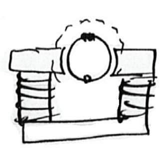


Fig 100 shews an improvement on the phonograph in respect to recording on the cylinder itself the precise point where the[a] record stopped so on using the cylinder again if only ½ its surface has been used. The exact position necessary to put the Recorder will be Known by a mark previously made on the Cylinder itself— I do this by holding a crayon made[a] of parafine & Lampblack against the rotating cylinder when I have made the record & am ready to take the cylinder off—[45]

fig 100

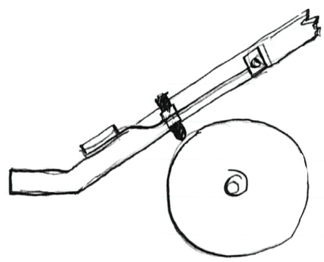
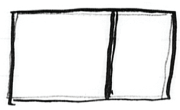


Fig 101 shews a phonogram[a] marked so when it is again put on the phonograph the position to set the Recorder is shewn by the Crayon mark— in fig 100 is a fixed marker but the Crayon may be held by the finger itself

fig 101



I am experimenting on depositing by electrical Incandescence by what is called the flashing process materials other than Carbon on incandescing Conductors The materials used are Silicuretted Hydrogen Tribromide of Silicon[a] Iodide of Silicon Chloride silicon for depositing the element Silicon on the filiment of metal or Carbon The Carbon[a] being afterwards retained or burnt[a] out by oxidation before putting in the Lamp To deposit Silicon on any heated matter heated externally & not by The Current by the process of Sidot[46] The materials in the form of filiments are placed in a Tube heated to the decomposing point of the gas or Vapor of the Compound containing the element to be deposited. The passing gas or Vapor is decomposed and desposits the element on the filiments

For depositing Titanium which has a high melting point Hydrocyanate of Titanic Chloride which[a] under certain conditions as to the presence of Nitrogen deposits Nitride of Titanium which is a conductor of electricity and infusible. In some Cases I make a filiment by squirting through a die finely divided Nitride of Titanium mixed with say a small quantity of Titanic Chloride & then either pass a current through the filiment in the presence of Hydrocyanate of Titanic Chloride & nitrogen to flash the whole with a very coherent layer or the Nitride of titanium filiments are put ~~into~~ through the Sidot process. ~~hence a filiment can be made of high resistance Composed entirely of Nitr~~.

For depositing Chromium Hexafluride of Chromium may be used For depositing Molybdenium Pentachloride of Molybdenium may[a] be used For depositing Tungsten Tungstic Hexachloride, Tungstic pentachloride. For depositing Osmium It can be done by placing the filiments squirted from Carbonaceous Compounds, or from a material soluable in acids or Alkali, or Carbon itself. ~~by pla~~ in a Vacuum & Volatilizing ~~the Volatilization of~~ the metal by an electric arc or spark similar in character to the Giesler tube arc or spark The filiment being rotated so as to expose Every[a] part to the vapor. In fact any of the more infusible materials Metals or even oxides & other Compounds may be volitilized by an arc or ~~g~~Giesler tube action of electrical Carry[47] and the vapor or melted material deposited on any other material within the chamber. The space being Vacuous the melted Vapor of the different fusible materials is not chilled in passing away from the surface of the highly heated electrodes & only chills when it comes in Contact with a cold object.

Osmic tetrachloride being decomposable by heat the metal may be flashed on the filiment by electrical Incandescence or the [~~Sid~~---][d] Sidot[c] process—

Mercury Vapor is objectionable in Incandescent Lamps. Bichloride of platinum absorbs the Vapor— I place a small quantity in the bulb while Exhausting & remove it or it may be left permanently in the globe where it will in time absorb every vestage of mercury Vapor—

For depositing Boron I use Boric Chloride or Fluoride of Boron A Carbon filiment may be made by using iron or nickel as the chlorides of both iron & nickel & copper[j] are Volitile. The passage of the Current through a filiment of iron Copper or nickel in a chamber containing a chloride of Carbon The Chlorine will be set free combine with the iron Copper or nickel and deposit Carbon & so continue until the filiment is wholly of Carbon— The same effect is obtained in greater perfection by the Sidot process. Sulphide of Carbon can be used in fact any Compound of Carbon may be used which can be made gaseous & the element in Combination with the Carbon will Combine with the Iron Copper nickel or other metal & the resultant either become gasous or a vapor [~~or melt & g~~?][d] The Halogen Carbon Compounds are preferable—

To make porous filiments so as to obtain high resistance a salt of iron say the oxide of iron nickel or Copper is moistened & squirted into the form of a filiment The filiment on heating is reduced to the metallic state & is somewhat porous by the action of incandescent Chloride of Carbon the whole of the metal is displaced[a] by Carbon Aluminum heated in the presence of Chloride of Carbon Vapor is wholly displaced by Carbon the Chloride of Aluminum being Volitile. Instead of Carbon being deposited a conductor whose Chloride is not volitile without decomposition can be made to displace the conductor of the original filiment the chloride of which is volitile.

Iodide of Cyanogen Volitilizes about 120 Cent and can be used to free an Incandescent Lamp from mercury Vapor. The Iodine set free combining to form solid Iodide of mercury Filiments of metal of a shape suitable for Incandescing Lamps can be made by immersing the same in Bisulphide of Carbon Vapor on heating the same by a Current or exteriorily The iron is changed to a sulphide & Carbon is deposited. The former can be eaten out by nitric acid thus leaving a high resistance filiment.

Carbon filiment can be made by squirting through a die, Asphalt which has been acted upon by Nitric acid, Chloride of Sulphur any many other bodies of an oxidizing nature or a Halogen Compound whose Chlorine will displace some of the Hydrogen of the Asphalt. Sulphuric acid & Hot Caustic alkalis will also act upon the asphalt and Sulphur also to displace sufficient Hydrogen with or without a substitution for some of the atoms of Hydrogen of the active Reagent[a] The asphalt product which in nearly Every case when finely divided is yellowish brown does not melt like the Original asphalt owing to oxidation or displacement of the Hydrogen in some of the lower boiling point Hydrocarbons which go to make such a hetrogeneous Compound as asphalt. The resultant of the agents is soluable in Chloroform Chloral Hydrate & other Liquids The finely divided material is kneeded together to a paste by the use of Chloroform & then squirted. There are many asphalt like residues than may be dehydrogenized These residues are from the distillation of Various Hydrocarbons & oxidized Hydrocarbons. The black viscous bodies which are left in the retorts which are generally black can be acted on by A Halogen, Sulphur or an oxidizer or a polymerizer like sulphuric acid Chloride of Zinc etc to render these residue nearly infusible & capable of being used for filiments filiment of asphalt & asphalt[a] like residues[k] before being acted on can upon application of heat to the squirting press be squirted into filiments and then acted upon by many of the reagents recited Such as say pentachloride of Antimony in a solution of Chloride of Ethyl in which a number of the filiments are immersed or Chloride of sulphur ~~dilute~~ in a solution of Common Kerosene in which the filiments are immersed in the course of a few days it will be found that the filiments have had the Hydrogen withdrawn from them & in some cases some of the Hydrogen has been replaced by Chlorine. After taking out of the Solution & washed they can be Carbonized without distortion.

I am experimenting on making filiments by Squirting finely divided material moistened to a dough in their solvents. Those which I have tried are Phlorizein[48] Rubian,[49] most of the Amorphous[a] Coloring dye stuff Extracts ~~Rub~~ Rubianin, Chloro-Rubidian Convolvulin, Cyclain Carthamen Haemaloxylin, Fat of wax of shellac Bi hydrosulphate of Cyanogen Sulphide of Stilbene, Saliretin Sulhydramide Mellic Acid, Paramide Creatine, Amidosulphobenzoic acid, mallasic acid, Mucic Acid, Sulphate of Benzodin, Sulphanilic Acid, The aniline dyes, & pseudo Carbon[50]

Fig 106 shews an automatic device for determining the position of the Recorder or Reproducer in relation to the spectacle the same being thrown out automatically after the relation is established by the movement of the cylinder itself & is similar to that already in a patent application.[51] The difference is that the position lever is pivoted in the spectacle & swings like a pendulum bob— on the end of the lever is a screw, this is split & hardened to give it elasticity & prevent the nut on the end from turning. The nut can be screwed up or down thus lengthening the pendulum. a flat piece of steel with a[a] slot causes the pendulum to be limited in its swing to two fixed points back & forward on setting down the spectacle the nut on the pendulum touches the phonogram & the spectacle is in the right position for clamping X. on starting up the phonograph the forward movement of the cylinder carries the pendulum forward nearly to the limiting stop where it rides on the surface of the cylinder the bob only touches the forward limit should the clamp X fail to grip— The clamp is shewn in 107 a part of the rod is eccentric corresponding to an eccentric hole in the plate n the rotation of X by the pin 3 clamps the rod to the spectacle arm by a [caming?][g] action.

fig 106

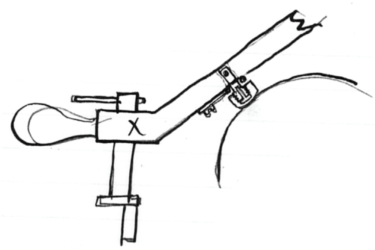


fig 107

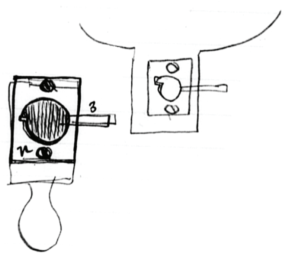


Fig 109 shews a phonograph blank moulded over cloth tape.

fig 109[52]

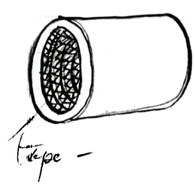


Fig 108 shows a false shell for holding phonogram blanks so that instead of removing & putting on the blank direct on the cylinder & thus render it liable to distortion by frequent handling it is kept on the ~~s~~Removeable shell until wholly used up. The large end of the shell is provided with a flange to facilitate removal while the other end has an inward flange to prevent eccentricity in handling—

fig 108

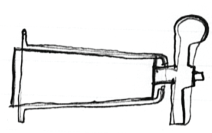


Fig 110 shews[a] a magnetic seperator whereby thin pulp of magnetic & non magnetic material mixed together wet passes through a slit in a hopper into a tank of water provided with magnet[a] & partition similiar to that already patented by me[53] The upper pipe Conveys continuously pulp to the hopper while another pipe takes care of the overflow of water.

fig 110

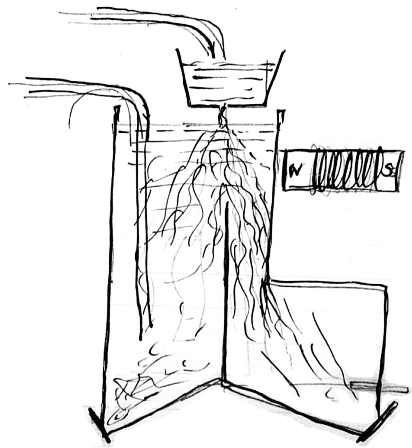


Fig 111 shews a tank filled with water & magnetic & nonmagnetic materials making an very ~~thick~~ thin[c] pulp—a magnet over the water but not touching draws out the magnetic particles & on rotating the magnet to the position shewn by the dotted lines & demagnetizing it the iron falls into a receptible a Reservoir of pulp supplies[a] a new charged after the Tub is tipped on its bearings & emptied

fig 111[54]

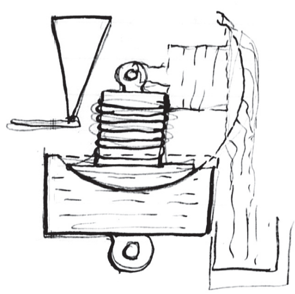


Fig 112 shews my regular magnetic seperator but is provided with a Chamber which is symetrical on both sides of the fall stream of fine ore the symetry being necessary to prevent air whirls & the consequent alteration of the trajectory of the stream other than magnetically

fig 112

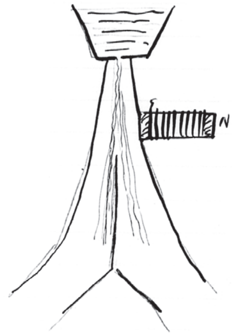


Fig 113 shews a travelling Rubber belts with raised sides & [---][d] raising pieces connecting the two raised sides[a] at intervals so as to provide a number of flat receptables to hold pulp. the belt is ~~rotated~~ carried forward Continuously & pulp is continuously supplied from a receptable. in front is an Electromagnet Rotating at right angle to the movement of the belt. this attracts the magnetic particles See fig 115 which are scraped of by a Scraper & fall into a bin—

fig 113

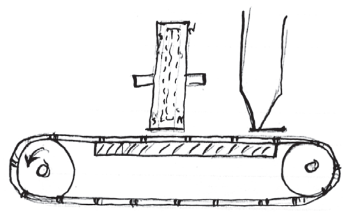


Fig 114 shews a[a] magnetic seperator in which the thin pulp falls just as the dry stream of ore falls in my regular seperator. a fixed magnet & a rotating shell attracts the magnetic particles out of the water part[a] fall over & partition & part stick to the magnet & are scraped off—

fig 114[55]

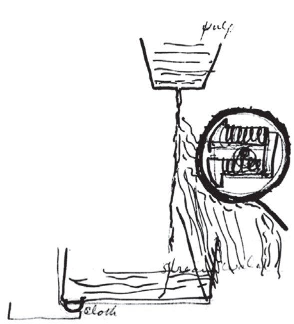


fig 115

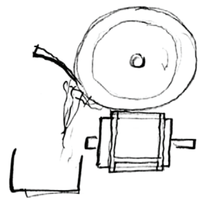


Fig 116 shews a Carbon Crucible kept brilliantly incandescent by an Electric Current in Vacuo & is useful for Reactions[a] with metals etc a high temperatures in Vacuo

fig 116

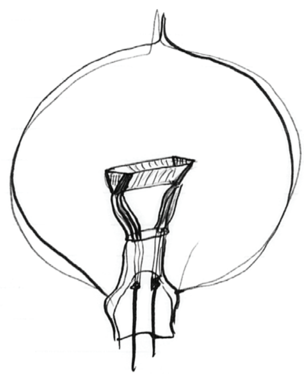


Fig 117 is a Sound Bridge for measuring the resistance of tube and other materials for conveying sound

fig 117[56]

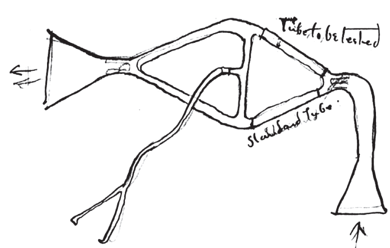
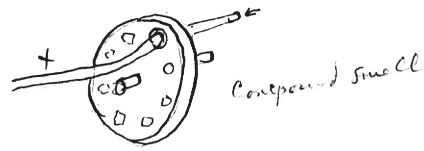


Fig 118 is a revolving wheel having several chambers filled with sponge saturated with materials giving off different odors all the chambers are closed but at every revolution each chamber is uncovered when opposite the Tube .X. a tube also on the opposite side has a slight air pressure in it on putting X to the nose & rotating the disk compound smells of a very curious character are obtained which are altered by speed of rotation.

fig 118[57]



In addition to the materials used for squirted filiments I may add Tetrochlorohydroquinone, Ethylinic Sulphide, Berthalets Bitumene[58]

T A Edison

ADS (fragment), NjWOE, PS, Caveat Files, Case 115 (*TAED* PT031AAF1). Document multiply dated; figures drawn on twenty-one separate pages. [a]Obscured overwritten text. [b]Marginalia possibly written by Edward Rowland. [c]Interlined above. [d]Canceled. [e]"& Re" added in left margin. [f]"of the surface" interlined above. [g]Illegible. [h]Multiply underlined. [i]"102 104 103 105" interlined above. [j]"& copper" interlined above. [k]"& asphalt like residues" interlined above.

1. The editors have selected this unusually long document to represent Edison's inventive work around this time, much of which he chose to record in caveats instead of laboratory notebooks (see Doc. 3365; Docs. 3349 and 3358 and two 12 April drafts [Lab. (*TAED* NA022AAD) and PS (*TAED* PT031AAS)] are in a similar vein). Edison titled this draft a "Phonograph Caveat," but it covers a range of subjects. He seems to have made and numbered the drawings as he prepared the text, though a few are referenced out of sequence. His attorneys reorganized the text into a more coherent final version and rearranged the drawings accordingly; various marks and notes made on Edison's manuscript during that process have not been transcribed. The result was a twenty-seven page typed document that Edison signed on 15 June. It was filed at the Patent Office three days later as his Caveat 115 for phonographs. The Patent Office swiftly notified him that the application could not be accepted until "confined to a single invention." The editors have not determined what, if any, action Edison or his attorneys took in response. Commissioner of Patents to TAE, 21 June 1889; Patent Office file wrapper; both Caveat 115 case file, PS (*TAED* PT031AAF, PT031AAF2).

2. Edison dated the first page on 12 May and the last page (after his signature) on 15 May. The separate sheets of drawings are not dated.

3. British chemist and physicist Sir William Thomson (1824–1907) was renowned for his work in thermodynamics and electrical theory. Among his contributions to practical telegraphy was his tray battery, designed in the early 1870s as a low-resistance form of Daniell (constant voltage) cell for the siphon recorder used on submarine cable lines. It consisted of a series of shallow wooden trays stacked one on top of the other, each lined with lead, fitted with a zinc grating, and filled with a copper sulphate solution. Each tray had an electrode of sheet copper wired to its neighbors above and below. Doc. 2600 n. 2; Prescott 1892, 2:1155–59; Thomson 1872–1873.

4. The number 10 was interlined here during a later revision, apparently mis-identifying the spring marked "13" (top right) in the drawing.

5. The "monitor" was another name for the turret, the part of a lathe holding multiple cutting tools that could be positioned in sequence without removing the work piece from the chuck. Monitor lathes were often used for cutting screws and for fine brass work. Van Dervoort 1900, 341; Horner 1900, chap. 12.

6. A page of Edison's text is missing at this point, at the end of his second numbered page; the transcription resumes after the drawings from the top of his fourth page. The remainder of the text for figure 5 in the final version (see note 1) reads: "disturbing the accuracy of the adjustment."

7. Edison's description of figure 6 presumably was on the missing manuscript page. The final caveat (p. 3) described the device as follows:

> Figure 6 shows a phonograph with a smooth glass or metallic cylinder. Instead of indentations the point of the recorder has a capillary bore leading from a reservoir, or is provided with a porous point or has a pencil like point of material which running on the cylinder leaves a thin trail behind which trail is thinned or thickened by the vibrations of the diaphragm and point. The reproduction of the sound waves is brought about by the chalk telephone action of working by a difference of friction; a broadening of the trail or mark increases friction and gives a large vibration to the diaphragm of the reproducer, while a very thin part of the trail between vibrations give scarcely any vibration.

8. The first portion of Edison's description of figure 7 is also presumed lost. The text from the finished caveat (p. 3) begins this way: "Figure 7 shows a shell to be used on the phonograph and a device for coating it with a thin veneer of recording material; the ring X serves to scrape off surplus material and gives a cylindrical surface to the veneer; a guide rod z in bearing 1, which opens. . . ."

9. The eminent German physicist Hermann von Helmholtz (1821–1894) experimented and theorized extensively on acoustics but seems not to have produced an artificial larynx, which Edison also credited to him in Doc. 2925. He may have been thinking of Helmholz's distinguished older contemporary, physiologist Johannes Müller, who did make such a device. *CDSB,* s.vv. "Helmholtz, Hermann von" and "Müller, Johannes Peter"; Bennett 1873, 3:578.

10. Edison presumably meant "wheel," which was interlined above during a subsequent revision.

11. Edison's drawing resembles his sketch of a similar idea in Doc. 2932.

12. Edison's drawing resembles his sketch of a similar idea in Doc. 2932.

13. The so-called Trevelyan instrument, named for its creator, Arthur Trevelyan, was a device used to demonstrate the conversion of heat into mechanical motion. It consisted of a brass bar curved so as to be able to rock back and forth. When heated and placed on a cold bar of lead, the brass would transfer enough heat to cause the lead to swell

along the line of contact, displacing the brass and creating a new line of contact. The result was a rapid oscillation of the brass piece perceptible as a series of knocks or a musical tone. Among the proponents of using this device for understanding heat and motion was John Tyndall, whose work was familiar to Edison. Tyndall 1869, lecture 4 (pp. 114–18); see Docs. 2804 (headnote) and 2873 esp. n. 16.

14. This general idea and Edison's sketch resemble those in Doc. 2935.

15. Doc. 2935 includes a sketch and brief description of a similar underground telephone.

16. Doc. 2935 includes a similar idea for "water telephone transmission."

17. See illustration with Doc. 3275.

18. Edison made similar sketches in a pocket notebook and included such lamps in a draft caveat, both on 12 April. N-89-04-12, Lab. (*TAED* NP036A [images 11–12]); draft caveat [unnumbered], PS (*TAED* PT031AAS).

19. Johann Geissler (1815–1879) was a skilled glassblower and experimentalist at the University of Bonn known for creating, among other instruments, an electrical discharge tube. The Geissler tube was essentially an evacuated glass vessel with an electrode at each end; passage of an electric current between the electrodes would visibly ionize the rarefied gas within. *CDSB,* s.v. "Geissler, Johann Heinrich Wilhelm"; Atkinson 1883, 862–64.

20. That is, a form of gas burner invented by Austrian chemist Carl Auer von Welsbach (1858–1929). Its mantle—fabric permeated with rare earth elements—emitted a bright white glow when heated in a gas flame. Edison had been unfamiliar with the invention two years earlier, when companies were being formed to promote it in the United States. Doc. 3058 esp. nn. 4–5.

21. Page fifteen of Edison's text, including a description of figure 37, is missing; the transcription continues from the description of figure 38 at the top of his sixteenth page. The text for figure 37 appeared this way in the final caveat (p. 9): "Figure 37 shows an arc light; on the side of carbons is a disk of infusible earthy oxide like zirconia, etc. A magnet either permanent or any electric magnet draws the arc against the zirconia and raises it to intense incandescence."

22. Edison did not include descriptions of figures 39 and 40 in his draft. The final caveat (p. 10) reads: "Figure 39 shows an arc light, one electrode within the other, the outer one being the electrode which wastes most rapidly; a rotating magnet below not only rotates the arc around and thus causes the carbons to wear even but repels the arc sufficient to keep it from going down the sides inwardly." Arthur Kennelly recorded experiments with such a device on 15 May, noting particularly the magnet's effect on the arc. Kennelly notebook #1:108, Lab. (*TAED* NM023108).

23. The final caveat (p. 10) reads: "Figure 40 shows an arc light carbon formed of two thin sheets wound with insulating material between say magnesia or the layers may be concentric; an arc started burns across the whole edge, the arc being a compound arc formed of several small arcs; a rotating magnet can be used as in figure 39."

24. Edison here describes a form of fuel cell, one means of achieving what he more generally called the "direct conversion" of coal into electricity. He had a long-standing interest in such processes and fuel cells in particular. See Doc. 2520 (headnote).

25. Figure labels are "Trays with oxide Copper," "Steam," "Carbon," and "iron"; "water" appears to be at the bottom.

26. The "inside part" was the short piece of glass tubing through which the lead-in wires passed at the base of the bulb. Skilled glassblowers formed the critical seal between the lip of the tube and the outer globe. Doc. 2098 (headnote).

27. Cf. similar drawings in Doc. 3349.

28. Edison had sketched related mechanisms in a notebook following Doc. 3349. N-88-01-03.2, Lab. (*TAED* NA021AAD).

29. Figure labels are "air," "dust flue," "N," and "Rake—."

30. The use of water as an aid in separating magnetic particles was a familiar idea by this time. In his 1888–1889 survey of the state of the art, John Birkinbine described a number of machines using water in conjunction with agitation, washing, or flotation. In Birkinbine's taxonomy, however, such wet processes were distinct from magnetic ones, none of which involved water. Birkinbine 1888–1889a, 1888–1889b, 1888-1889c.

31. Figure labels are "overflow" and "water."

32. Edison's repetition of "non" was evidently a mistake. It was subsequently circled in his draft and omitted from the finished caveat (p. 18).

33. Figure label is "Link."

34. Figure label is "wheel."

35. Figure label is "hair point."

36. Figure label is "watch spring."

37. Figure labels are "Recording point" and "Recvr pt."

38. This word was underlined during the revision process; the phrase was rendered in the final caveat as "a record of circles."

39. Figure label is "Rolling ball."

40. This paragraph reflects Edison's general understanding of electromagnetic phenomena as the result of some form of vibration or other material disturbance. Cf. Docs. 2804 (headnote) and 2811 esp. n. 8.

41. What Edison meant by a "true Radiometer" is not wholly clear, but he seemed to refer to some direct action of energy beyond the range of visible light. William Crookes created a sensation in the English-speaking scientific world in the mid-1870s with his radiometer, sometimes called a light mill. A number of competing hypotheses were advanced for the mesmerizing rotation of thin vanes, black on one side and white or silver on the other, around a spindle in an evacuated globe in response to light. Edison was certainly aware of the instrument, having tried to make a manufacturing arrangement with Crookes. The controversy died down by 1880, however, with the explanation of James Clerk Maxwell based on the uneven heating of residual gas in the globe and the flow of gas molecules, rather than the direct effect of light itself. See Doc. 2034 esp. n. 3; Wess 2010; Brush and Everitt 1969.

42. That is, a prepared animal membrane used to separate the layers during the production of gold leaf. *OED,* s.v. "gold-beater."

43. This is the Edison-Lalande battery. It was omitted from the final caveat and was instead the subject of a patent application (Case 837) that Edison executed on 15 June and filed on 2 July 1889. The application issued in June 1890 as U.S. Patent 430,279.

44. Edison did not draw a figure 98; figure 99 was omitted from the final caveat.

45. This idea was included in a patent application (Case 842) that Edison signed on 20 July and filed on 10 August 1889. It issued in September 1890 as U.S. Patent 437,426.

46. French chemist Theodore Sidot demonstrated a process about 1870 by which he deposited a layer of carbon on pieces of wood and threads of other materials. He reportedly did so by placing the material in a vessel through which he passed carbon disulphide while applying external heat. His process figured significantly in British litigation over the validity of Edison's incandescent lamp patents in 1886. Senning 2007, s.v. "Sidot blende"; Campbell, Jones, and Gould 1900, 348–50; "Incandescent Lamp Patents," *Teleg. J. and Elec. Rev.* 18 (11 June 1886): 545–50; "Incandescent Lamp Patents," *Teleg. J. and Elec. Rev.* 19 (9 July 1886): 38–40; Swinburne 1886.

47. Edison referred to what he called "electrical carrying" or "carbon carrying," the migration of fine carbon particles from the lamp filament to the glass globe. It resulted in an increasingly opaque coating and was a longstanding problem with incandescent lamps. See, e.g., Docs. 2117 n. 2 and 2892 n. 6.

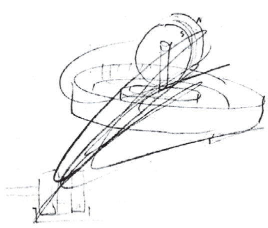
48. That is, a nitrogenous substance derived from phlorizin, a naturally occurring glucose compound. *OED*, s.v. "phlorizein."

49. That is, a resinous material obtained from madder root. *OED*, s.v. "rubian."

50. Edison concluded this list, from "Creatine" to the end, on a separate sheet of paper he numbered 38½. "Pseudo-carbon" was a term for the blackened residue produced by heating cellulose away from the presence of air; though consisting largely of carbon and having similar properties, it is also compounded with hydrogen and oxygen. Cross and Bevan 1888, 23–24.

51. This design does not appear to correspond exactly to any in a pending application but is broadly related to the automatic determining device described in Case 818 (filed in January 1889) for a complete phonograph. It bears closer relations to the five applications filed on 11 February covering specific variations on such a device (Cases 824–28). All six applications were still at the Patent Office. See App. 5.

52. Figure label is "Tape—."



Edison's canceled sketch may be a variant of figure 115.

53. As Edison did not have a patent (or a pending application) on a wet process, he presumably meant only the general form of a slotted hopper and partitioned collector of dry material such as shown in his basic separator patent (U.S. Pat. 228,329) and later modifications (U.S. Pats. 396,356 and 377,518).

54. Preceding figure 111, Edison made and crossed out a faint drawing under which he wrote "Note= peroxide lead scheme," although it appears related to magnetic ore separation. It bears some resemblance to figure 115, for which he provided no description and did not include in the final version. See Doc. 3358 (esp. n. 22) regarding processes for forming peroxide of lead plates.

55. Figure labels are "pulp" and "cloth." At the bottom of the page next to figure 114, Edison made and crossed out an unclear sketch.

56. Figure labels are "Tube to be tested" and "Standard Tube."

57. Figure label is "Compound smell."

58. Edison also listed these filament materials below his drawing of figure 116. French chemist Marcellin Berthelot (1827–1907) gave the name "bitumene" to the least volatile hydrocarbon product of benzene in a red-hot retort. A blackish liquid even at high temperature, bitumene cools to a solid mass. Watts 1872–75, s.v. "bitumene"; *Ency. Brit. online,* s.v. "Berthelot, Pierre-Eugène-Marcellin."

–3354–

Draft to Philip Dyer

[Orange, c. May 16, 1889][1]

<Tate Write Dyer as follows Antwerp>[2]

Phil[a] Dyer—

I shall probably want to start a small factory in Antwerp or some place where Customs wont interfere & where rent is reasonable & Labor cheap The factory can be a 1 2 or 3 story one. I shall want about 10 to 15 000 square feet of floor space, & boiler & Engine of 75 horse power or place to put one. It is for The Toy Doll biz and to be used for assembling parts sent from america & also to make some of the parts Especially the Tin Casing which I can do cheaper[b] there. I shall probably want you to run the biz end of the factory Machinery & tools will be sent from here

I also may want to start a Lamp factory there and will require 50 000 sqr feet of floor surface & it would be a good thing to get them close together or even right together. The suburbs of a City would Answer or in a suburbian town or even a small Town good for shipping—

Look around get prices send plans & data & condition property—Repairs required costs Coal Labor etc. & in fact every kind of data[3] I will be over in August. Mr Dick[4] will have Selling Agency probably—

~~Edison~~

Gilliland & Tomlinson are coming over with some of men hired away from me to start a factory for Dolls to run opposition to me,[5] but I believe I can bust them up on cheapness & a better doll to say nothing of the new patents I have which alone will permit of a good doll being made—

Edison

ADfS, NjWOE, DF (*TAED* D8905ADH). [a]Interlined above. [b]Obscured overwritten text.

1. The typed letter to Dyer, signed by Edison, was dated 17 May, and the editors suppose it took some time for Alfred Tate to compose it and have it typed, probably by Thomas Maguire. It was based closely on this draft and ended with an admonition for Dyer to "lose no time in commencing your investigations." Lbk. 29:434 (*TAED* LB029434).

2. Edison's marginalia overwrites his multiplication of 200 by 50, which may be a calculation related to the square footage mentioned below.

3. Dyer acknowledged Edison's letter on 1 June. He promised to supply comparative information about land and labor prices in Germany, France, and Belgium but suggested that Antwerp would likely best serve Edison's purposes. Almost immediately, he cabled and wrote in detail about a factory building for sale there, but Edison rejected it as too expensive. Dick followed up with several letters about land and labor markets and on 7 June again put forth Antwerp as a city with a large supply of unskilled youth labor, ample space for factory construction, relatively light taxes and regulations, and no trade unions or notable socialist organizations. He sent details about specific sites for a doll factory, either alone or in combination with lamp manufacture. He also continued to research Germany but, at the end of the month, reiterated the advantages of Antwerp. Dyer to TAE, 1, 6, 7, 11, 15, and 28 June 1889; all DF (*TAED* D8905ADQ, D8905ADT, D8905ADV, D8905ADY, D8905ADZ, D8905AEG); TAE to Dyer, 6 June 1889, Lbk. 30:252 (*TAED* LB030252).

4. Dyer was evidently not acquainted with Albert Dick. When Dick went to Europe in late April to reconnoiter the doll business, Edison gave him a letter of introduction to Dyer. TAE to Dyer, 27 Apr. 1889, Lbk. 29:257 (*TAED* LB029257).

5. How Edison learned this information is unclear, but it was confirmed when Dick wrote a few days later from Paris that Ezra Gilliland (who had built and supervised a factory in Antwerp for Western Electric [Adams and Butler 1999, 48]) was looking for a partner to make phonograph toys in France. (According to other accounts, Gilliland was collaborating with Oscar Madden, who had some understanding with William Jacques about foreign rights.) Philip Dyer apparently interceded by raising questions about Gilliland's patent rights. In the expectation that Gilliland would persist with the aid of Frank Toppan and William Jacques, Dick asked Edison for more information about his patent rights. Dick to TAE, 19 May 1889; Franck Maguire to Alfred Tate, 29 May 1889; both DF (*TAED* D8964AAZ, D8955ABY); see also Wile 1987, 9–12.

–3355–

To William Hammer

ORANGE NEW JERSEY 16 MAY 89[a]

Wm J. Hammer exp[ositi]on Edison[1]

Will give you twenty four phonographs with attachments and extras whereby six listen at once[2] Better give French Edison company[3] six of these Also will ship two hundred musical cylinders and follow with one hundred every week very fine[4] Phonograph goes Saturday,—[5]

Edison,

TL (printed telegram), DSI-AC, WJH, Ser. 1, Box 1 (*TAED* X098A035). Typed in upper case; variant letterpress version in Lbk. 29:423 (*TAED* LB029423). [a]Date from handstamp.

1. The cable was transmitted to Hammer's registered cable address ("Newark Paris") and then addressed to him by hand at the "Exposition palais des machines."

2. See Doc. 3345 n. 4 regarding the phonograph exhibits.

3. The Compagnie Continentale Edison was formed in 1882 as a holding company to license Edison's electric lighting patents throughout continental Europe and the French colonies. It consolidated with two related Edison companies, the Société Electrique Edison and the Société Industrielle et Commerciale Edison, about the the end of 1886. See Docs. 2806 n. 1 and 3013.

4. Hammer seems to have had some musical cylinders when the Exposition opened on 1 May, one of which included vocal renditions of "La Marsaillaise" and "America" (Hammer to Francis Upton, 13 May 1889, DF [*TAED* D8946ABO]). Adelbert Wangemann, who was overseeing the recording of music at the laboratory, planned to have thirty recordings ready to ship on 11 May. Another shipment of unknown quantity went two weeks later, and Edison instructed Wangemann to send a new "supply of records of various kinds" every two weeks thereafter (TAE to Upton, 7 May 1889; TAE to Hammer, 29 May 1889; Lbk. 29:317, 30:98 [*TAED* LB029317, LB030098]; TAE to Hammer, n.d., WJH [*TAED* X098A035]). Wangemann listed in a "Musical Cylinder Account" book the titles and performers of all the compositions he recorded beginning 24 March, and this account continued after he went to Paris. He reported recording 880 musical cylinders between 24 May and his departure on 15 June, when he took 654 with him. His recordings were entirely instrumental and most featured one to three performers playing chiefly of European or European-style waltzes, polkas, marches, and excerpts from classical scores. Musicians included violinist Alfred Amrhein; cornetists John Mittauer and Theodore Hoch; clarinetist Henry Giese; flutists Frank Goede, August Goepel, Eugene Rose, Gustav Gast, and Carl Wehner; bassoonist John Helleberg; and pianist Max Franklin. On 11 June, Wangemann also appears to have recorded Anton Seidl's Orchestra at Chickering Hall in New York City (Musical Cylinder Account Book, E-2531:1–20, Cat. 1410, NjWOE [transcribed in Koenigsberg 1969, 109–33]; *ERS,* s.v. "Woodwind Recordings").

5. The telegram delivered to Hammer had no punctuation or capitalization, creating ambiguity as to whether "very fine" referred to the cylinders or the phonograph machine. The editors have based this transcription on the letterpress copy of a typed confirmation, which concludes: "Also will ship two hundred musical cylinders and follow with one hundred every week very fine— phonograph go Saturday." TAE to Hammer, 16 May 1889, Lbk. 29:423 (*TAED* LB029423).

Alfred Tate to Robert Thurston[1]

[Orange,] May 17th [188]9

Personal

My dear Sir:

I have conversed with Mr Edison upon the subject of your personal letter to him under date 6th inst. and as he has not time to explain his views fully to you himself, I take occasion at his request to communicate to you the impressions I received as to his opinion.[2]

You of course understand that Mr Edison takes great interest in the work with which you are so closely identified, and that the promulgation of any scheme designed to facilitate or Enlarge its scope, has his entire sympathy and he also stands ready to render such assistance as he feels he can consistently extend. The case in question, however, is one which he believes should be laid before men who have no means of perpetuating their names except by the erection or endowment of an institution [–––][a] their identification therewith [––?],[a] as Mr. Edison expresses it "plutocrats who have acquired their money easily"—by which he means men who have amassed wealth without conferring at the same time any unusual or lasting benefit upon others.[3] Many of [them?][a] are really glad to have pointed out to them a means by which they can succeed in attaching permanency to their names, and the present requirements of your College furnish a most desirable opportunity for some such person to take advantage of.

Mr Edison feels that the pioneers and real laborers in the field of Electrical Science, by contributing to the world the result of their researches, and by spending their time and energy in clearing the way for those who follow, perform their whole duty, and that others should interest themselves in, and provide for the propagation of the knowledge thus acquired.

So far as he is personally concerned all the money which he realizes from his successful experiments is at once absorbed by further experimentation—doubtless the most profitable investment that could be made of it for the benefit of mankind—and while he might have answered your letter by simply saying that he had not the means available to fall in practically with your ideas, his desire for the success of your undertaking has prompted him to make the suggestion which I have conveyed, believing that if you follow it up it will lead to the realization of your wishes.

In regard to furnishing Cornell with the models of all his inventions, Mr Edison will give this consideration a little later

on.[4] At the present time the whole of his apparatus, excepting that in daily use in his Laboratory, is in Paris. I am respectfully
A. O. Tate Private Secy

ALS (letterpress copy), NjWOE, Lbk. 29:456 (*TAED* LB029456). [a]Illegible copy.

1. Pioneering educator Robert Henry Thurston (1839–1903) was the director of the Sibley College of Engineering and professor of mechanical engineering at Cornell University. He had successfully solicited the donation of a new dynamo from Edison in 1885. At Thurston's request, Edison recently agreed to have some of his students tour the Orange laboratory. Doc. 2846 esp. n. 6; TAE to Thurston, 25 Feb. 1889, Lbk. 28:381 (*TAED* LB028381).

2. Thurston wrote on 6 May that his electrical engineering department had "grown so rapidly and so embarrassingly" that it needed a larger home, and he asked Edison's advice on obtaining a new laboratory space dedicated to its needs. He suggested that financially successful electricians, either alone or jointly, could design and build a substantial structure such as he envisioned, costing between forty and eighty thousand dollars with another fifty thousand for equipment. Holding out the possibility of naming it after a single large benefactor, Thurston appealed directly to Edison's "inclination to do things on a grander, and more perfect, scheme than most men." Edison drafted a one paragraph response on the letter, from which Tate adapted his own reply (Thurston to TAE [with TAE marginalia], 6 May, DF (*TAED* D8905ADB]). Thurston had recently described in detail the department's rapid growth and overcrowding, in hopes of obtaining a large dynamo to replace the small one Edison had donated in 1885. Edison obliged in February with a 240-ampere (no. 12) model (Thurston to TAE, 17 Jan. 1889; Samuel Insull to Thurston, 5 Feb. 1889; both DF [*TAED* D8905AAY, D8905AAZ]; TAE to Thurston, 29 Jan. 1889; TAE to Insull, 9 Feb. 1889; Lbk. 27:960, 28:180 [*TAED* LB027960, LB028180]).

3. Tate quoted from Edison's remark on Thurston's letter (see note 2) that "it would benefit the world at large more for the College to get the money out of the plutocrats who acquired it easily & dont deserve it & have no other means of perpetuating themselves."

4. The editors have not found evidence that Edison acted on this request. In 1891, Thurston asked for a sample of each new type of electrical device made by Edison. Edison referred the request to Samuel Insull, second vice president of the Edison General Electric Co. Tate to Thurston, 3 June 1891, Lbk. 49:570 (*TAED* LB049570).

–3357–

Alfred Tate to Sherburne Eaton

[Orange,] May 20, 1889.

My Dear Major Eaton:—

Here is a letter from the Editor of "American Notes and Queries,"[1] asking Mr. Edison to suggest a new word which would express the act of executing by electricity.[2] Mr. Edison has made several suggestions, such as ampermort (which suggests death by passage of amperes of current through the body, and dynamort (suggestive of dynamic death), and other words such as electromort (death by electricity). The trouble is that none of us here remember enough latin to inspire confidence in the etymology of these coined words. Mr. Edison would like you to revise them.[3] Yours very truly,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 29:477 (*TAED* LB029477).

1. The editors have not found the inquiry from William H. Garrison, the new editor of *American Notes and Queries*. The magazine was launched in Philadelphia in May 1888 by William Shepard Walsh as a weekly counterpart to the British journal *Notes and Queries.* The American version, like the original, identified itself as "A Medium of Intercommunication for Literary Men, General Readers, Etc." and aimed to address questions on "all matters of general literary, historical and archaeological interest." Garrison took over from Walsh with the 4 May 1889 issue. Mott 1957, 64; *Ency. Brit. Supp.,* s.v. "Walsh, Robert"; "Apologia," *American Notes and Queries* 1 (5 May 1888): 1; *American Notes and Queries* 3 (4 May 1889): 1.

2. The 11 May 1889 issue asked readers to "send suggestions for a word that shall express *execution by electricity.*" Nearly a score of responses from professors, journalists, and other readers appeared in the 25 May issue. Among them was "electrocution," from a correspondent identified only as "R" of Lancaster, Pa. More replies appeared in subsequent issues through mid-summer, and the debate found its way into newspapers on both sides of the Atlantic. *American Notes and Queries* 3 (1, 8, 22, and 29 June, 13 and 20 July 1889): 21, 45–47, 57, 66–67, 96, 108, 130–31, 140–41; "Chat," *Anglo-American Times* (London), 14 June 1889, 14; "Execution by Electricity," *Sacramento Record Union,* 21 July 1889, 2.

3. Eaton forwarded Tate's letter to his law partner Eugene Lewis, who replied with criticisms of the words suggested by Edison and offered his own contribution of "electricide," a term also nominated by several respondents to *American Notes and Queries*. That word, however, was apparently coined earlier in the year by the *Philadelphia Press* (*Buffalo Morning Express,* 4 Mar. 1889, 4; also cf. Doc. 3271). Sensing a polemical opportunity for the Edison lighting interests, Lewis also suggested "westinghouse" or "westinghoused," arguing that since a Westinghouse dynamo would be used for the execution, the word would follow the guillotine's precedent of naming the means of execution for its inventor (Lewis to Eaton, 1 June 1889, DF [*TAED* D8933ABD]). Eaton replied to Tate on 6 June that he had "gone into the matter

more fully" than Lewis and agreed that "electricide" would be the best choice. At Eaton's suggestion, Lewis also publicized that term through the newspapers (Eaton to Tate, 7 June 1889, DF [*TAED* D8933ABE]; "'Electricide.' Two Words Suggested for Execution by Electricity," *Buffalo Courier,* 3 Aug. 1889, 6.)

–3358–

Draft Caveat: Miscellaneous[1]

[Orange,] May 20[–19 June?] 1889

<Rub out pencil marks on drawings>[2]

Phonograph Caveat

Fig 1 shews a reproducer wherein the return motion of the diaphragm from the Record material is checked This checking is made to exactly imitate the gradually increasing retardation of the recording Tool as it enters deeper & deeper into the recording material on making a vibration[3] Hence to produce a perfectly true wave to exactly Correspond to the sound wave it is esential that a retarding motion as near as posible imitating the down motion should be connected to the diaphragm. by means of a small elastic ball pressing very slightly on the diaphragm on the opposite side to the recording tool this is accomplished. A forward motion of the diaphragm meets gradually increasing retardation by the record material all pressure of the rubber ball from the diaphragm is removed but on reversing the direction the retardation of the ball gradually increases, & so in a measure the diaphragm as far as retardation outside of elasticity of diaphragm is the same at every part of the movement. a more perfect imitation would be an air Vane or air dash pot a Valve opening on the record point working and the valve closing & retarding on return motion The rubber stores up elastic or spring force while the retardation of the point in the record material does not hence the imitation with Rubber is not perfect. Figs 2 3 4 5 6 shews different devices for holding & adjusting the Rubber dampening ball.

Fig 1

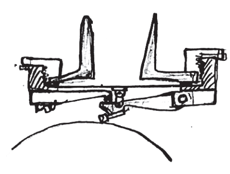


Fig 2

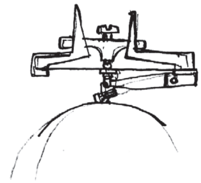


Fig 3

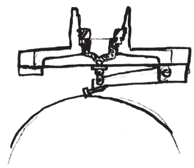


Fig 4

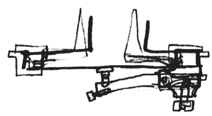


Fig 5

Fig 6

Fig 7 shews phonograph Recorder to obviate defect of eccentricity[a] of the phonogram
Fig 7

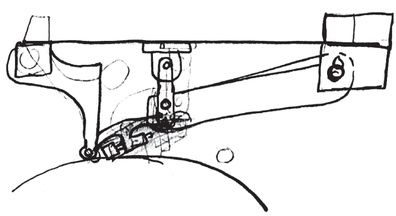


Fig 8 shews X main shaft of phonogh ~~without thread except at one end~~ with a thread[b] which is a worm over this two worm wheels press,[a] both are connected together by bevel gear wheels or they may be side by side & connect by gear wheels one is arranged to run faster than the other by means of the gears hence both being fixed to the travelling arm both rotate but the arm is caused to go forward the same as if there was a 1 2 3 or 800 thread screw

Fig 8

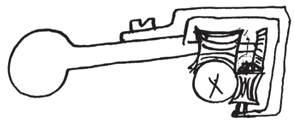


Fig 9 shews a slow feed a worm being on phonograph shaft rotates[a] a worm wheel & the shaft Carries a drum over which fine steel wire is wound this is unwound as the phonograph rotates a weight attached to the arm of the traveller serves to pull the carriage along as the wire is unwound.

Fig 9

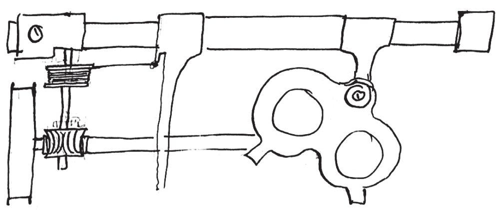


Fig 10 shews a continuous steel band perforated with holes the pin on the travelling arm engages in a hole & is carried forward by the steel belt. the drums over which it passes are also full of pins which pass in & out of the holes while the band passes over them this makes the motion positive. by slipping on the mainshaft different worms & on the right ange shaft different worm wheels any fineness of feed may be obtained

Fig 10

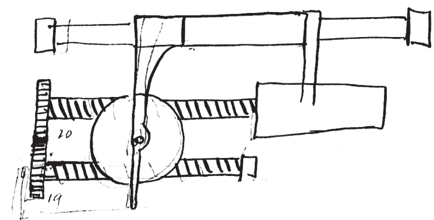


Fig 11 is similar to No 8. the two screws both revolve the wheel in the same direction but one faster than the other hence the arm will move slowly forward notwithstanding both screws ~~are~~ have[c] coarse threads

Fig 11[4d]

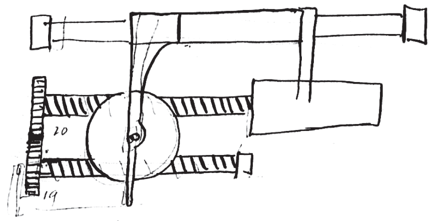


Fig 12 Is a phonograph Recorder the Recording tool being as shewn— fig 13 a half ball [-][e]

fig 12

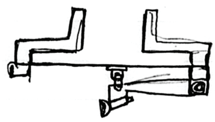


fig 13

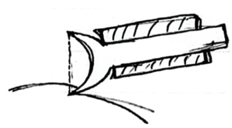


Fig 14 is apparatus for the deaf shewn in a previous Caveat.[5] The difference here is that instead of a pivoted bearing for the amplifying lever its bearing is on a torsion wire which is adjustable, X being in fig 15 like the tightner of strings on a musical instrument.

fig 14

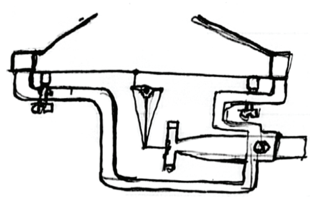


fig 15[6]

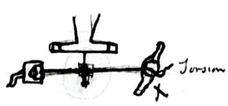


Fig 16 is an magnetic[a] seperator for ores. a trough X in fig 17 has passing through it pulp very thin & containing the magnetic material in passing the latter is lifted out of the trough & as the magnet is rotated is scraped off by the scraper[7]

fig 16

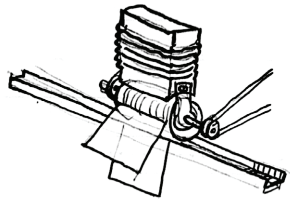


fig 17[f]

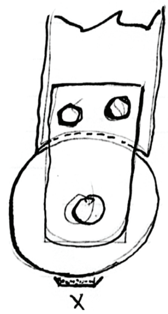


Fig 18 shews a sheet of water falling in front of the falling stream of fine magnetic ore the magnetic particles are attracted to the water & through it no silica or non magnetic material can get through & no float is possible towards the Concentrating side—[8]

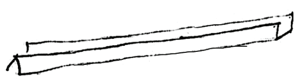


fig 18

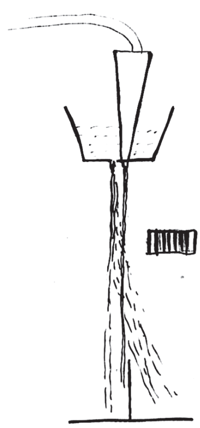


Fig 19 shews the stream of water filled with pulp—
fig 19

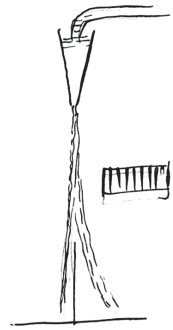


Fig 20 shews the falling stream broken up into sections
fig 20

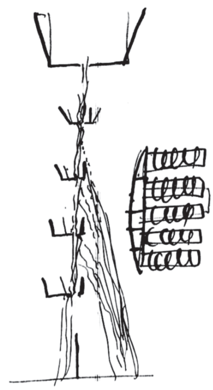


Fig 22 shews the[a] method of mixing the ore & water before it falls as a sheet
fig 22

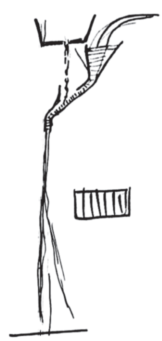


Fig 23 a belt machine of rubber with cross bars, for holding pulp. 1 is supply ~~ore~~ water 2 the ore hopper 3 the seperator.

fig 23

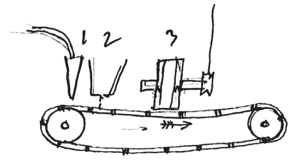


Fig 21 shews a circular stream Seperator.
fig 21

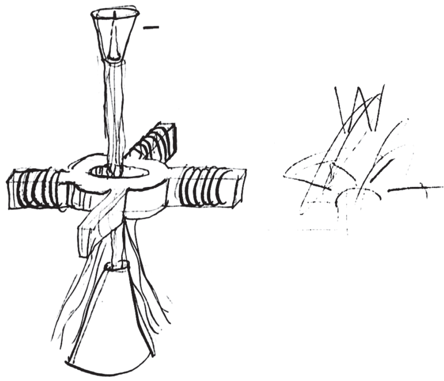


Fig 24 Shews a photometer for central stations to indicate the Volts at the ends of the feeders a box containing several apartments each containing a incandescent Lamp Connected to a feeder the front face is closed by paper with a round grease spot in the Center of each partition. from another box facing proceed the rays of a carcel Lamp.[9] When no spots are seen the Volts are right & are low or high as the spot appears & has one or the other color which is quite different as the Electric or the Carcel Light predominates
fig 24

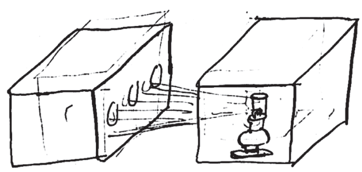


fig 25

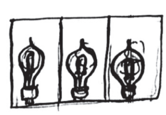


Fig 26 shews a phonogram blank prepared by[a] a grooving tool set in [~~a~~–][c] advance of the Recorder & a recorder having a ball recording point which rides on the apex of the ~~V~~ ∧ shape tops. no stock is taken out of the phonogram. instead of a ball a round cylinder as in fig 27½ may be used

fig 26

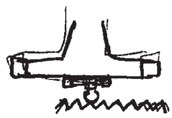


fig 27½

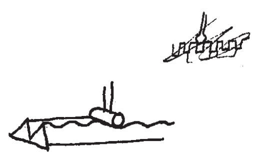


fig 27 shews this form of recording

fig 27

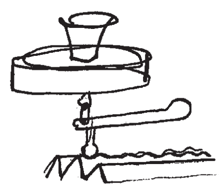


Fig 28 is a ball recording point the record being made by pushing away the stock of the side which have been previously grooved by a tool in advance of the recording ball. The receiver~~s~~ points[c] are preferably as shewn in fig 127½=[10] Fig 29 shews a ball for determining the position of the spectacle in relation to the surface of the phonogram. Its weight keeps it on the lower side but after the spectacle is set. the forward motion of the Cylinder Carries[a] the ball forward Instead of a ball the lever could be pivoted & have a wheel; going over the center frees it.

fig 28

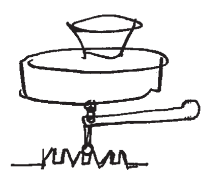


fig 29

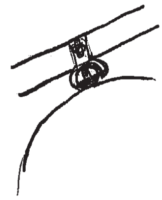


Fig 32 shews a lever on both sides of the spectacle.
fig 32

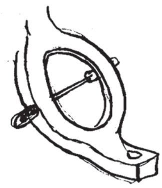


Fig 30 shewn an ironing wheel to true the cylinder & iron of[11] the Cylinder this is cold while the wax is warmed while being ironed
fig 30

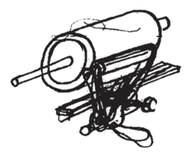


Fig 31 Is a turning off tool for trueing a cylinder in Situ before using while rotating the whole Knife is fed[a] exceedingly Slowly towards the Cylinder by a worm & wheel
fig 31

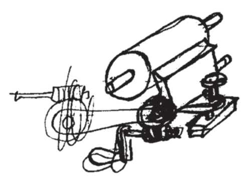


Fig 33 shews a phonograph which has recorded several messages consisting of dots & dashes Composed of waves of different musical pitches a magnet serving to give motion to the diaphragm— The different messages are seperated from each other so operators Can Copy them by means of resonators tuned to a different pitch from each other[12] fig 33 <Record Musical waves & Anylise with Resonators>

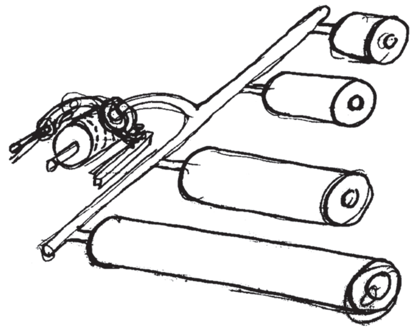


Fig 34 shews a locking device for phonogh spectacle[13]
fig 34

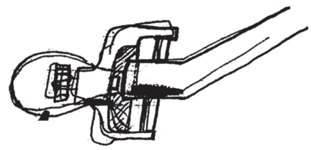


Fig 35 the same the two rods being Camed[14] together when in proper position
fig 35

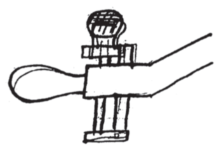


Fig 36 shews an automatic Locking & determining device— The forward motion of the rider works an[a] arm from the bolt near the handle and cams it tight by means of eccentricity in a part of the bolt & a corresponding eccentricity in the plate & already described in a previous Caveat.[15] fig 37 shews it more in detail at X the connection is made & may be a friction Contact.
fig 36

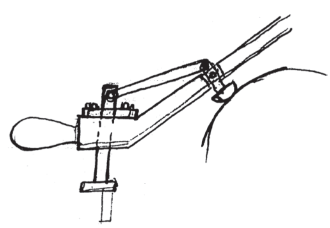


fig 37[16]

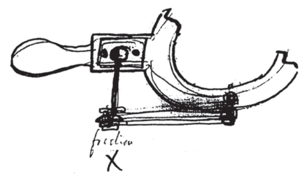


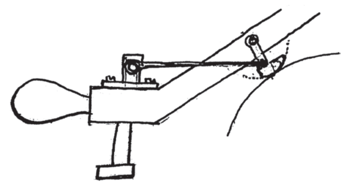
Fig 38 shews the rolling forward of the determinator to a Considerable distance where the Circumference of the wheel abruptly ends. [–][17e]

Owing[a] to the friction Connection[a] at X the Locking of the bolt is secured before this point arrive.

fig 38[18]

Fig 39 shews it connected better.

fig 39



For making glass globes for incandescent Lamps & parts also for prisms & sheets for the passage of the vibrations beyond the Ultra Violet,[19] for phonographic & Telephonic diaphragms, for casting different articles to shape and size in a hot mould I use fused pyrophosphate of Calcium—

For use in dehydration Chemical Steam Engines I add to the list[20]

Alumina potassic sulphate
phosphate of Sodium
Borate of Sodium,[a]
and the Double salts of pyrophosphate of Soda & phosphate of Zinc
d[itt]o manganese ditto Copper[g]

Oxide of Copper (CuO) if moistened with an alkaline[a] solution pressed into plates by hydraulic pressure and then subjected to a full red heat for two hours becomes very hard

& coherent If one plate is put in a battery jar while the other plate is ~~reduced to a metallic state~~ is put in a solution of Hypophosphorous[a] acid The Oxide is turned into a ~~Nitride~~ Hydride[c] of Copper. If this opposed to the Oxide of Copper plate in an Alkaline solution & the plates Connected by a wire wound around them or in grids A[a] current is obtained water being formed the H of the Copper Combining with the .O. of the oxide in the other plate, until both plates are reduced to metallic Copper when they may again be rejuvenated [---][e] by heat ~~the other~~ & one[h] by immersion in the Hypophosphorous acid solution

It is very desirable to obtain solid [~~mol~~?][e] moulded plates of peroxide of Lead chemically[c] which will [~~give~~?][e] give as good results in Sulphuric acid of[21] alkaline solutions as the peroxide of Lead in the storage battery produced by Electrolysis[22]

If Red Lead is moistened with say water or weak Alkaline Solution & moulded by pressure into the form of plates & then subjected to any of the many Chlorinating substances ~~The~~ in the presence of water Oxygen is set free and the Red Lead is raised to peroxide of Lead but this used under the same conditions as that Electrolytically produced does not give the same results. at first when used in connection with Zinc in Sulphuric acid Solution it gives fairly high volts by[23] rapidly loses its Voltage which is not the case with that Electrolytically produced I propose moulding the Red Lead plate & then raising Electrolytically to peroxide but after the first preparation all subsequent reproductions are to be obtained chemically By Coating the grid originally with peroxide of Lead Electrolytically very thinly & then moulding the Red Lead over this & peroxidizing in the chemically way may produce the desired result It may be that the Electrolytic peroxide is partly an anhydride & part a Hydrate and would be better if it were purely an anhydride. To make an anhydrous peroxide The red Lead plates may be immersed in Ether Containing Hydrogen peroxide in solution also submitted to dry ozone—or immersion in strong Sulphuric Acid containing small quantity of water & then passing Hypochlorous acid & other gaseous agents which Liberate nascent oxygen. The sulphuric acid in this Case acts as a dehydrizer [---][e] Hydrofluoric & phosphoric acid Chloride Zinc & other dehyrating agents might be used— The solid plates of Red Lead might be peroxidized & be a hydrate & afterwards the plates could be immersed in a dehydrating agent free from solvent action & the water taken from the hydride—thus rendering the plates anhydrous peroxide. It is possible that the Lowering[a] of the Volts is due to the Chemically prepared peroxide not making good contact with itself so as to allow of Electrical~~ly~~ Conduction and being in loose contact permits the passage of the Electrolyte between the particles which then produces a reduction of one side of one particle to metallic Lead & the other to protoxide which is a non Conductor this would account for the Loss in Voltage & the gradually increasing resistance of the battery. Now this can be obviated by moulding the red Lead in a grid [~~under~~?][c] powerful pressure and then by a further action so restrains its expanding when being peroxidized chemically that the pressure will be very much increased so that when the whole is reduced to metallic the pressure is still considerable— The Lead grid might be like a printers chase[24] around the edges but inside like a window The outside fram being of iron & the red Lead forced into the pannels while the outside of the Lead grid is bound in the iron chase on the sides. sheet Lead can be used full of holes. The iron of Course is varnished On peroxidation the Red Lead swells from the absorption of of Oxygen & this exerts an increased pressures so that when fully peroxidized the pressure on each particle is so great as to insure good Electrical Contact & also prevent the Electrolyte from penetrating by Capilliarity The plates might be peroxidized chemically[c] not under pressure ~~by Chemis~~ and then by powerful Springs acting Continuously keep pressure on while being used To permit of the penetration of both the gases to peroxidize as well as the Electrolyte while being used & at the same time to preserve the pressure, pulverized porous cell material or porous powdered charcoal or equivalent substance.

steel tubes say ½ inch inside diameter Lined with Lead & perforated with many holes also lined with Lead & the outside of the tube also lined or rather Coated with Lead so that none of the steel can come in contact with the electrolyte. The holes are very small say 1⁄32 of inch but very numerous at the top of the tube which does not enter the electrolyte & is not coated with lead is a screw and plunger The bottom of the tube is closed. The whole is filled with a mixture of Chemically made peroxide of Lead mixed with a sufficient quantity of porous material capable of withstanding great pressure The plunger is screwed down on a spring washer over a solid washer. The bottom of the solid washer be coated with platina. any degree of pressure is obtained= good contact is maintained during the action of the battery   Two such electrodes on reduced to metallic Lead[25] from Litharge by hydrogen acts as the positive Electrode while the other or peroxide acts as the negative   Thus we can get electricity directly from Chemical action produced by heat   Of course ~~two such~~ [-][e] a single peroxide tube in Alkaline or better sulphuric acid solution with amalgamated Zinc will give a powerful battery.

Battery scheme: phosphite of chromium as a positive Element CuO as a negative Element & in Alkaline solution.

No 2   phosphate of Lead in Lead grid and Finely divided Lead in sulphuric acid—

No. 3. Same But Zinc instead of Lead in Sul Acid or alkaline solution.

No 4   Dicupric orthophosphate for negative, Zinc in alkaline solution for positive

No ~~4~~5   Tricupric orthophosphate in alkaline solution with Zinc

y=Cupric pyrophosphate. In alkaline solution with Zinc—

For mixing with Stearate soda for phonograph cylinders to render them more amorphous. Hydrates of Magnesium—especially trihydrate of Alumina— also Phosphate of Alumina   Hexametaphosphate of magnesium[26]

For making very pure stearic acid I disolve it in alcohol & chill it out using the stearic acid so obtained as base for phonograph Cylinders in combination with an oxide like Soda & alumina—

The Stearate of Soda & Stearate of Alumina which form the cylinders may be disolved in alcohol and chilled out, leaving a very pure material which is then melted[a] & Cast into Cylinders

To prevent crystalization of stearate of Soda or other stearates which Crystalize & alone are unsuitable for phonographic Recording I mixed a ~~great~~ ~~n~~Stearate or similar fatty body or body mixable with the stearate of soda which is highly amorphous & this in most cases prevents Crystalization[27]   in many cases the amorphous material alone may be used without the stearate but generally They are not so cheap—

Thus Oleamide, Oxalate of Calcium Palmitate of Lead Mannitic Palmitate, Sulpho-acid of Parabenzene combined with Barium ($C_{12}H_{10}BaS_2O_6$)—

Action of Hydrochloric acid on Amarine   Trinitramarine

Anchoiate of Barium Anchusin Andaquies wax ~~(Cera~~ (Cera de los Andaquiès)[28] Anemonic acid Angelica wax[29] Resinous anisic alcohol Action of pentachloride of phosphorous on Hydrate of [----~~yl~~][e] anisyl.

Carbon filiments may be made from potato fat moistened with ether and Squirted through a press & carbonized

Fig 40 shews a method of turning pig iron into wrought iron D is a box C is sand A is magnetic oxide & sand d d' are Electrodes of wrought iron X is the molten bar of pig iron just poured from the blast furnace The heat from the Current passing through The molten metal brings it to a very high temperature some of the oxygen from the iron oxide rising & boiling through the liquid burns out the Carbon owing to the great power of the Current the iron when turned to wrought may be kept still liquid & not pasty as in a puddling furnace—[30] Small quantities of some other oxygen producer such as black oxide of manganeese Lead or Chromate Lead, Red hemitite with the magnetic oxide, [---][e]

Many articles moulded to shape can be turned into wrought iron in situ The Strength of the Current is regulated at E by a Resistance[31]

Fig 40

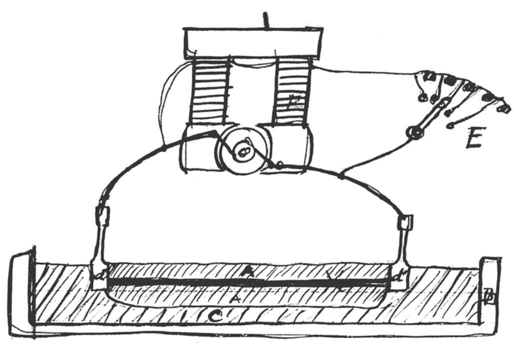
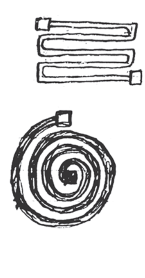


fig 41 shows method of getting a great length of molten pig to save loss by conduction to the Electrodes which is a great factor when short pigs are used—[32]

fig 41



This principle can be applied to a puddling furnace the device 41 being used in this Case no stirring is necessary and ~~but~~ very much less Electricity is required

~~I f~~ I have ascertained the reason why blast[a] furnaces cannot control the quality of the pig iron produced and have obtained a simple remedy therefor Pig iron is known as No 1 2 3 and white iron. No 1 is the most Valuable being softer & highly Crystaline while 2 3 & ~~which~~ white are less valuable ~~in relation~~ The crystals becoming smaller & the iron harder.[33] The reason is the rate of Cooling of the pig relative to the constitution of the molten metal & its temperature the Condition as to moisture & heat Conductivity of the sand so there being so many constantly changing Conditions ~~foundr~~ furnace men have been unable to Control their product. I eliminate all of the changable conditions & reduce it to one which is independent of the quality or temperature of the molten metal in practice—

The pig iron moulds are of sheet iron in a chamber where no draughts of air take place. The inner part of the sheet iron mould is lined with magnesia in a finely divided & porous[a] state so that its heat Conductivity is very small. The sheet iron mould is supported at several points by strong but porous[a] fire brick having small contact with it so that ~~the~~ nearly the[i] whole of the heat of the cooling pig must be lost by radiation & convection through an air space & not by Conduction, hence It is a great object to reduce the total radiating surface of the cooling pig as low as is practicable to the end that the bar will take several times as long to set as those poured under the usual conditions, so that the iron shall be highly Crystaline & allow the Carbon to Crystalize out. All of the sheet iron moulds are connected by sheet iron troughs similarly made & connected together and the whole gang of moulds worked as now. The trough leading from the blast furnace is covered to prevent chilling—

Nearly[a] the whole of the iron if thus slowly cooled will be no 1 foundry. Another plan in to put the whole of the moulds connected with the furnace in a fire brick chamber & kept at a red or yellow heat by the waste heat of the furnace to obtain a still slower cooling of the pig Especially at the yellow heat point=

Another improvement in blast furnace practice is to ascertain the position of the iron & slag in the bottom of the furnace by putting in double Electrodes at certain points above which the iron[a] & cinder must not go & as both the iron

& slag are conductors, when they reach a certain point close the circuits & ring bells. The iron electrodes having a weaker battery & low resistance bell than the slag so that the slag will have no effect on the electrodes intended to indicate heighth of iron in the well & vice versa.

Another improvement in working fine or concentrated ores with large ore & coal is to cause the fine ore to feed downward more rapidly by a jarring machine worked by power to produce a slight jarring of the foundation of the Stack.[34]

An improvement in concentrating iron ores is to Crush & seperate with the magnetic seperator in the usual manner setting the seperator so it will give[a] a very perfect concentrate but with Considerable loss of iron in the tailings, Then running the whole of the tailings through a more powerful magnetic seperator to draw every particle of magnetic material from the same, then running the concentrate (which is not very high in iron on account of small magnetic particles sticking to large pieces of gangue) between rolls to bring it to a fine condition & then running the whole through another magnetic Concentrator similar to the one first used thus very high grade Concentrates may be obtained & practically nothing left in the tailings

For running phonographs in series I use a non breaking switch as in fig 43 and Connect the phonograph motors in series as in fig 42; about 40 machines can be worked in one circuit taken from a 110 volt electric Light circuit or a dynamo X X' [-][e] are amperemeters. C C' switch Resistances[c] at the Central point for regulating the amperes according to the number of Customers.[35]

fig 42

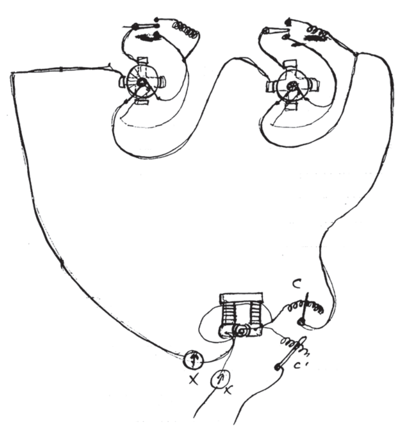


fig 43

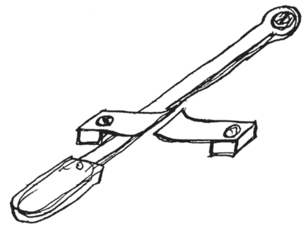
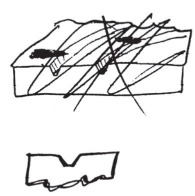


Fig 44 is a mandril with sunken thread used in the Center of a mould for pouring phonograph cylinders 45 shews the sunken thread fig 46 The phonogram blank with internal thread fig 47 a section

44

45



46[36]

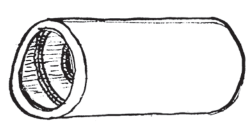
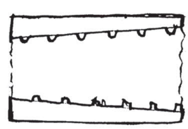


fig 47[37]



Compounds for making good phonogram blanks are Carnauba wax seventy parts Beeswax thirty parts adding while molten about 5 parts of acetate of alumina & boiling to expel the acetic acid. The fatty acids of the Carnauba or[a] Beeswax It is believe combine with the alumina to form say Creotate of alumina which renders the cylinder very hard Easily moulded & not liable to expand & contract so much by variations of temperature.

Another mixture is stearate of Soda 50 parts, Stearate[a] of alumina 10 parts, & Ozocerite parafine ~~&~~or ceresin 30 parts. The proportions of the ingredients of both of the above compounds may be varied in endles proportions The beneficent agents for phonogh purposes is the very amorphous Substance stearate of alumina. Stearate of Zinc is another good substance for this purpose

In batteries where strong alkalis are used with glass jars the addition of the soda produces so much heat that it nearly always cracks the jar; to obviate this I cast the soda while molten in sticks & then dip the same in molten parafine. This preserves them from moisture & when used ~~they~~ the parafine may be scraped off in several places exposing a small portion of the total surface the heat produced owing to slow solution in the water prevents the glass from Cracking

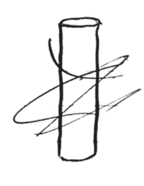
A cheap hard soap formed from the cheaper soap stocks Combined with Lime or soda or alumina oxides to form a hard but Easily fusible material Combined with Crude Ozocerite or parafine the latter to prevent action of moisture moulding shells of same & veneering surface with the more Expensive Record material.[38]

The internal part of the moulded phonogram blank may be made smooth & not liable to Cause wax chips to cling by shellacing the same or coating with Collodion or gum balata

Fig 48 is a wire basket over the outside of which is streatched fine Linen the whole immersed in the molten pot of material which filters through & dipped out

fig 48

~~soda stix coated by dipping in parafine etc or cooled in parafine paper & dipped in Parafine Top torn off & picked~~



[A][39]

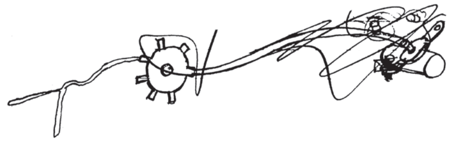
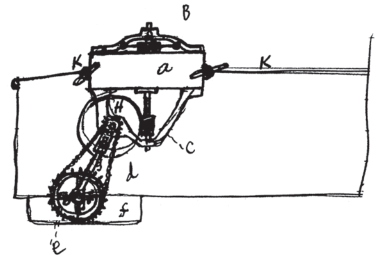


Fig 49 shews an electric brake for Railway trains especially freight trains.[40] The following is the system= In each Caboose I place say twelve small motors weighing say 50 pounds each & easily carried by one man also as many wheels which are split & have teeth on their periphery over which a linked chain runs on making up a train of say thirty cars the yard hands or brakeman selects from the thirty cars 12 which have straight break rigging; below the ordinary hand wheel he puts the split wheel & clamps it to the brake rod by nuts & wrench this is done quickly He then brings from the Caboose the 12 motors adjusts them to & connects them with the brake rod by a linked Chain. two grappling ropes connected to the edge of the top of the car in Connection with a forked rod attached to the motor & coming in contact with the break rod serves to hold the motor in position. two double wire insulated ropes are passed over the top of the Cars the ends being in the Caboose & the other Ends free or passed to the Locomotive A Dynamo run by a small engine & boiler on[a] the Caboose furnishes current. When it is desired to brake the train the Field is energized in one direction See fig.[41] which is always the same— on throwing the switch X to one side the current is sent to the armatures of all the motors in one direction & they rotate say to the right, on throwing the switch to the opposite side, the direction of the current & motor is reversed by means of a worm wheel H fig 49 & worm C [—][e] the chain gives rotation to the brake rod in one direction & the reverse direction when the motor rotates in the opposite direction. e is the split wheel d the chain f the ordinary brake rod platform K' the grappling ropes provided with tightening device on motor g is the forked rod which is adjustable. a similar Dynamo & Engine may be on the Engine so the ~~Eng~~ brakes Can be controlled at both Ends The advantage of this system is that when the train reaches the end of the journey all can be replaced on the Caboose hence no permanent investment is required on each[a] car & freight train braking is made universal at a small cost which it would take years to accomplish so desirable an object if the Railways were compelled to make permanent attachments to all their cars fig 49[42] <Electric Brake Caveat>[43]



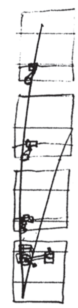
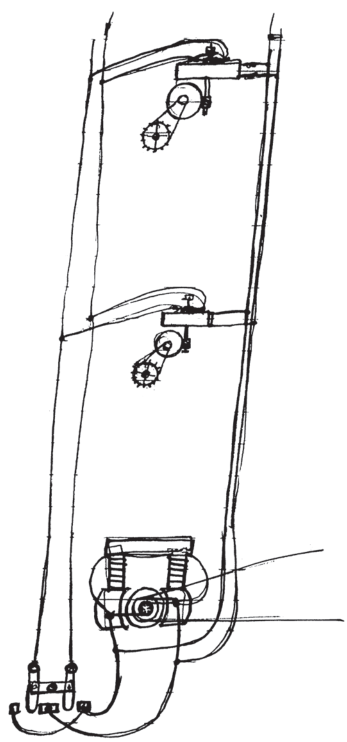


fig 50 <Electric Brake>



<Caveat Kinetoscope>[44a]

Fig 51 & 52[j] shews an improvement in the Kinetoscope. N is the rotating Cylinder of glass covered with the photographic film, K the Lenses A A' the object to be photographed with all the motions P is a break wheel which closes & opens the circuit of an induction Coil g with Leyden jar H, a Reflector X throws the light of the spark on the moving object A A' The break wheel breaks are so arranged that there will be say 15 breaks per second~~s~~ allowing 1/8 of inch of space on the cylinder for each photogh. owing to the instantaneous character & high actinic power of each spark a [---][e] shutter cutting of & on the lenses from the Cylinder as in my first devices unnecessary. at Every Spark a photograph is taken always at definite intervals & as the spark is infinitely quick the continuous movement Even of the cylinder does not blur the photograph of course a shutter through which a powerful arc light beam[a] or sunlight passes to the object may be controlled positively by a lever worked by the machine & thus instead of continuously illuminating the subject to be photoghd & the use of a vibrating shutter, the light itself is intermitted.

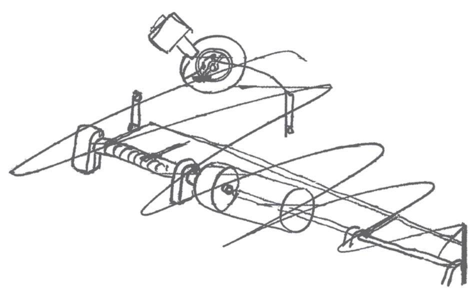
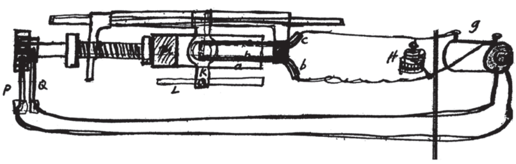


fig 51



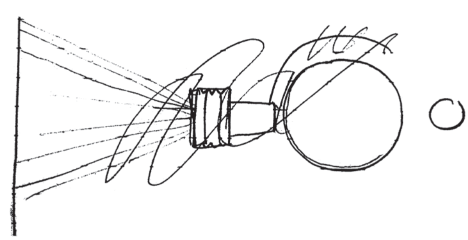


fig. 52 <Rub out pencil marks>

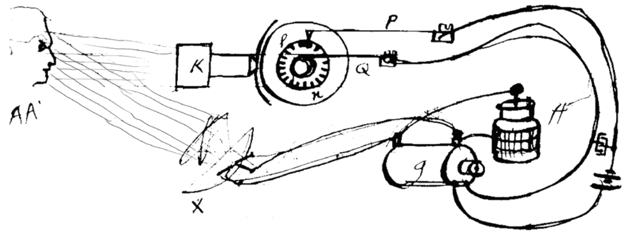


Fig 51 shews the manner of reproducing the picture on a screen the microphotghs instead of being looked at through a microscope are projected very[a] much magnified[45] by using a lense on K & inserting inside of the rotating glass cylinder spark points controlled by the break wheel the spark being given at the exact moment when the Negative is exactly opposite a hole leading to the lense.

Figs 53 to 59 are magnetic iron ore seperators 53 Conveys by rubber belt to magnetic wheel from ore hopper & delivers under water

Fig 53

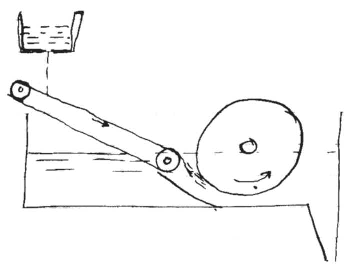


Fig 54 The hopper delivers ore to rubber belt moving under water & conveys a[a] thin layer of ore under the revolving magnet which lifts out magnetic particles & delivers the same outside of tank

fig 54

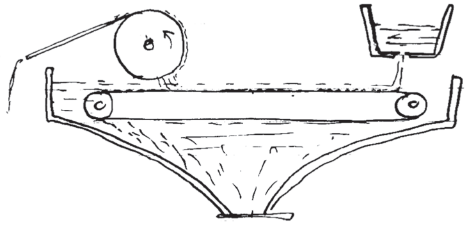


fig 54½ is double rotating magnets which alter the trajectory of the magnetic particles and can be worked close to stream any magnetic particles sticking to the magnet being scraped off—

54½

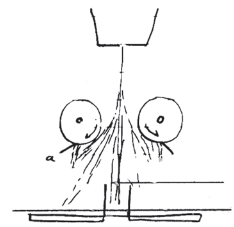


Fig 55 Ore delivered to tank rotating magnet has its magneticsm intermittant so small clinging magnetic particles disengaged by causing many rearrangements of the whole of the particles in contact at every Variation of the magnetism thus Enabling nonmagnetic particles by friction of the water & gravitation to be worked out, the variation of magnetism not being sufficient to permit magnetic particles from getting any considerable distance from contact attraction.

fig 55 <~~open & close magnetic ckt to Razzle in water—~~>

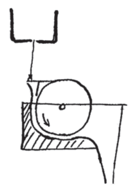


Fig 56 shows ore dropping down a partitioned tank to rotating magnets made water tight the magnetic particles being lifted with some gangue to the bottom magnet and held there until immediately under the next magnet at which point a Commutator within the magnet Cuts off the section of the drum & the magnetic particles & very much less gangue are lifted to the 2nd magnet & so on being scraped off from the small exterior magnet.

fig 56

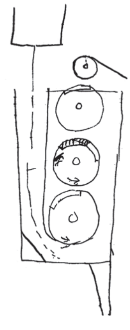


Fig 57 shews a single one

fig 57

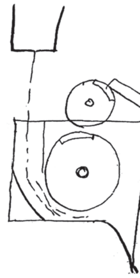


fig 58 shews the dry seperator with a Λ shaped board over the slit & full of holes so as to produce an even pressure of ore on the slit & take off the great pressure due to the whole of the ore which tends to form arches of particles over the slit & thus prevent easy running The slit in this device is a rotating one.

fig 58

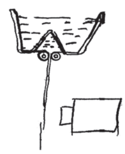
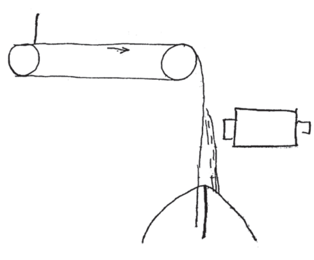


Fig 59 Shews a device for doing away with the slit, by delivering the ore in a thin flat stream sized to thickness by a scraper over the belt the speed of the belt being kept very Constant. The magnet alter the trajectory of the magnetic particles in the usual way

fig 59



ADDENDUM[k]

[Orange, June 1889?][46]

~~Caveat~~

~~For phonograph cylinders I am continuously Expmt'g to obtain a perfect material for phono records among recent experiments, is~~ For[a] prevent~~ion~~ing of the great Contraction of the Carnauba or palm wax family by adding a stearate of a metal preferably stearate of Aluminum making a more amorphous compound when cooked for some time & one which has nearly the ordinary contraction of waxes. to this Compound Beeswax, Parafine Ceresin & other softer waxes or materials[l] can be added to give it cohesion[a] & prevent chipping— Another method is to act upon Beeswax by Alumina to form Creotate of alumina by adding Acetate of Alumina to[a] molten Beeswax The resultant Compound being[a] Combined with Carnauba—~~Othe~~ or the proper proportions being put together say ~~5~~400 Carnauba 500 Beeswax. The decomposable alumina Salt can be added until the proper consistency is reached which is about 30 parts of acetate Alumina—

The Cerotic Acid of the Beeswax & probably the Carnauba decomposes[a] the alumina Salt Combines with the alumina & sets free acetic acid which is driven off by the heat. Acetates ~~or~~ of The other Metals can be used such as magnesia Zinc but they are not so easily worked & do not give so good a combination. All amorphous stearates, Cerotates & other fatty acids combined with metals, serve a very useful purpose in producing phonoghic cylinders when used in conjunction with Waxes & other materials which [~~have a~~?][e] are[c] Crystaline or semicrystaline. The Salts tend to prevent contraction & roughness due to Crystalization.

A Cylinder for indenting without removal of material can be made by using 50 parts Camphor & 50 parts of a wax or other material when turned true & allowed to stand the Camphor volatilizes & leaves a pour waxy surface which is easily flattened down by the sound waves & point—

I am also Experimenting with Shells of [~~Br~~?][e] Sulphur Cast by pouring ~~a~~Sulphur approaches more nearly the expansion point of Ordinary Waxes & soaps than any other substance equally strong hard ~~&~~ mouldable & cheap The Shells are dipped in[a] the ~~solution~~ molten Recording material thus putting a thin veneer on the surface or the thin shell of Recdg material may be made by heavily Coating a metallic mandril with Castor oil dipping & then stripping off the shell & pouring Sulphur inside shell when over a mandril which has a space between it & the shell for the Sulphur

TAE

ADf, NjWOE, PS (*TAED* PT031AAG1). Document multiply dated; figures drawn on sixteen separate pages. [a]Obscured overwritten text. [b]"with a thread" interlined above. [c]Interlined above. [d]Drawing followed by "over" to indicate page turn. [e]Canceled. [f]Drawing followed by

"Turn over" to indicate page turn. [g]Followed by dividing mark. [h]"& one" interlined above. [i]"nearly the" interlined above. [j]"& 52" interlined above. [k]Addendum is an ADfS. [l]"or materials" added in right margin.

1. This document is the sum of two separate caveat drafts. Edison began one on 20 May, when he dated the first page, and continued without other date notation until 19 June, when he dated four of the final six pages of figures, which he presumably made before completing the descriptive text. (Other drawings in the caveat correlate with sketches that Edison made elsewhere from 23 May and 15 June; see notes 13 and 40.) Edison began the other draft, undated and much shorter, as a separate document with its own page number sequence and no drawings. He later renumbered the pages to carry on the sequence of the first draft, and his attorneys likewise attached the later text to the end of the first draft in creating the finished typed caveat. The editors similarly present the later draft as an addendum to the first. The finished caveat filled twenty-one typed pages and closely followed Edison's handwritten text. Edison executed it on 29 July and it was filed on 5 August as his Caveat 116 for phonographs. As with Doc. 3353, the Patent Office refused to process the application until it was narrowed to a single invention. Edison may have considered some of the ideas in this document, such as proportions of phonograph wax compounds, as trade secrets rather than patentable inventions, but his larger purpose was to create a confidential record of his work (see Doc. 3365). Commissioner of Patents to TAE, 8 Aug. 1889; Patent Office file wrapper and form of oath; all Caveat 116 case file, PS (*TAED* PT031AAG, PT031AAG2); Caveat 116, Pat. App. (*TAED* W100ABZ).

2. The faint pencil lines of Edison's initial sketches are still visible on some of his completed drawings.

3. Edison was addressing a fundamental problem posed by the vertical motion of the recorder of the phonograph (and graphophone). According to Edwin Houston, the machine had difficulty capturing overtones because

> the degree of resistance to indentation offered by the tinfoil, or, indeed, by any ordinary material, does not increase in the same ratio as the depth of indentation, but in a much more rapid ratio. It therefore follows that the relative depths of the phonogram-record indentations are not a correct reproduction of the movements of the transmitting diaphragm, consequently the phonogram-record is unable to correctly reproduce the quality of a speaker's voice. [Houston 1888, 45]

Houston's diagnosis was explicitly endorsed by Emile Berliner, whose gramophone addressed the problem by cutting laterally in the recording medium (Berliner 1888, 435–37).

4. Faint figure labels are "20," "19," and "19 to 20."

5. Doc. 3353 (see figs. 92–93).

6. Figure labels are "X" and "Torsion."

7. The drawings that follow appear related to a long series of ore milling sketches that Edison made on 18 May, many of them specific to wet separation processes. N-89-05-18, Lab. (*TAED* NA031AAA).

8. Edison presumably intended the water processes described here to

deal with very fine or dusty ores, which tended not to sort as neatly as those with larger particles. On 10 May, he drafted a patent application covering dry processes for such materials, such as tumbling them with sand or other silica-bearing materials. That application became his Case 848 and was eventually forfeited. PS (*TAED* PT032ACA).

9. That is, a modified Argand lamp devised by Bernard Guillaume Carcel in 1800. Its distinctive feature was a clockwork pump to supply oil to the wick from a reservoir below. The Argand produced a steady circular flame and was used throughout the nineteenth century as a lighting standard but the pump meant that the fuel could be metered, an advantage that specially suited the Carcel for photometric work. Comparing the appearance of grease spots under different conditions was a standard photometric technique. Doc. 1874 n. 3; Dredge 1882–1885, 2:156–63; Figuier 1870, 4, 32–39; Tidy 1872, 99–100.

10. This incorrect figure reference was corrected in the final caveat (p. 5) to "27½."

11. In the final caveat, "of" was corrected to "off."

12. An instrument devised by Hermann von Helmholtz, the resonator is a spherical or cylindrical vessel with one or two small openings used to detect or amplify faint sounds of a specific frequency. Edison was familiar with it through his work on acoustic telegraphy and also the electromotograph telephone receiver. Doc. 708 n. 5.

13. The various locking mechanisms here resemble several of the dozens of sketches Edison made for a draft caveat dated 23 May. Those sketches, many showing the phonograph and ore milling devices, are largely devoid of explanatory text. N-88-06-01.2, Lab. (*TAED* NA025AAD).

14. This word was carried without remark into the final version of the caveat (p. 6). Edison presumably meant to indicate the action of a cam or eccentric, as in the explanation of figure 36.

15. Doc. 3353 (see figs. 106–7).

16. Figure label are "friction" and "X."

17. The editors have not reproduced several rough sketches that Edison made on the back of this page.

18. Figure label is "ball joint."

19. Cf. Doc. 3353 n. 39 and fig. 88.

20. Edison first proposed designs for chemical steam engines in November 1887. Doc. 3113.

21. Edison's attorneys corrected "of" to "or" in the final caveat (p. 7).

22. The process of forming battery plates described here may be the "scheme" Edison referred to obliquely in drafting an earlier caveat. See Doc. 3353 n. 54.

23. In the final caveat (p. 8), "by" was corrected to "but."

24. That is, the iron frame used in letterpress printing to hold a page of type that is placed in the press. One page of unclear and unnumbered sketches, pinned with the text, may relate to this printer's chase idea. Doc. 3115 n. 4; *OED,* s.v. "chase, n. 2."

25. This phrase was rendered more clearly in the final version (p. 10): "Two such electrodes are used; one reduced to metallic lead…."

26. Edison apparently referred to the "Useful Determinations" recorded in late May by Jonas Ayslworth in connection with experimental

cylinder compounds Nos. 1016–1020. N-88-08-23:125–27, Lab. (*TAED* NB050098 [images 63–64]).

27. For Jonas Aylsworth's experiments to solve this crystallization problem, see 88-08-23:27–37, Lab. (*TAED* NB050017, images 14–19) and his testimony (pp. 23–31), *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046).

28. That is, the wax produced by a particular bee species native to the Oronoco and Amazon basins, sometimes used in place of ordinary beeswax. Watts 1873–1875, s.v. "Andaquies-wax."

29. Archangel wax is the resinous compound remaining from the root of the archangel plant after treating it with alcohol then successively, distilling, washing in ether, and heating it. Watts 1872–1875, s.v. "Angelica balsam."

30. Puddling is the process of producing malleable wrought iron by removing excess carbon and other impurities from pig iron. It takes place in a reverbatory furnace, where the iron is melted and continually stirred out of direct contact with the solid fuel. *KAMD,* s.vv. "Puddling" and "Puddling-furnace"; *Ency. Brit.* 9, s.v. "Iron" §23–24.

31. Edison wrote and canceled below figure 40: "or a reg pud furnace Cavity filled to make bars."

32. Next to figure 41, Edison wrote and canceled: "bottom of puddler connections below on bottom."

33. Pig iron was generally graded one through five based on its hardness and pliability as determined by the content of carbon and other elements and correlated with its color and crystalline structure. No. 1 (gray), the softest iron, was used in foundry work and prized for making machinery; no. 5 (white), the hardest and most brittle, was used only in rolling mills. Hartman 1892, 137–40; "The Numbering of Pig Iron," *Bulletin of the American Iron and Steel Association* 26 (24 Feb. 1892): 53.

34. The rate at which a blast furnace's charge of fuel and ore drops into the working fire at the bottom is critical to the furnace's operation and the character of the iron it produces. The flow was generally determined by the bosh angle—the degree to which the circumference of the roughly cylindrical stack is greater near the middle than at the top or bottom. A particular bosh angle suited to one type of ore, however, might not work well with coarser or finer material. *Ency. Brit.* 9, s.v. "Iron" §12.

35. Edison evidently envisioned a phonograph subscription service based on a dedicated electrical circuit. He outlined the construction and operation of such a line in correspondence with Louis Glass in June (see Doc. 3368).

36. Next to this drawing, Edison wrote and crossed out: "Varnishing thread with collodion Varnish—or chlorinated Balata—Shellac plumbago—."

37. Below figure 47, Edison wrote and crossed out two phrases that he would expand in the following paragraphs of text: "Carnauba wax Beeswax adding Acetate Magnesia & boil to Expell Acetic acid=" and "Sterate of Soda—alumina Ozocerite or Parafine 30."

38. At the bottom of the page on which he made the next three drawings, Edison wrote (and crossed out) a draft of this paragraph: "A ~~S~~Cheap hard soap formed from the cheaper soap stocks Combined

with Lime soda alumina oxide to form a hard but easily fusible material Combined with Crude Ozocerite or Parafine to prevent effects moisture moulding Cylinder & then veneering the surface with the more expensive Record material."

39. The final caveat did not provide a description of this drawing, which appears to be a device for distributing recorded sound to different listeners.

40. Figure 49 closely resembles a drawing of 15 June, one of several Edison made that day on looseleaf paper. Another drawing from a different perspective, made the same day in a laboratory notebook, was marked for a caveat (Unbound Notes and Drawings [1889], Lab. [*TAED* NS89ACT, images 3–6]; N-88-01-03.2, Lab. [*TAED* NA021AAC]). The Westinghouse air brake put train braking directly under the engineer's control for the first time, and American railroads rapidly adopted it for passenger trains in the early 1870s. They moved more slowly in the freight business, however, and did not equip their freight fleets until the late 1890s. Their reluctance was due to several factors, including the expense of retrofitting a much larger number of cars and the fact that even one car without the equipment would make the brakes on cars behind it useless. Compounding these challenges was the fact that freight cars moved over an integrated nationwide network, so that one line's cars—representing capital investment—were dispersed over rival lines. Edison evidently intended his flexible electric system to meet these difficulties in ways that the Westinghouse brake could not (Usselman 1984, 30–39). Edison's interest in freight car brakes may have been spurred by his competition with George Westinghouse. Beginning in early spring 1888 and continuing through the end of the year, key figures connected with the Edison lighting interests seemed to believe that "a strong attack can be brought upon Mr. Westinghouse's position regarding the Automatic Brake." However, they failed to make a serious challenge to Westinghouse's air brake patents (Francis Upton to Edward Johnson, 3 Apr. 1889, Upton [*TAED* MU125]; Charles Spofford to Samuel Insull, 29 Mar. 1889; Phillips Shaw to Charles Batchelor, 27 Sept. 1889; TAE to Alfred Tate, 24 Oct 1889; Insull to TAE, 29 Oct 1889; [a]William Stern to TAE, 2 Nov. 1889; Stern & Silverman to TAE, 23 Nov. 1889; George Barker to TAE, 21 Dec. 1889; all DF [*TAED* D8905ACL, D8905AGO, D8905AHP, D8905AHT1, D8905AHY, D8905AIM, D8905AKC]).

41. Identified in the final version (p. 17) as figure 50.

42. Wheel **H** is to left of worm **C** (at center); wheel **e** and platform **f** are at bottom.

43. Edison dated four of the last six pages of drawings, covering figures 49 to 59, on 19 June.

44. The text following describes the kinetograph. Edison had already adopted that word for the picture-taking instrument and designated the reproducing instrument as the kinetoscope (see Doc. 3271 esp. n. 3). The instrument shown here had at least two distinctive features that appear to signal a conceptual break from the approach represented in Doc. 3307 (see esp. n. 3). One was a source for a flash of light (here a Leyden jar connected to an induction coil), obviating the need for a shutter to control the exposure of the photosensitive material. The other was a timing mechanism to synchronize the light flash with the

cylinder's brief intervals of rest. Edison refers here to a break wheel fixed to the cylinder shaft. In later testimony, William K. L. Dickson described how at some unspecified point the timing function of the break wheel was incorporated into the drum itself by having "Around one end of the drum a large number of small pegs…inserted in order to correspond exactly with each picture. The drum while revolving ruptured the primary induction coil" to create a flash at the precise instant the cylinder was at rest. Dickson was specifically describing the process for viewing images but it could apply equally to creating images as well. His assistant Charles Brown testified that the viewing instrument "had a transparent drum with a light inside it, and then we put these on that drum and looked at them through a microscope" (Dickson and Dickson 1894b, 208; Dickson's testimony, pp. 145–46, *Motion Picture Patents Co. v. Chicago Film Exchange*; Brown's testimony, p. 146, *Edison v. American Mutoscope Co. & Keith*; both Lit. [*TAED* QM003143, images 5–6; QM001140, image 88]). Dickson's biographer is unsure if the kinetograph described in this document was actually built, though laboratory time sheets for motion picture projects show a suggestive pattern like that in connection with Doc. 3307 in late winter: a bit of work by a pattern maker followed by a sustained effort from the machinists who would create working instruments. The variation with the wooden pegs, however, definitely was built (probably during the summer), and a photograph of it was submitted into evidence in a later court case (Spehr 2008, 133–34; *Edison v. American Mutoscope Co. & Keith,* Complainant's Exhibits, pp. 360–61, 419; Lit. [*TAED* QM00100014, images 200, 241]). In any case, the inspiration for the spark-timing instrument may well have come (as Dickson's biographer contends) from the Electric Tachyscope created by Ottomar Anschütz, a German chronophotographer who, like Edweard Muybridge, made studies of motion. His tachyscope had two dozen small photographs on the edge of a disk illuminated by stroboscopic sparks from a Geissler tube as the disk revolved by hand power. It was exhibited in Berlin in 1887 and described in American periodicals, including the *Journal of the Franklin Institute* and the March 1889 issue of *Cassell's Family Magazine.* According to an account Dickson published with his sister in 1894, at least one of the Edison devices from around this time similarly used a Geissler tube as its light source (Spehr 2008, 132–33; Dickson and Dickson 1894b, 208).

45. Cf. the last paragraph of Doc. 3271.

46. The materials and processes described in this addendum are like those with which Edison experimented over a long period, and the editors have been unable to correlate them positively with dated notes or drawings. It seems likely he would have drafted the text and appended it to the main caveat soon after finishing the drawings on 19 June (see note 1) although, because his attorneys did not complete the final typed caveat for another five or six weeks, he may have worked on it in July.

–3359–

From Sherburne Eaton

Pittsburg Pa May 21 1889[a]

T. A. Edison

Case[1] begun before Bradley[2] J McKennan[3] Court limits hearing to three days we all think you ought to be here tomorrow if for only one day Come on six oclock train tonight[4] answer to Hotel Duquesne[5]

S. B. Eaton

L (telegram), NjWOE, DF (*TAED* D8954ACB). Message form of Western Union Telegraph Co. [a]"188" preprinted.

1. The lawsuit was *Consolidated Electric Light Co. v. McKeesport Light Co.* in U.S. District Court in Pittsburgh (40 F. 21, 21 [W. D. Pa. 1889]). The named parties were proxies for Westinghouse Electric, which owned Consolidated, and the Edison Electric Light Co., which was bound to defend its licensee in McKeesport, Pa. At issue was the exclusivity of a patent of William Sawyer and Albon Man for a low-resistance incandescent carbon lamp, issued after years of contest with Edison in the Patent Office (U.S. Pat. 317,676). Westinghouse Electric now owned the patent through Consolidated and contended that Edison lamps infringed its manufacturing rights. George Westinghouse made clear that the fight was for control of the lucrative lamp business in the United States, telling the press that it was intended "to settle finally whether the Edison company has any right to make incandescent lamps" or should be compelled to buy them from his firm ("Incandescent Lamp Patents," *Western Electrician* 1 [24 Dec. 1887]: 309–10; "The Westinghouse vs. Edison Lamp Suit," *Electrical World* 13 [1 June 1889]: 318. A helpful summary of the arguments and course of the trial is in "The Sawyer-Man Patent. The Westinghouse-Edison Suit," *Electrical Engineer* 8 [June 1889]: 286–304]; see also Passer 1972 [1953], 153–54). The trial attracted considerable coverage in the New York and Pittsburgh newspapers.

2. Joseph P. Bradley (1813–1892) was born to a farming family in New York State, attended Rutgers College, and practiced law in New Jersey. A convert to the Republican Party during the Civil War, Bradley ran unsuccessfully for Congress in 1862 and headed the New Jersey slate of electors for Ulysses Grant in 1868. Nominated by Grant as an associate justice of the Supreme Court, he was confirmed in March 1870 and became, according to historian Christopher Beauchamp, "both one of the court's leading authorities on patents and one of its chief skeptics of industrial monopoly." Bradley helped lead the Court to an expansive interpretation of fundamental patents, especially those for processes rather than material things. Notably, he dissented from the 1888 judgment upholding the Bell telephone patents, a 4–3 decision that effectively ended private legal challenges to the Bell monopoly (*ANB,* s.v. "Bradley, Joseph P."; "Justice Joseph P. Bradley," *Illustrated American* 9 [13 Feb. 1892]: 591; Beauchamp 2015, 63, 70, 82–83). By statute, the justices had to preside over a district court in their assigned circuit at least once every other year (Surrency 1987, 29). Bradley had hoped to go to California after the Supreme Court's term ended on 13 May but reluctantly agreed to hear the McKeesport case as a result of machinations by Edison's lawyers. Grosvenor Lowrey, Edison's former

attorney and a member of the Pittsburgh defense team, said he would rather "argue this case with Bradley on the Bench even if we were there with one stocking off and one stocking on, than to argue it before Judge McKennon alone in full dress." Accordingly, he proposed to see if a colleague "has any friend who could quite casually fall in with Judge Bradley and learn from him his plans before they are communicated to Judge McKennan" (Lowrey to TAE, 10 May 1889; DF [*TAED* D8954ABT]). Eaton met with Bradley in Washington on 12 May and reported that the justice was "very tired" and "shrinks from sitting in a big case, but may consent to sit if his associates on the Bench at Pittsburg urge him" (Eaton to TAE, 13 May 1889, DF [*TAED* D8905ADF]). The start of the trial was subjected to a last-minute delay to accommodate Bradley's schedule (Richard Dyer to Lowrey, 13 May 1889; Magnus Pflaum to Lowrey, 15 May 1889; Eaton to TAE, 20 May 1889; all DF [*TAED* D8954ABV, D8954ABW, D8954ABZ]; "Ready on Monday," *Pittsburgh Dispatch,* 15 May 1889, 8). Joining Bradley and McKennan on the case was district judge Marcus Wilson Acheson ("The Westinghouse vs. Edison Lamp Suit," *Electrical World* 13 [1 June 1889]: 318).

3. William McKennan (1816–1893) served two years as deputy attorney general of Pennsylvania but otherwise largely practiced law with his father in his hometown of Washington, Pa., until 1869, when Ulysses Grant appointed him circuit judge for the district encompassing Pennsylvania, Delaware, and New Jersey. The circuit judge was a fairly new position in the federal court system, equal in authority and responsibility with a Supreme Court justice when the latter sat with a circuit court. *NCAB* 9:553; "In Memoriam," *Pittsburgh Legal Journal* 24 (1 Nov. 1893): 111.

4. The editors have not found a reply to Eaton, but Edison left for Pittsburgh that evening and was in court the next day (as was George Westinghouse) when Eaton resumed his opening statement. Edison apparently attended just the one day and was not present (as Westinghouse was) for closing arguments on Thursday, 23 May (Alfred Tate to Jesse Lippincott, 21 May 1889, Lbk. 30:2 [*TAED* LB030002]; "Let There Be Light," *Pittsburgh Dispatch,* 22 May 1889, 2; "The Edison-Westinghouse Contest. Concluding Arguments in the Case at Pittsburg," *New York Tribune,* 24 May 1889, 1). Several years later, long after the suit was decided, Lowrey wrote Edison that although he supposed that watching the trial had been a "bore," the inventor's presence had helped make the case:

> Concrete objects stand for so much when we are dealing with historical and scientific abstractions, and while I would not, for a moment, intimate that your presence there won the case, I have not the slightest doubt that when Judge Bradley,—and Judge McKennan in particular,—saw you sitting there (you will remember I was particular to allude to you and point you out, and I had a motive in all that) you ceased to be an abstraction. They had seen the man; they had seen the lamp; and the whole thing was made easier. [Lowrey to TAE, 16 May 1891, DF (*TAED* D9142ABR)]

5. The Hotel Duquesne, a new addition to downtown Pittsburgh at 518 Smithfield St., hosted prominent industrialists doing business in the city (*Appleton's General Guide* 1889, 218; G. Fleming 1916, 32). Eaton planned to make it the "headquarters" of his eight-man defense team, which also included Richard Dyer and Francis Upton in addition to himself and Grosvenor Lowrey. He promised Edison he would "have a room ready for you, and will personally look after your comfort" (Eaton to TAE, 17 May 1889, DF [*TAED* D8954ABX]; "Let There Be Light," *Pittsburgh Dispatch,* 22 May 1889, 2).

–3360–

To Albert Dick

[Orange,] May 27, 1889.

My Dear Sir:—[1]

As yet I am unable to instruct you definitely in regard to Toy Phonograph business, but expect to cable you my wishes soon.[2] Meanwhile you can do nothing but accumulate statistics and general information, which it is quite important I should be in possession of so that I can form my plans intelligently. I wish you would be kind enough to write me immediately, outlining the whole commercial doll system as you have found it to exist, both as to France and the doll trade of any other countries with which you have made yourself familiar, quoting prices as far as you are able, and using care to omit no details of which you have knowledge. Perhaps the best way would be for you to assume that I am entirely ignorant of the whole business, and write me in conformity with that assumption. What I wish to avoid is the omission of any detail which might seem unimportant to you were you writing me under ordinary circumstances, as it may have some effect upon my plans which you could not foresee. My machinery, which has an immediate capacity of two thousand movements per day, will be delivered in about three weeks.[3] This output can be increased to three thousand daily as soon as the operatives become expert. You will, therefore, see that I have this end of the business well in hand. I want now to get a good grasp of the commercial end, and thus be fully equipped all around for quick action. So please lose no time in complying with my request.[4] Yours very truly,

Thos A Edison

TLS (letterpress copy), NjWOE, Lbk. 30:084 (*TAED* LB030084).

1. Uncertain where Dick was at the moment, Edison had this letter addressed to him in care of Philip Dyer in Antwerp, Belgium, with a

cover letter describing it as "a very important communication." TAE to Dyer, 28 May 1889, Lbk. 30:83 (*TAED* LB030083).

2. Edison probably had in mind his hope of making talking dolls in Europe but may also have thought of importing European-made parts, as some American doll makers did (see Formanek-Brunell 1997 on American practices and the mechanization of dolls). Before sailing from New York in April, Dick had asked for a written designation as Edison's sole European business representative for the doll phonograph, a statement Edison did not make in the letter of introduction he wrote to Philip Dyer. Dick's status was unclear in light of Edison's prior contract with William Jacques and Jacques's subsequent transfer of European manufacturing and sales rights on behalf of the Edison Phonograph Toy Manufacturing Co. Dick had cabled and written for clarification since reaching France, but Edison was unable to provide more information at the time (Dick to TAE, 18 Apr., 7, 9, and 10 May 1889; all DF [*TAED* D8905ACU, D8964AAU, D8964AAV, D8964AAW]; TAE to Dyer, 27 Apr. 1889; TAE to Dick, 10 May 1889; Lbk. 29:257, 355 [*TAED* LB029257, LB029355]). Edison contended that Jacques had forfeited the contract but Jacques had in the meantime assigned foreign rights to his own licensees, and the matter was now the subject of conferences and legal reviews (see, e.g., Alfred Tate to TAE, 16 Apr. 1889; TAE to Herman Trost, 2 May 1889; both Miller [*TAED* HM89AAV, HM89AAT]; Wile 1987, 10–13). At the same time, negotiations were underway with the Edison Phonograph Toy Manufacturing Co. for Edison to have worldwide manufacturing rights (TAE draft agreement with Edison Phonograph Toy Mfg. Co., 24 May 1889; Alfred Tate to Sherburne Eaton, 13 June 1889; Lbk. 30:52, 337 [*TAED* LB030052, LB030337]; TAE agreement [draft?] with Edison Phonograph Toy Mfg. Co., 1 July, Miller [*TAED* HX89043]; see also Doc. 3372).

3. Edison presumably had settled on a particular design for the doll mechanism, but the editors have not learned what he had in mind. In Dick's first report from France, he relayed comments from doll makers there that it should be made lighter and smaller by about one-third and its shape altered to better fit the toy's body. Dick reiterated these ideas in subsequent letters while also urging Edison to make "the more delicate parts" sturdier to stand up to the rough hands of children. Dick to TAE, 27 May, 19 and 25 June 1889; all DF (*TAED* D8964ABB, D8964ABS, D8964ABV).

4. Dick answered on 11 June from Vienna and suggested that his letters already sent from there and Paris, summarizing information gathered from doll makers and other manufacturers, largely answered Edison's questions. He planned to visit London but held out little hope of finding significant new information there. He subsequently wrote again from Berlin and Antwerp. Dick to TAE, 11, 16, 19, and 25 June 1889, DF (*TAED* D8964ABG, D8964ABQ, D8964ABR, D8964ABV); also cf. Rondeau 2003.

–3361– [Orange,] May 30, 1889.

To George Gouraud

Dear Sir:—

Your letter 4th instant, wherein you state that "The last phonographs received fully realize the expectations which I have confidently held throughout and if you are now ready to produce them in large numbers, as I understand indirectly you are, the moment has come and no time will be lost in proceeding," has been received.[1]

On the 7th instant, I cabled you that I was "Ready to ship phonographs in practical commercial form for sale and use commercially in such quantities as you require. Am impatient to get your orders,"[2] which, while written before the receipt of your letter above referred to, answered your implied question as to whether I was ready to produce machines in large numbers.[3]

Your reply to the above was embodied in your cable to me under date 9th instant: "Must first see commercial machine and price. If both satisfactory large orders. Express sample. Cable departure. Wrote Saturday,"[4] which I answered on the 16th inst.: "Can't give price until three thousand made. However, are billing them at forty-five dollars to Company here for first thousand, forty for next and probably thirty-five for next thousand, subject to final settlement by books. Ultimate price will be lower, as we have stopped making changes and are cheapening work. We have up to to-day delivered seven hundred. They are working satisfactorily in hands of public. <u>Send order for what you want now, whether one a week or one hundred</u>."[5] To this you replied on 17th instant: Must decline ordering until see machine proposed. Last received proves unsatisfactory. I prefer waiting [automatic][a] to Injuring otherwise splendid business,"[6] which was followed up by your letter of complaint dated 18th instant.[7] I quote all these cables in their proper order in compliance with the suggestion in your letter last referred to that I read the telegrams in the light of those immediately proceeding. Viewed strictly in this light it would appear that the phonographs last sent you "fully realized the expectations which you had confidently held throughout" up to the date of my cable of 7th inst. asking for your orders, and that your troubles then began.[8]

I find your specific complaints to be as follows, and I will answer them by the numbers I give them.

(1) Great irregularity.
(2) Diaphragm easily broken. All broken thus far.
(3) One cell seems too little. Two too much.

(4) New machines less to be relied on than previous machines received.

(5) New machines require experts.

FIRST. We encounter no such troubles here. The phonograph governor is as perfect a piece of mechanism as exists to-day and performs its work with absolute accuracy, as I have proven time and again by tests made under my personal supervision, and I have never had a single complaint as to bad governing in connection with the 900 machines which have been delivered to date to the licensees of the North American Phonograph Company.[9]

SECOND. This to me is conclusive evidence of the incompetency of the persons in whose hands you have placed your instruments. There is no reason whatever why the diaphragms should be broken. They are well protected, and the ordinary handling of a machine in practical use should result in no damage to the diaphragm. This complaint also is original with you.[10]

THIRD. It was never my intention to adopt permanently the first batteries sent out with the phonograph. I know they are very imperfect. I have experimented steadily for more than a year to obtain a suitable battery for this business, and I have succeeded. One of the first of these which I have made will be shipped to you on Wednesday next, 5th prox. It will run the phonograph four (4) hours per day for thirty days, and then by adding a small quantity of compound to the solution, will run for twenty days more. I can prolong the life of this battery to six months, or any part thereof, by increasing the size of the cells proportionately.

FOURTH. This is another criticism entirely original with yourself and is disproved by an experience which we have had here, that is far wider than your own. Your trouble is without doubt want of knowledge on the part of your operators.

FIFTH. I have had vast experience in the marketing of novel inventions and I have never yet seen a piece of special mechanism designed for ultimate use by the general public, that could be placed directly in their hands without employing experts to teach and instruct them. The Telephone, the Electric Pen, the Mimeograph, and the various devices embodied in the electric light system, which are handled by the public, all require to be explained by men who are familiar with them,[11] and even so simple an instrument as an improved flat-iron[12] involves a certain amount of explanation by an "expert" before it can be intelligently introduced into domestic use.

Probably ninety per cent of all the sewing machines employed to-day are operated by women and the Companies employ paid agents or "experts" to educate these, which takes from three to four weeks time.[13] Every new device which from time to time is brought out by sewing machine people has to be explained by an expert, and compared with this instrument the phonograph is a marvel of simplicity. It takes us just about two hours to thoroughly instruct a person with no previous knowledge in the operation and care of the phonograph, but the instructor must be thoroughly competent and familiar with the machine, or his instructions would serve only to confuse and add to the ignorance of his pupil. Your trouble seems to be that you have no one who is master of the new instrument, consequently you can have no efficient graduates and the phonograph is blamed for faults which exist only in those who handle it. Your complaint, therefore, in regard to experts is absurd.

To the majority of people this term "expert" conveys the idea of intricacy. It is a case where there is a great deal in a name. I think if we were to call our men "Phonograph Operators" seventy-five per cent of the visionary difficulties of the instrument would disappear.

In regard to loudness and other qualities you mention I can reply to all your questions of this nature by saying that we find the new instrument superior in every respect to the old ones.

I find in your correspondence the following queries, answers to which follow:—

(1) How many phonographs can you rely upon in monthly deliveries beginning with June?

This depends entirely upon yourself. We are turning out phonographs at the rate of from 215 to 240 per week, and doing everything necessary to increase the output rapidly to meet the full number ordered by the North American Phonograph Co., viz., 300 per week. When you made your contract with me you secured to yourself privileges regarding the number of machines to which you would be entitled. You surely do not expect me to guarantee provisional deliveries, dependent upon your future decision as to whether you will order the instruments or not? This is practically what you ask me to do, and I, of course, decline.

(2) What are the maximum prices of (a) Motor Machines (b) Treadle Machines. (c) Motor Machines for Electric Light Circuits. (d) Regular Chromic Battery. (e) New Oxide Battery?

(a & b) We are billing these to the North American Phono. Co. at $45 each, exclusive of battery power for the former, which will be billed separately as explained below. When we have turned out three thousand machines the correct price will be determined. The effect of this will be to make the average price of these 3,000 instruments considerably lower than would be a price arrived at at the present time on instruments manufactured to date, as the percentage of general expense will be lower when applied to the former owing to the increased output consequent upon the increasing efficiency of our operatives, who as they become familiar with this new work are able to finish a larger number of parts within a given time.

(c) For the present we are going to bill these machines at ($50) fifty dollars each. They require a little more work than the battery instruments. Ultimately we do not think the difference in price of the two classes of instruments will be so great.

(d) The price of this battery is [$3.40?][b] per cell complete. The solution costs about $[—-][b] per gallon. [-- you —- compare this cost as it is different ——– difference in price?][c]

(e) We have just erected a new building in which to manufacture this battery. We will make various sizes proportionate to the life desired, the maximum being six months. We have not yet made any but the thirty day size, which, for the present, we will bill at $[--][b] per cell. Solution costs about $[--][b] per gallon. See P.S.[d]

(2) What is price of combined motor and treadle machine? We do not intend making an instrument of this kind. As we make a treadle machine and a motor machine, I cannot see the utility of a combination of the two in one instrument.

(3) Are the last instruments sent you the same as the 700 which I stated in my cable 18th inst. had been supplied to the North Am. Phono. Co. up to that time?

A portion of these are the same and the others like the machine which goes to you on Wednesday, upon the arrival of which you will find that the difference in no way justifies your vehement criticism to the effect that I have furnished the North American Phonograph Company with instruments vastly superior to your own. The spectacle adjustment of these later machines is more simple than that of the earlier instruments, which constitutes the only change.[14]

There are fifty of these phonographs in the hands of the public right around Newark, and no complaints. The only trouble I hear of is in connection with the old batteries, which we are replacing as rapidly as possible. Mr. John L. Butterfield, Manager of the Michigan Phonograph Co.,[15] writes me under date 28th instant:—[16]

"I am glad to say that the phonograph, with the exception of the battery, is giving entire satisfaction."

Having provided a reliable battery, the only remaining difficulty is in the wax. We have trouble freeing it from impurities which have the effect of cutting and dulling the knives, and this of course results in a rough recording surface on the cylinders. We are after this trouble and will eliminate it very shortly, producing also a cylinder which will neither warp nor crack.

All these minor differences are incidental to the development of an entirely new enterprise, and will in due time disappear. We are thoroughly familiar with all points where improvement is desirable and are straining every nerve to make the instrument absolutely perfect.

There is no reason, however, why business should be delayed while we are going through these different degrees of perfection. We have passed the comparative and will reach the superlative in good season. That we are now making a practical commercial machine is beyond dispute. Any changes which are made in methods of adjustment or in other directions will not render useless other parts of the instruments. Phonograph parts are all interchangeable—are gauged to [suction?][e] fit[17] in manufacture—and any new designs will be adapted to instruments already sent out, requiring only the removal of the part intended to be replaced—nothing else will be interfered with. I explain this fully to you, because you apparently desire to be assured that I will make no further changes, which would mean practically that I do not intend to improve the instrument in the future. If you want assurance to the effect that I am not going to make a radical change which would render useless all the instruments sent out so far, and necessitate their abandonment and result in a heavy loss to the present purchasers, I give it to you most readily, though to interpret your desire in this manner would be crediting you with having formed but a poor opinion of my judgment.

Altogether your criticisms are superficial and are the result of a very imperfect acquaintance with the machine.

I can only reply to your question as to when you will receive a commercial phonograph by stating that you already have commercial instruments and we will be glad to increase the number when you advise us definitely of your wishes in that connection. Yours very truly,

Thos A Edison

P.S. It has occurred to me that you may have encountered a difficulty which we have met with here, and not realized its cause. We find that men who have had no previous acquaintance with the phonograph learn to handle the new instrument more quickly than those who have been used to operating the old machine. The working of the instrument involves the education of the hands as well as the intellect, and an operator eventually makes the motions of adjustments intuitively. A man transferred from an old machine to a new one is obliged not only to forget his previous education, but to overcome the impulse of his muscles to indulge in a familiar movement. Thus an old operator is virtually handicapped for a time, which though short in itself consumes more time than is necessary to educate a new man.[18]

It is quite impossible for me in this letter to quote price of new battery and solution. I will advise ~~of~~ you of these as early as practicable. Mr. Butterfield, whom I have referred to before in this letter says: "I am making a test of a storage battery here which promises to be very satisfactory. It runs about one hundred and fifty-five hours without stopping. I shall use this storage battery in connection with the machine until I get some other battery from you."[19]

Perhaps you might take advantage of what is here suggested, and try a storage cell until I am ready with my new type of primary battery.

TLS (letterpress copy), NjWOE, Lbk. 30:153 (*TAED* LB030153). [a]Illegible copy. [b]Figures written by hand; illegible copy. [c]Illegibly faint sentence interlined below by hand. [d]"See P.S." written by hand. [e]Illegible copy.

1. Edison quoted from the postscript to a long 4 May letter, one of three Gouraud addressed to Edison that day. Gouraud wrote in the opening of the letter that

> The new Phonographs with the spectacles have reached me and they seem in every practical quality to mark great improvements. For loud records Hamilton does not think they are equal to the old.… In the manipulation of the machine and clearness of articulation as also in the automatic adjustment of the knife they seem all that could be desired for practical commercial use and that of course, is 99 per cent of the question. [Gouraud to TAE, 4 May 1889, DF (*TAED* D8959ABC)]

2. TAE to Gouraud, 7 May 1889, Lkb. 29:321 (*TAED* LB029321); cf. Doc. 3369 esp. n. 1. Some of the cable messages quoted in this document exist in more than one version; the editors generally cite the earliest or those in Edison's hand.

3. Edison cabled after Samuel Insull and Alfred Tate consulted attorney Sherburne Eaton, evidently with an eye toward curtailing Gouraud's contractual rights. Eaton drafted a telegram at the request of Insull, who relayed it to Tate with his own recommendation that "Mr. Edison should send a cable, and also a letter such as Major Eaton outlines, and I agree absolutely with Major Eaton that this should be done in a formal manner. It is much better in a case of this character that there should be no doubt as to Mr. Edison's intentions." Insull thought Edison's 1887 contract with Gouraud required a straightforward declaration of his readiness to manufacture machines. "A year from now," he urged, "the interests involved may be enormous. A letter which is absolutely clear and without question will then be an advantage should we find it necessary to abrogate Mr. Gouraud's rights under his contracts" (Insull to Tate, 6 May 1889, DF [*TAED* D8920AAN]). The cable Edison sent on 7 May was more general than Eaton's draft, which referred to specific sections of "my two contracts with you for exploiting my phonograph inventions in all parts of the world except the United States, Canada, China, Japan, and Great Britain and Ireland." Eaton revised his draft on 9 May to refer to a single contract with Gouraud, after questions arose about whether Edison had executed one or more (Eaton to TAE, 6 and 9 May 1889, both DF [*TAED* D8959ABE, D8959ABG]; see Docs. 3092 n. 1 and 3458 n. 2).

4. Gouraud's cable was addressed to Edison in New York and forwarded by Samuel Insull from the office of the Edison Machine Works. Gouraud's "Saturday" letter was the one of 4 May discussed in note 1. Gouraud to TAE, 9 May 1889; Insull to Alfred Tate, 9 May 1889; both DF (*TAED* D8959ABK, D8959ABI).

5. Edison drafted this reply on Insull's letter enclosing Gouraud's telegram (see note 4). TAE to Gouraud, 16 May 1889, DF (*TAED* D8959ABJ).

6. This message was transcribed below the postscript of Gouraud's 4 May letter (see note 1). It was connected by a line to the passage quoted above about Gouraud's satisfaction with the phonograph, now underlined in the same ink. Gouraud to TAE, 17 May 1889, DF (*TAED* D8959ABC1).

7. Gouraud sent a dozen handwritten pages, including confirmations of various cable messages and his interpretations of them. He chastised Edison for an "unbusiness like & embarrasing neglect" (p. 2) of his requests for information, then registered his disappointment that the price apparently would be considerably higher than the $25 per phonograph he had expected. Gouraud then turned to the machine itself and his incredulity both that Edison had delivered 700 to the public and that they worked as well as claimed, which led him to wonder if he was being saddled with models inferior to those on the American market. Five of the ten most recent machines (with new spectacles) to reach him were at work in his office, and he described the difficulties found by his clerks and Hugh de Coursey Hamilton, complaints which Edison distilled into the numbered list below. Stating that he did not

"want any more phonographs involving experts" (p. 5), Gouraud hoped that the latest improvements shown in Edison's foreign patent Case 90 (likely based on U.S. Cases 832–33 and perhaps others) would "meet the requirements. I prefer to wait for Phonographs of that description & don't want to spoil a splendid business" for which "all Europe is on the tip-toe of expectation" (pp. 5–6). He drew near the end with a reiterated plea for Edison to cable the date when such machines would be shipped. Gouraud to TAE, 18 May 1889, DF (*TAED* D8959ABQ).

8. Referring implicitly to the seeming contradiction between his initial enthusiasm for the new machine and subsequent criticism of it, Gouraud explained in his 18 May letter (see note 7) that his positive opinion "was based upon very brief practical experience with a single m[a]ch[ine.]" (p. 5).

9. In addition to the battery problems, the phonograph governor apparently sparked at the commutator brushes, at least on the models adapted to run from electric light circuits. Arthur Kennelly, testing electrical characteristics of the motors on 27 and 28 May, noted that a resistance of at least 60 ohms had to be in the circuit "to control the spark in governing"; less than that "made the governor useless." Though Gouraud did not expressly refer to governing the treadle phonograph, that was done by a friction device laid out along a horizontal shaft. Kennelly Notebook #1:118, Lab. (*TAED* NM023118A); North American Phonograph part catalog (p. 27), 1889, PPC (*TAED* CA027B).

10. Hugh de C. Hamilton had recently requested two dozen glass diaphragms because "the ball point Repeater sent with latest machs. very easy to get out of order, diaphragms easily breaking in inexperienced hands." Hamilton to Charles Batchelor, 11 May 1889, DF (*TAED* D8959ABL).

Hamilton later responded directly to several of Edison's numbered points:

> The new phonograph is a most marvellous talker, more astounding than anything I ever heard and the greater part of our trouble is directly tracable to the Battery. One cell is not strong enough to insure governing when required to do the maximum work, hence irregularity & raise of pitch when reproducing, but by first shaving off the blank & afterwards letting recording needle down alone & making record, it is perfect. . . .
>
> I am quite as much at home with the adjustments of the new machine as on the former.
>
> Our first experience with people entirely unaccustomed or familiar with the phonograph—the repeating diaphragms certainly did pop off pretty lively; but now, I am glad to say, they all are getting satisfactory results every day in the office. [Hamilton to TAE, 15 June 1889, DF (*TAED* D8959ABV)]

11. Cf. Doc. 3351 esp. n. 1 about Edison's views on the role of experts and the difficulty of writing adequate instructions.

12. Edison's patent attorneys, Richard Dyer and Henry Seely, had taken out their own patents on electric flat irons in 1881 and 1882, but the application of electricity to domestic work may have been drawing more inventive interest about this time. The *Electrical Engineer* noted in

early 1890 that the heating powers of electric current seemed "destined to play a prominent part" in the home: "Electric cooking utensils of various kinds have been designed, and in some instances put into practical operation. One of the latest novelties in this respect is an electric flat iron which has recently been patented." Doc. 2298 esp. n. 13; *TAEB* 6 App. 5.C; "An Electric Flat Iron," *Electrical Engineer* (9 Apr. 1890): 208.

13. See Doc. 3205 n. 2.

14. See Doc. 3364.

15. The editors have not identified Butterfield beyond his position with the company in Detroit.

16. Butterfield to TAE, 28 May 1889, DF (*TAED* D8963AAO).

17. Although the copy is not fully legible, Edison likely meant suction fit, as sometimes used in machining or dentistry to indicate extremely close tolerances between parts. See, e.g., *KAMD,* s.v. "suction fit"; "'Elastic Stop' Locknut," *American Machinist* 67 (28 July 1927): 174.

18. Cf. Doc. 3364.

19. Edison would have just received this report from Butterfield, who closed with the statement that "the phonograph, with the exception of the battery, is giving entire satisfaction." Butterfield to TAE, 28 May 1889, DF (*TAED* D8963AAO).

–3362– [Orange,] May 30—1889

Notebook Entry: Phonograph

No 3½ <1022>[1a]

First class cylinder—[2]

Not ⅕ scratch of Reg—[b] make splendid musical cyldr—Very hard—will probably require Saphire Cutters. Cant be filtered well— Moulds nicely— Only Keenest Edges on Recorder can be used on account hardness— can track deep—works well as a thick or thin Veneer Low melting point, pours low temperature. The Cylinder I tried was filtered—

500 grammes[c] Purified Cake Beeswax
400 grammes Carnauba
30 " dry salt, acetate alumina

Cook well to get off acetic Color light brick red— There is a great lot of precipitated alumina left & this causes filter to work bad

X, NjWOE, Lab., N-89-05-30.2:15 (*TAED* NB070015). [a]Marginalia by Jonas Aylsworth. [b]Multiply underlined. [c]Interlined above.

1. Edison wrote this entry in one of the two notebooks that Jonas Aylsworth used as a rough record book for phonograph cylinder experiments in 1888 and 1889. "3½" was the number assigned to the experiment in the rough record notebook; when Aylsworth recopied experiments into a formal notebook using consecutive numbers, this one was

no. 1022. N-88-08-23:128–29, Lab. (*TAED* NB050129); Aylsworth's testimony, pp. 58–59, *American Graphophone Co. v. National Phonograph Co.*, Lit. (*TAED* QP003046).

2. Other than this remark about a "First class cylinder," Aylsworth copied Edison's note almost verbatim into his formal notebook. The next item in the series (no. 1023) was also a musical cylinder made with carnauba but with ceresin in place of beeswax and aluminum stearate instead of aluminum acetate. Aylsworth concluded about it: "Talks very good, noiseless, smooth, hard, insoluabl, loud talking, and in fact perfect except the chips wont go through chip box on account of their peculiar nature." The issue of insolubility had become "a very serious matter as records on cylinders became spoiled and the cylinders that were sent out made of this material [Regular No. 957] had to be called back. At the time No. 957 was introduced it was cool weather and they were not affected, but when the hot moist summer weather came, cylinders exposed to it, were badly corroded on surface." It turned out that stearic acid they were using contained "oleic in considerable quantity" and this excess oleic acid combined readily with atmospheric moisture to ruin the smooth recording surface. They soon switched to a stearic acid made by Mitchell & Co. that was "very hard and free from oleic." The experimental compounds below were made with varying amounts of Mitchell's stearic acid and ceresin resulting in No. 1029, which Aylsworth described as "O.K. absolutely not affected by moisture, can be soaked over night in water without showing it. Talks even better than old Reg, and makes an excellent musical cylinder. Molds O.K. and at lower temperature. Excepted [sic] by Mr Edison as regular." The next experimental compound, No. 1030, designed to "do away with the expensive acetate of alumina," was sufficiently successful that a plant was set up to produce five hundred pounds per day of the compound. Experiments were continued to find the best proportion of ingredients. Edison adopted No. 1046, which was "an exact duplicate of Reg (1029) and is much cheaper and easier to make. The acetate of Alumina are being done away with." Aylsworth later described the process for manufacturing records with this compound, which included precipitating stearate of aluminum from a solution of alum and stearate of soda. N-82-08-23:128–39, 145; Lab. (*TAED* NB050129 [images 65–70, 73]).

–3363–

To George Gouraud

[Orange,] June 1, 1889.

My Dear Gouraud,—

I have received your letters of May 4th,[1] replying to mine of 12th and 20th of April,[2] and am very much obliged for the explanations which you make both as to your policy and your motives. It is your first attempt to familiarize me with the work which you have been conducting, and the fault is your own that I have arrived at conclusions based upon information received from other sources. That this information was unmixed with malice towards yourself I have no doubt. The conclusions arrived at in so many directions were too unanimous to admit of that idea. In my letters to you I did not condemn any specified part of your policy. I said that I considered some of your arrangements were excellent, and I had in mind the lectures of yourself and your assistants before the Scientific Societies of England and France, my approval of which is evident by the assistance I have extended to you in your preparations for them. At this distance it would be quite impossible for me to point to that particular part of your policy which agitated a wave of very adverse criticism on the part of the public abroad, and which when it reached me here convinced me of what my duty was both to you and to myself, more especially as you were on the verge of committing an indiscretion in connection with the Paris Exposition which we would both have had cause to regret. I am sorry to see that no where in your correspondence do you admit this error of judgment upon your part, but instead you relate the use to which the old machine was put upon a similar occasion years ago, and for which I personally was in no way responsible.[3] Perhaps if at that time I had had in Europe a personal representative having my better interests at heart, the exhibition to which you refer, and many other mistakes as well, would never have been made. I intend, so far as I am able, to protect myself against a repetition of these things in the future. I appreciate fully the trouble you have encountered through the attempts of exhibitors of the old instrument to steal your thunder, all of which you doubtless find as difficult to control as the vagaries of a comic journal. It is more than unfortunate that you should be [annoyed?][a] in this way, and I think the steps which you have taken to acquaint the public with the true state of affairs are in the right direction and will, if they have not already done so, accomplish your object, in which I feel deep interest. There is one thing which I am very pleased to note in your recent correspondence, and that is, that you are contemplating real business. The North American people have covered all their territory, with the exception of Alaska, and I see no reason why our progress in Europe should be delayed. Phonographs are ready for you whenever you want them; you have excited public interest abroad to as high a pitch as can possibly be reached—in fact everything is ripe for immediate action, as you have yourself stated, and I hope to see the commercial side of the phonograph take shape in the countries under your control, with consistent dispatch.

I have not yet had an opportunity to give thought to the brief outline which you have submitted, regarding your proposed plan of campaign, but will consider it to-morrow and communicate with you early in the week.[4] Yours very truly,

TL (letterpress copy), NjWOE, Lbk. 30:168 (*TAED* LB030168). [a]Illegible copy.

1. Edison referred to Doc. 3350 and two other letters Gouraud sent the same day about the phonograph exhibition at the Exposition Universelle and the demonstrations of Edmund Archibald. Gouraud also discussed his plans to form separate phonograph companies in foreign countries. Gouraud to TAE, both 4 May 1889, DF (*TAED* D8946ABI, D8959ABC).

2. The former letter is Doc. 3343; the latter set out Edison's wishes for the exhibition in Paris and accused Gouraud of misrepresenting his intentions there. TAE to Gouraud, 20 Apr. 1889, Lbk. 29:180 (*TAED* LB029180); see also Doc. 3345 n. 4.

3. Edison presumably referred to Gouraud's descriptions in Doc. 3350 of exhibitions of the old tinfoil phonograph by the London Stereoscopic & Photographic Co.

4. Doc. 3369 is probably Edison's belated response. Gouraud replied to the present letter on 14 June. DF (*TAED* D8959ABW).

–3364–

To George Gouraud

[Orange,] June 11, 1889.

My Dear Gouraud,—

I am sending you on Wednesday next, per S.S. "City of Paris,"[1] two phonographs with latest adjusting device, and I enclose you herewith a set of instructions for Hamilton's use.[2] I regret exceedingly that these machines were delayed beyond the time originally set for shipment,— namely Wednesday last, but I desired to test them myself before they went out,[3] so as to be assured personally of their perfect condition in every respect, and could only do so to-day. I am also sending you twenty-five new phonograph blanks, in connection with which I have made great improvement during the past few weeks. You will be surprised to find that I have gotten rid entirely of all scratching sound. In using these blanks, be careful not to track your recorder too deep. Experience with the old cylinder may have gotten your operators into the habit of tracking the recorder quite deep, but with these new ones it requires to be tracked lightly. To ascertain how to track the latter, make several trackings from heavy to light, and you will reach a point that when tracking you get scarcely any sound, and upon reproducing you will hear absolutely no sound whatever, excepting that of the record which you have made. These cylinders will not warp as the old ones did. They are slightly affected by moisture, but if you have any trouble from that source, advise me promptly, as I can give you a cylinder equally as good which will not be affected by moisture, and the cost of which will be about half a cent more than the former.[4]

I really cannot see how the phonograph can be made more simple than it now is. Any person with ordinary intelligence can learn to operate it in half an hour.

I have already written you in regard to new battery, which I am preparing to manufacture, the price of which I am as yet unable to quote.[5]

I shall be glad to hear from you when you have tried these new machines. Yours very truly,

Thos A Edison

TL (letterpress copy), NjWOE, Lbk. 30:283 (*TAED* LB030283). Signed for Edison by Alfred Tate.

1. The Inman Line's new twin-screw steamship *City of Paris,* built in Glasgow by J. & G. Thomson, had recently set a fresh record for the fastest eastbound crossing between Sandy Hook, N.J., and Queenstown, Ireland. "Launch of the City of Paris," *Sci. Am.* 59 (17 Nov. 1888): 314; "Another Record Broken," *NYT,* 23 May 1889, 8.

2. Edison planned to write the instructions, according to Alfred Tate, and several typed pages of directions follow this document in the letterbook (Tate to Charles Batchelor; 3 June 1889; Edison Phonograph Co. instructions, n.d. [June 1889]; Lbk. 30:193, 285 [*TAED* LB030193, LB030285]). One page explained the operation and the rationale of the new spectacle. The changes were intended to correct a design flaw that allowed the pressure needed for locking the spectacle to bear on the "universal joint-screw" determining device, upsetting the adjustment of the recording or reproducing point. The new spectacle was completed by 2 June, when Charles Batchelor placed a photograph of it in his journal (Cat. 1337:64 [item 568, 2 June 1889], Batchelor [*TAED* MBJ004064B]).

The detailed instructions told the operator to:

> take the hand off the handle and put the index finger on the top of the little bolt near the handle, whose end rests on the straight edge; and with the thumb press the little wire which protrudes at right angles to this bolt to the left. The very slightest touch will raise it [-----] and lock the spectacle in position.… You will notice that on the side of the spectacle, there is a little pendulum, with a little screw on the end of it. This is the determining stop. The bottom of the pendulum… forms part of a circle of which the fulcrum is the centre. The bottom of this screw which rests upon the cylinder when the spectacle is let down, and determines the position of the latter, has a much wider circumference than the rider which performs the same service on the

old machine. [Edison Phonograph Co. instructions, n.d. (June 1889), Lbk. 30:285 (*TAED* LB030285)]

The second page further described this automatic depth-determining device. An additional half page discussed care of the motor commutator. The directions for setting the spectacle and the cutting adjustment were greatly simplified and adapted into a printed one-page illustrated circular (North American Phonograph Co., n.d. [1889], PPC [*TAED* CA028A]).

3. Edison promised in Doc. 3361 to send the machines on 5 June but had Charles Batchelor hold them for testing. When Gouraud asked for confirmation of their shipment, Edison acknowledged that they would be a week late. Tate sent them (with Edison's instructions and recorded cylinders) aboard the *City of Paris* on 12 June. Tate to Batchelor, 3 June 1889; TAE to Gouraud, 31 May, 11 and 19 June 1889; Tate to TAE, 12 June 1889; Lbk. 30:193, 146, 305, 436, 320 (*TAED* LB030193, LB030146, LB030305, LB030436, LB030320).

4. See Doc. 3362 n. 2.

5. Edison's prior letter is Doc. 3361. He sent four cells of the new battery with the phonographs on 12 June. TAE to Gouraud, 11 June 1889, Lbk. 30:290 (*TAED* LB030290).

–3365–

From Richard Dyer

NEW YORK, June 11th. 1889[a]

(Dictated)

My Dear Mr. Edison:—

Since seeing you Sunday it has occurred to me that if you propose to make your records by filing caveats in the Patent Office a complete scheme for keeping the records should be formed and followed out.[1] To do this in such a way that the caveats could be promptly filed so as to get them[b] in the Patent Office within four or five days of the time we prepare them is what is needed. If you could make your sketches on the mimeograph the matter would be made quite easy. You would need three or four mimeograph file plates accurately fitted so as to form a bed large enough for your purpose. Then make sketches within a space on each mimeograph sheet equal to the clear space on a legal cap sheet of type writer paper. You could then have a number of copies carefully struck off, say six, on type writer legal cap of good quality. You could send us four copies and the written description. We would simply add the formal opening and closing clauses to the description and have it typewritten, making four copies, one original and three carbons. One set of drawings and specifications would go to the Patent Office; one set of both would go in our files; one set of both (best carbon copy of description) we would preserve and when there was enough matter collected we would have it bound. These sets for permanent binding would have copies of petitions and oaths attached and would show all dates and signatures; volumes when bound to be sent to you; the fourth copy of both drawings and description to be endorsed with dates of execution and filing and sent to you to be put in temporary binder for your use while waiting for permanently[c] bound copy; the two or more extra copies of drawing to be carefully preserved under lock and key where they could be found in future years or to be destroyed if in any danger of being circulated; the original copy of description to be kept in our files or returned to you. As to the caveats of the new set already sent in, we could get blue prints of drawing and have copies made of specifications for permanent binding and other copies for your temporary binder. Instead of keeping a temporary binder you could have prints of the drawings made on thin sheets and pasted in a book, or you could have a book specially bound so that it would open flat and print the copies directly into the book. As you see it could be very nicely arranged provided you could use the mimeograph. I suggest that you at least give it a trial. I find out that Rowland[2] went out to the laboratory and made the drawings you wanted the day after you wrote Mr. Seely, some three weeks ago,[3] but you were not there. He was at your laboratory yesterday and will be there again tomorrow morning. Very truly yours,

Rich N. Dyer

TLS, NjWOE, DF (*TAED* D8954ACG). Letterhead of Dyer & Seely. [a]"New York," and "188" preprinted. [b]Interlined above by hand. [c]"ly" added by hand.

1. The editors have learned nothing about Dyer's meeting with Edison on Sunday, 9 June. Edison seems to have neither responded to this letter nor adopted the suggestions outlined in it. Dyer was acknowledging an important change in Edison's practice that had been underway for some months—his declining use of dated notebook entries as a record of inventive activity. Edison had been consciously making this shift since at least February, when he told Dyer in reference to a sprawling draft that he wanted to "get it in patent office for dating purposes." Unlike patents, caveats were not public documents, so filing them did not pose the same risks of exposing secrets. They proved to be a problematic form of documentation, however, because Patent Office rules required them to be limited to a single invention. Draft caveat, 3 Feb. 1889 (p. 1), Case 114, PS (*TAED* PT031AAE1); see Docs. 3353 n. 1 and 3358 n. 1.

2. Edward C. Rowland (1863–1926) was a former Edison employee now working as a draftsman for Dyer & Seely. Doc. 2673 n. 5.

3. The editors have neither found such a letter nor been able to infer its contents.

–3366–

To Alfred Tate

Bechtelsville Pa[1] June 12 1889[a]

O. A. Tate.

Would like to stay here till Saturday how would next Monday answer?[2] Telegraph my wife say that I want to finish work here;[3] am getting good rest Answer

Edison

L (telegram), NjWOE, DF (*TAED* D8949ABC). Message form of Western Union Telegraph Co. [a]"188" preprinted.

1. Bechtelsville, sixteen miles east-northeast of Reading in east central Pennsylvania, was settled in 1852 but not incorporated until 1890. It was home to a single-stack blast furnace built in 1875. Edison had been inspecting his mining properties in the area (see Doc. 3309 [headnote]) since at least the afternoon before, when he wired Tate to immediately send one of William K. L. Dickson's assistants to join him with a variety of sieves, a "Microscope small hand Magnet and round hand Electro Magnet and agate Mortar." *CGW,* s.v. "Bechtelsville"; D'Invilliers 1883, 233; TAE to Tate, 11 June 1889, CR (*TAED* CJ001AAI).

2. Edison sent this telegram at 2:30 in the afternoon in reply to one from Tate that morning, part of a series of messages between them that day. Tate asked if Edison would "be here tomorrow to keep appointment with Toy Phonograph people or shall I postpone?" After receiving Edison's answer, Tate promptly put off the meeting with directors of the Edison Phonograph Toy Mfg. Co. and rescheduled it for Monday, 17 June (see Doc. 3372). Edison was back in Orange by 15 June. Tate to TAE, 12 June 1889; Tate to Edison Phonograph Toy Mfg Co., 12 June 1889; Tate to Benjamin Stevens, 13 June 1889; all DF (*TAED* D8964ABI, D8964ABJ, D8964ABL); Tate to Samuel Insull, 15 June 1889, Lbk. 30:390 (*TAED* LB030390).

3. The editors have not found a message to Mina Edison. When Tate wired Edison at 3:00 p.m. that day about the rescheduled meeting, however, he added that "Mrs Edison says all right Everything O.K. here." Tate to TAE, 12 June 1889, DF (*TAED* D8964ABK).

–3367–

To Alfred Tate

Bechtelsville, Pa. June 12, 1889.

A. O. Tate

Secure Wangemann passage.[1] Give him letter credit Drexel[2] $500. Have him report to Hammer for first two weeks to help him get his phonos. all going; after that notify me and I will instruct him.

e.d.i.s.o.n.

TL (telegram), NjWOE, DF (*TAED* D8955ACC). On message form of Edison laboratory.

1. Edison wired in response to a telegram from Tate, sent at 3:30 p.m. that day, seeking confirmation that Adelbert Wangemann should sail for Europe on Saturday, 15 June. Before receiving Edison's reply, Tate fol-

lowed up with a letter in which he offered to give Wangemann "the necessary letters to Gouraud and Hammer. I presume you want the former to arrange facilities for Wangemann, to get records outside of Paris." Finally, Tate wired back to Edison the same day that Wangemann's "passage secured for Saturday will follow out your instructions." Tate to TAE, both 12 June 1889, DF (*TAED* D8955ACB, D8955ACD); Tate to TAE, 12 June 1889, Lbk. 30:320 (*TAED* LB030320).

2. Established in 1868, Drexel, Harjes & Co. was the Paris affiliate of Drexel, Morgan & Co. and one of the leading private banks in Europe. Doc. 2155 n. 2.

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To Louis Glass

[Orange,] June 22, 89.

Dear Sir:—

I beg to confirm the following telegrams received from you and sent by me:—

THOS. A. EDISON. June 20, 1889. "Thought you had dynamo circuit till receipt of letter of fourteenth this morning; telegraph volts and amperes required for present phonograph, also whether you can supply dynamo and cost.[1] Louis Glass."[2]

LOUIS GLASS. June 21, 1889. "We can fill orders for phones[3] wound to run in multiple arc on hundred volt circuits. Regular battery wound motor requires two volts and two and half amperes. You can put thirty subscribers on wire in series; use a resistance and continuity preserving switch at each phone to throw compensating resistance of seven-tenths ohm in circuit; when phone out of use phone plug need not be touched; add German silver coil at station to keep current constant. You can attach this to any incandescent circuit in City, or by using our smallest dynamo you can supply five such circuits. Lines may have a resistance of fifteen ohms or more with fewer subscribers. Our new battery has run phone 26 days four hours daily full speed and is great success. Price dynamo two hundred sixty. EDISON."

TL (letterpress copy), NjWOE, Lbk. 31:20 (*TAED* LB031020).

1. The telegram from Glass on 20 June, quoted here in full, was one in a series of communications with Edison about supplying phonographs to California (DF [*TAED* D8963AAZ]). Based on Glass's satisfaction with the treadle-powered machine received in March, the Pacific Phonograph Co. ordered 250 from the North American Phonograph Co. In May, however, Edison advised Glass to "Go light on treadle" because of recent improvements in the battery. Glass could, he suggested, "run out telephones wire and put sixty Phonographs on one circuit supplying current from small dynamo and gas engine all made

independent by resistance" (an arrangement akin to subscription-based telegraphic services like stock quotations, and one he also suggested to the Western Phonograph Co. in Pittsburgh). Glass was skeptical about the cost of distributing and servicing batteries in remote locations, however, and asked why Edison seemed to "disparage" the treadle design. He was more optimistic about using dedicated electric lines for a phonograph subscription service and decided "to hold back our machines until we get the dynamo circuit mentioned in your telegram and this we want just as soon as it is perfected" (Glass to TAE, 13 Mar. and 8 June 1889, DF [*TAED* D8963AAF, D8963AAT]; TAE to John Sabin, 21 May 1889; TAE to Louis Clarke, 11 June 1889, Lbk. 30:36A, 294 [*TAED* LB030036A, LB030294]).

Edison responded on 14 June that Glass had "misunderstood" his intent, which was

> that you get the Telephone Co. to run some wires for you, arrange them yourselves, and establish phonograph circuits putting 50 phonos on a circuit. At some convenient place you can use a small dynamo, driven by a gas engine, or by steam power if you prefer, and supply these circuits with current....
>
> I do not disparage the use of treadle machines. My opinion is, that when the new battery is sent out, the motor machines will be used almost exclusively, and I told you to go light on treadles for this reason....
>
> I am very much taken with the idea of a dynamo circuit, and would like to see you wire up and put a line in operation. The satisfaction which your customers would derive from such a system, and the increase of business which I am sure it would bring you, would more than [reimburse?] you for the trifling expense necessary to install the plant. [TAE to Glass, 14 June 1889, Lbk. 30:372 (*TAED* LB030372)]

Pointing to a Pacific coast reputation for developing innovations quickly, he explained that "when I opened your letter under reply, I expected to find that you had already acted upon my suggestion in regard to a dynamo circuit, and had forwarded me a report expressing your satisfaction." This optimism was misplaced. In July, Glass reported "putting in treadle machines" and using sewing machine motors sold by a local company: "it is a rather cumbersome system, but the best we can do." There were no available dynamos for setting up a dedicated power station, he explained, and waiting for one would delay his business by three months (Glass to Samuel Insull, n.d. [July 1889], Lbk. 31:322A (*TAED* LB031322A]).

This correspondence with Glass raised general questions of which type of power local phonograph companies should promote in different circumstances. The Edison Phonograph Works addressed this issue in a three-page pamphlet at the end of July. It reviewed the available options and the advantages and drawbacks of each. While not making blanket recommendations, it encouraged local companies to provide power as a means of ensuring subscribers' satisfaction and creating another revenue source for themselves. In August, Charles Batchelor experimented on the amount of resistance needed to run phonographs on a dynamo circuit. Edison Phonograph Works pamphlet, 31 July 1889, PPC (*TAED* CA025A); Cat. 1337:67 (items 575, 577; 3 and 19 Aug. 1889), Batchelor (*TAED* MBJ004067B, MBJ004067D).

2. Louis Glass (1845–1924) of San Francisco was cofounder and general manager of the Pacific Phonograph Co., formed in 1888 as the Pacific Edison Phonograph Co. Born in Maryland, Glass moved to northern California as a youth and worked for Western Union. Having become involved with hydraulic gold mining by 1879, he entered into correspondence with Edison about platinum deposits and was drawn first into Edison's gold and platinum mining interests in the region and then into an effort to introduce electric lighting into San Francisco. Glass was personally acquainted with Edison from having made business trips to New York, including one in January. He was until recently also an agent of Albert Dick for the Edison mimeograph (Docs. 1776 n. 1 and 2176; "Glass, Louis," Pioneers Bio.; "New Corporations," *Electrical Review* 13 [10 Nov. 1888]: 3; "Personal," *Electrical Review* 13 [12 Jan. 1889]: 8; "Obituary," *Woodland* [Calif.] *Daily Democrat,* 14 Nov. 1924, 2; Glass to Dick, 6 Apr. 1889, DF [*TAED* D8903AAH]). Glass introduced a novel coin-operated phonograph in San Francisco in November 1889 that, for the price of a nickel, would play a recording for as many as four customers using listening tubes. He and a partner took out patents in 1890 on improvements in the mechanism, and he and Edison cooperated in the commercial development of the so-called nickel-in-the-slot phonograph (Welch and Burt 1994, 87–88; 2; *ERS,* s.v. "Coin-Op"; TAE agreement with Glass, et. al., 19 Apr. 1890, Legal [*TAED* HX90077]).

3. "Phones" was typed mistakenly instead of "phonos."

–3369–

To George Gouraud

[Orange,] June 22, 89.

My Dear Gouraud,—

Since the receipt of your letter outlining a proposition for the formation of a Company in England to exploit the phonograph and of your cablegram referring to the same subject,[1] I have been considering what action it would be best for me to take in order to facilitate business between us, and have finally decided to send my Private Secretary, Mr. Tate, to London to co-operate with you in the work which you have in hand.[2]

Mr. Tate is familiar with the phonograph business as organized in this country and understands thoroughly my own views and wishes as to any foreign organizations of which I may in the future approve, and I desire you to discuss with and submit to him all details which may arise and plans which you may formulate in regard to the formation of Companies in your territory, my idea being that after you and he have arranged a proposition, it shall then be submitted to me for consideration, by which means we will avoid the annoyance of delays which would otherwise be incurred through your having to seek my views and learn my wishes by mail and cable.[3]

I want you to deal with Mr. Tate as fully and freely as you would with myself, giving him every facility to familiarize himself with your plans broadly and in detail and submitting to him all papers that he may ask for or that may be necessary to acquaint him thoroughly with the work in hand—in short, I desire everything to pass through him before reaching me and any propositions which you have to make to be presented to me by Mr. Tate, who has a code[4] with me for this purpose, all of which will greatly facilitate your progress.

Mr. Tate sails for Liverpool on July 2nd, S.S. "Arizona."[5] Yours very truly,

Thomas Edison T[ate][6]

TL (letterpress copy), NjWOE, Lbk. 31:11 (*TAED* LB031011). Signed for Edison by Alfred Tate.

1. Gouraud wired Edison on 17 June to "Cable dollars you approve for England write Wednesday sure capital and what paid by each American Company." Edison immediately instructed him to "Send details of scheme, will forward data American Companies" (TAE to Gouraud, 19 June 1889, Lbk. 30:436 [*TAED* LB030436]). The letter to which Edison referred was probably a long one from 4 May in which Gouraud discussed his plans

> as regards the formation of companies. The public is ripe now I suppose for subscribing liberally for this enterprise; and my idea is to form companies on the same general lines as has been done in America and which I presume is in accordance with your view. My purpose is to form a separate company for each important country covered by my agreement providing for a fair proportion of money and shares for us in each case.… [Gouraud to TAE, 4 May 1889 (pp. 4–5), DF (*TAED* D8959ABC)]

While proposing to allow each company to decide whether to rent or sell phonographs, Gouraud suggested they should be rented in England as in the United States. He also proposed "not to sell the patents to a parent Company, but that we keep the patents ourselves and form licensees companies such as has been done in the Telephone Company" (p. 6). Subsequent correspondence on this subject through late May is recapitulated in Doc. 3361. Gouraud, meanwhile, asked London solicitors whether the London Stereoscopic and Photographic Co. had any claims that could interfere with the rights of a new company and shared with Edison their opinion that it did not (Gouraud to TAE, 11 June 1889, enclosing Bircham & Co. to Gouraud, 6 June 1889; both DF [*TAED* D8954ACH, D8954ACI]).

2. Tate evidently carried with him a typed four-page memorandum "AS TO LETTERS OF INTRODUCTION" (and presumably the letters themselves). The unsigned document summarized Gouraud's relations

with six individuals and what Tate might expect to learn from each one about his "methods" and prospective investors. The author (almost certainly Samuel Insull) speculated that investors might include Sir George Elliot and Spencer Balfour and that "these same people may be interested with Seligman." It is not clear whether Edison's side knew of Gouraud's imminent negotiations with representatives of the Seligman banks, which were underway by the time Tate reached London. Insull to Tate, n.d. [c. 1 July 1889]; Tate to Insull, 15 July 1889; both DF (*TAED* D8959AGT, D8959ACD).

3. Gouraud had recently complained—not for the first time—about the "unbusiness like & embarrasing neglect" of his correspondence in Edison's office. Gouraud to TAE, 18 May 1889 (p. 2), DF (*TAED* D8959ABQ).

4. That is, a prearranged set of code words to conceal the meaning of telegraphic messages.

5. The *Arizona,* a large steamer of the Guion line since 1879, set a transatlantic speed record soon after entering service. Doc. 1858 n. 2; Fox 2003, 284–86.

6. Below his signature for Edison, Tate appended and signed a typed note to "My Dear Insull,— I will see you about the attached." The editors have not identified the attachment.

–3370–

To William Hammer

Orange, N.J. June 24, 89.[a]

Dear Sir:—

I beg to confirm the following cablegram sent you 22d instant:—[1]

NEWARK, PARIS. June 22, 1889. "Use your judgment about juries. Graphophones only claim to originality is recording by cutting wax. Procure immediately copy of La Nature,[2] edited by Tissandier,[3] 1879, page 349; article on Lambrigots phonograph uses cutting tool and sterine wax.[4] See also my British Patent Number 1644 of 1878, paragraph thirty of specification filed October 22d.[5] EDISON."

Yours very truly,

T. A. Edison T[ate][b]

TL, DSI-AC, WJH, Ser. 1, Box 1 (*TAED* X098A043); letterpress copy in Lbk. 31:38 (*TAED* LB031038). Letterhead of Edison laboratory. [a]"*Orange, N.J.*" preprinted. [b]Signed for Edison by Alfred Tate.

1. Edison was responding to a cable in which Hammer stated: "Juries inspect exhibits in ten days just appointed if you wish to make special claims telegraph or write at once am preparing matter for pay [matter?] cable salient point for phonograph as graphophone makes ridiculous claims if you write cable me to hold jury till letter arrives answer." The "pay matter" presumably was articles or notices to

be planted in the press. Hammer's message was relayed from the Edison Machine Works in New York, and Edison drafted and then crossed out a reply on the cover letter. His brief note said "Have nothing to say" and instructed Hammer to "do best you can," presumably about the jury visits. Regarding the graphophone, Edison called it a "failure" and pointed to his British patent but did not mention the *La Nature* article referred to below. TAE to Hammer, 24 June 1889, Lbk. 31:39 (*TAED* LB031039); Thomas Butler to Alfred Tate (with TAE marginalia), 21 June 1889, DF (*TAED* D8920AAQ).

2. *La Nature* was an illustrated journal of popular science founded by Gaston Tissandier in 1873. It was published under this title until 1960 when it became *La Nature science progrès.* Parville 1889, 225; "La Nature (Paris)," catalog record, website of Bibliothèque Nationale de France (data.bnf.fr), accessed 3 Apr. 2018.

3. A scientist and popularizer with wide-ranging interests, Gaston Tissandier (1843–1899) founded and edited *La Nature.* Born in Paris, he studied at the Lycée Bonaparte, the Collège de Sorbonne, and the Collège de France. He began his career as a chemist at the laboratory of the Conservatoire des Arts and Métiers and was appointed director of the Laboratory of Tests and Chemical Analysis for the Union National in 1864. His interests broadened to include physics, meteorology, photography, and ballooning. With his brother Albert and three others, he spent a record twenty-five hours flying by hot air balloon from Paris to Arcachon in 1875. He ascended to 8,600 meters the same year, an exercise that left Tissandier unconscious and two companions dead from asphyxiation. He and his brother successfully powered a dirigible with an electric motor in 1883; three years later, he was appointed to the Commission d'Aérostation at the Ministry of War and to the French Civil Aeronautics Commission. A prolific author, Tissandier published more than two dozen books in his own name and co-authored at least nine others. Parville 1889, 225; *Ency. NCP,* s.v. "Tissandier, Gaston"; *Ency. Brit. online,* s.v. "Airship"; Wahl 1889, 5:375.

4. The brief article (Hospitalier 1879) described the recording system devised by Jacques Paul Lambrigot, a French telegraph engineer (Soulard 1969; Doc. 33 n. 3). The apparatus transferred sound waves to stearin wax coated on bars of glass or other hard material, which Lambrigot conceived as a good medium for duplication by electroplating. The *La Nature* article was silent about the exact process of recording on the surface, but the tool for doing so was specifically described as a steel blade and Edison likely inferred that it would cut into the wax, although a contemporaneous description in English used the word "emboss" ("A Sixpenny Phonograph," *Engineering* 27 [18 Apr. 1879]: 326–27; see also Doc. 3428).

Efforts to distinguish the graphophone from the phonograph according to the recording medium and means of inscription were not new, and Charles Tainter saw the action of cutting into a wax surface as a defining trait of the graphophone (see Doc. 3267, Tainter [1931?], 15, 98). For some reason, however, Edison at this time called Hospitalier's article to the attention of Jesse Seligman and Richard Dyer, separately advising each one that Lambrigot's device, by using a knife to cut into wax, undermined Tainter's claim (TAE to Seligman, 22 June 1889; TAE to Dyer, 24 June 1889; Lbk. 31:28, 37 [*TAED* LB031028, LB031037]). George Gouraud and his patent attorney were also drawn into the matter in the fall (see Doc. 3428 n. 2). A half dozen years later, Edison referred to Lambrigot's instrument in a major legal case to assert "that the use of wax-like materials for recording by engraving the record was not new at the time of [Charles] Tainter's patent" (Edison's testimony, p. 163, *American Graphophone Company v. U.S. Phonograph Company,* Lit. [*TAED* QP001161]).

5. Edison referred to the paragraph (quoted in full in Doc. 3267 n. 9) describing a waxy subsurface for the foil. The recording process was one of indenting, not cutting.

–3371–

To William Marks

[Orange,] June 24, 89.

My Dear Marks,—

I have received a copy of your report under date June 19th, 1889, to the President and Directors of the Edison Electric Light Co. of Philadelphia,[1] and I think that a few words in regard to our experience at the Pearl Street Station may be of benefit to you at this time.

We found that the best period to take on new customers was during the summer months, and at that time our solicitors did the best work of all the year. On very hot nights they used to go through the district, and enter an establishment where a lot of gas jets were burning—where the people were mopping their heads and perspiring—and seeking the proprietor they would commence talking electric light to him, and would point out that if he were to replace his gas jets by incandescent lamps, each one of the latter would give off only about [1/15?][a] the amount of heat of each gas jet. [Also?][a] that the incandescent light would give him the benefit of a dry atmosphere &c. &c. [using?][a] arguments with which you are familiar and which I need not elaborate. The result was that we took on more customers during the [----- summer months?][a] than at any other time of the year, and I [am certain? that][a] you can do the same thing in Philadelphia.[2] Yours very truly,

Thos. A. Edison

<We had a number of customers supplied from the Pearl St. station who used the light <u>during the Summer only</u>, going back to gas when cold months came T.A.E T[ate].>[b]

TL (letterpress copy), NjWOE, Lbk. 31:034 (*TAED* LB031034). Signed for Edison by Alfred Tate. [a]Illegible copy. [b]Marginalia written by Tate.

1. The report from Marks coincided with the Philadelphia utility taking full responsibility for their new equipment from the Edison Ma-

chine Works. Marks encouraged the company to focus now on enrolling new customers by hiring canvassing agents on commission. He advised that the station's income was sufficient to cover expenses during the summer but recommended cutting its rates in October to three-fourths of a cent per lamp-hour, the same as for gas and presumably enough to earn a profit during the lighting season (Marks to Edison Electric Light Co. of Philadelphia, 19 June 1889, DF [*TAED* D8937AAO]). Separately, Marks had written to Edison in defense of the plant against what evidently was a highly critical report by John Vail, who, having resigned from the Edison Electric Light Co., was now being put forward (possibly by Samuel Insull) to fill a position in Philadelphia. In a draft reply on the Marks letter, Edison wrote: "I dont see anything wrong in Vails report, except that I believe him mistaken in Every point except perhaps one or two minor details" (Marks to TAE [with TAE marginalia], 17 June 1889; Vail to TAE, 1 June 1889; both DF [*TAED* D8938AAT, D8914AAN]).

2. Marks forwarded Edison's letter to the company's general agent with instructions to hire at least four more sales people to solicit new customers. Marks was at first unsuccessful in persuading the board to cut electric rates, but later, invoking Edison's support of the idea, he won approval. Marks to TAE, 25 June and 18 July 1889, both DF (*TAED* D8935ABE, D8937AAR).

–3372–

Alfred Tate Memorandum to Samuel Insull

[Orange,] June 30, 89.

Memorandum for Mr. Insull.

I give you the following information in regard to current matters in this office:—[1]

Edison Electric Light [Co.?][a] bills for experiments. Maguire will hand you our bills against the Electric Light Co. for experiments conducted by Mr. Edison in this Laboratory, on their behalf, amounting to $4,458.82. These were forwarded by me to the Light Company and were returned by them through Mr. Wirt,[2] who was instructed to come here and get an explanation as to the nature of the experiments which are named in the bills, and to find out upon what authority these experiments had been conducted. In order to have these bills intelligently explained, it is necessary that Mr. Edison should be present at any interview which is had with Mr. Wirt, as no one else can give the necessary information. I have not had an opportunity to make an appointment for the discussion of this matter.

Bloomfield real estate.[3] Mr. Edison has purchased a number of different properties in Bloomfield. Randolph[4] has all the details of these properties. All papers relating to them, such as agreements, deeds &c., are in the hands of Mr. George P. Kingsley,[5] whose office is near the Orange Nat'l. Bank,[6] Orange, N.J., and who has acted as our local attorney in affairs of this nature. The papers were placed in Mr. Kingsley's hands, for him to have a survey made of all the properties, and a new map prepared, showing the correct boundaries of each. The first property which Mr. Edison purchased in Bloomfield is known as the FARRAND property,[7] and was bought from David N. and Lydia Ropes,[8] for the sum of $10,000, $3,000 having been paid in cash at the time of purchase, and a mortgage of $7,000 executed by Mr. Edison in favor of Lydia Ropes. During the present month, Mr. Edison made a payment of $2,000 on account of this mortgage, which was handed to Mr. Kingsley; and which he was to endorse on the bond, which he states has been done.[9] This makes the present amount of the mortgage $5,000. All the other properties have been paid for in full, with the exception of one. This is another Farrand property, and on July 15th there is a payment due to complete the purchase, of $4,990, $10 having been paid when the agreement was made, making the total purchase price, $5,000.

Mr. Kingsley is preparing for us a description of each of [the Farrand?][a] properties, taken from the [——],[a] which Mr Randolph will write up in his [journal?][a] when he is making his entries for those properties, so that we will always have a record to which we can readily refer when necessary.

BLOOMFIELD FACTORIES. There are two buildings going up on the Bloomfield property, one of which is, I believe, a Chemical Works, and the other for the manufacture of batteries.[10] I have started a small set of books, which are being kept in this Laboratory, for these two buildings, and the details of construction of each are being recorded separately.[11] One building is just about finished, and they are getting in machinery. The foundations of the other building are now rising.

TAXES ON BLOOMFIELD PROPERTY. In view of the extent to which Mr. Edison proposes going in to the manufacturing business on these new properties, I went to Bloomfield a few days ago and saw the Assessor, the idea being to obtain exemption from taxation for a number of years. The line between the Townships of Bloomfield and Belleville divides these properties almost equally. Mr. Batchelor has a map which shows this line. Mr. Edison can build in the Township of Belleville or in the Township of Bloomfield, as he pleases, and I intended playing off one Township against the other, in order to get as favorable terms as possible. The Townships are controlled each by a Committee, which is elected to office, I understand, annually. The office of Assessor is also an elective one. Mr. Kingsley, our local attorney, advises me that the Township Committees have not the power to grant exemption from taxation, but that we can keep our assessments down by having an understanding with the Assessor. As stated above, I saw the Assessor for Bloomfield Township, and he gave me the same information that Mr. Kingsley gave me. He called to see me the other day and assured me that he would keep the assessments down to the lowest possible point. I only took this matter up recently, and have not been able to follow it out beyond my last interview with the Bloomfield Assessor, above referred to; but I think that there must be some way by which we could obtain exemption for a certain number of years. I do not feel satisfied that Mr. Kingsley has advised me correctly. If we can avoid it, we do not want to be at the mercy of these Assessors, but if there is no way out of it, we ought to have a proper understanding with them, and make them our friends. The time to do this is the present.

For your information I may add that, all the Townships in this district furnish blanks to the various manufacturing establishments, and ask to have them filled up with information as to the value of real and other property. These blanks should always be ignored, and the Assessor allowed to put a valuation on himself. They usually assess for about 30 to 40 per cent of the actual value.

Lippincott's payments on account of phonos. and supplies delivered to the North Am. Phono. Co. You will recollect that I called your attention the other day to the fact that Mr. Lippincott had given his personal check for the last twenty-five thousand dollar payment made on account of the above. I also told you that I had written Major Eaton, and I now attach a letter from Major Eaton, under date 25th instant, in which he suggests that we have a clear understanding with Mr. Lippincott as to the account to which these checks are to be applied.[12] As you are dealing with Mr. Lippincott, I have done nothing about this matter, but leave it for you to adjust, as suggested by Major Eaton.

Osgood S. Wiley. I attach letters from Mr. George Munro, Sec'y. of Edison Phono. Co., London,[13] and J. L. Nixon.[14] Mr. Wiley appears to have boarded with the latter for about two months. These communications explain themselves. Under instruction from Mr. Edison, I have forwarded to Mr. Munro Exchange on London for twenty-five pounds, and to Mr. Nixon Exchange on London for 4-13-10.[15] Wiley is in Mr.

Edison's debt, apart from these matters, about $300. Our books will show the exact amount. With these last amounts added, his overdrafts will amount to between four and five hundred dollars. Wiley's father[16] has money, and an attempt should be made to recover this indebtedness.

Amount paid by Mrs. Hemenway for Phono. Co. stock. Through an error of Tomlinson, the Lippincott contracts state that the amount which Mrs. Hemenway paid for her stock was $22,500. This is not so. We sold her 150 shares of stock, at $148 per share, and the check that I received and deposited in the Orange National Bank, in the name of A. O. Tate, Trustee, was for $22,200.[17] Randolph has the check book of this Trustee account, and a certificate can be obtained from the Orange Nat'l. Bank as to the amount of deposit, if the same be necessary.

Mr. Edison's contract with the Edison Ore Milling Co. Limited. I obtained one of the original copies of this contract from Mr. Butler,[18] the other being in the possession of the Ore Milling Company. The copy which I had is now in the hands of Eaton & Lewis,[19] to whom I sent it for the purpose of having explained certain provisions which were not quite clear. I have written Eaton & Lewis to return this contract to this office, and when it reaches here it will be put in the safe, together with a copy of my letter to E. & L., and their reply. Mr. Edison agreed to spend a certain sum of money to perfect his Ore Milling process, the amount, as I recollect, was $25,000. The charge on our books at the present time against Ore Milling, is about $17,000. There may be some minor experiments which should be written off against Ore Milling experiment, but that can easily be determined by a glance at our experimental sheet. Mr. Edison has intimated his desire for an accounting between himself and the Ore Milling Co., under this contract, if the matter can be arranged at this time.

Toy Phonograph. Major Eaton can explain to you the legal aspect of these affairs. I told you to-day that we had written Mr. Stevens,[20] practically withdrawing Mr. Stevenson[21] as a candidate for the position of Manager of the Toy Phono. Co.[22] I have made an appointment for Mr. Edison to meet Mr. Stevens and some of the other Directors of the Company, at this Laboratory, July 8th, and I have dictated a memorandum to Mr. Edison, which will be presented to the latter at that time, the substance of which is as follows:[23] The Toy Phono. Co. made a contract with T. C. Crawford,[24] for France, a copy of which is in Major Eaton's hands. I have a letter from Mr.

Stevens, under date 25th inst.,[25] in which he says that it is a question whether this contract is a valid one. F. Z. Maguire came to the Laboratory the other day and told me that he was associated with Crawford in the matter of this contract, that the contract had lapsed, and that he wanted to obtain from me information regarding Mr. Edison's relations with the Toy Phonograph Company, so that he and Crawford could decide whether they would seek a renewal of their agreement with that Company. He appeared to have no doubt as to the expiration of Crawford's contract.[26] I have given this information to Mr. Stevens.[27]

From all of Dick's correspondence, it appears that Paris is the great distributing centre for the doll trade in Europe.[28] It is, therefore, of great importance that the Toy Phonograph Co. should take advantage of any right which they may have to abrogate the Crawford contract. Otherwise that gentleman will control the bulk of the trade abroad.[29]

TRUST AGREEMENT EDISON PHONOGRAPH WORKS. Mr. Edison's agreement with the Phonograph Works, under date 12th day of May, 1888, provides for an issue to Mr. Edison of 52% of the Capital Stock of that Company, or 1,560 shares. Mr. Edison agreed to place 38% of this 1560 shares, or 592 8/10 shares, in the hands of a Trustee, as is explained in the above agreement.[30] Eaton & Lewis are preparing this Trust agreement, and the Garfield Safe Deposit Company[31] has been named as Trustee. I believe the Trust agreement will be ready next week.[32] All of Mr. Edison's Phonograph Works stock is in the safe here, and that portion of it, namely, 1,560 shares, which was issued to him as a consideration for the assignment of his manufacturing rights has been stamped, "ISSUED FOR PROPERTY PURCHASED."

Phonoplex. Logue[33] is installing a circuit on the lines of the Penn. R.R. between Jersey City and Philadelphia, which he will finish in a few days. After that he is to go to Altoona, to set up a new battery which we desire to test there.[34] When he is through at Altoona, I think that Mr. A. B. Chandler, of the United Lines,[35] will be ready for him. I have corresponded with Mr. Chandler, and he has promised us a circuit. You can review this correspondence at any time. When Logue is through with the United Lines, he should go to Chicago and some of the larger Western Cities. We have very few circuits in the West. We need one running out of Chicago more than anywhere else, and an effort should be made to obtain it. I am going to prepare to-morrow matter for a new Phonoplex pamphlet. Burgoyne[36] printed the last one, and he has our cuts, and I believe has the old pamphlet in type. When a proof of the new pamphlet is received, it would be well to have Logue read it over and see that no technical errors have been made. We should have 500 copies of the new pamphlet for distribution among the various Railroads in the United States.[37]

Edison E. Lt. Co. of Europe.[38] I am sending you all the records of the Edison Electric Light Co. of Europe, Limited. There are coupons missing from those paid on February 1st last by Mr. Hutchinson. I, of course, must be held responsible for these. I can give the company a bond or a check, as they please.

Frazar & Co.'s contract for sale of phonos. in China and Japan. This matter was turned over to Major Eaton several months ago, at a time when he was loaded down with work in connection with the General Company[39] and the Lippincott deal. He is ready to take it up now and complete the papers. The last time I discussed the matter with Mr. Edison, he said he wanted a royalty of $10 on each phonograph sold in these countries through Frazar and Company. I think it would be much better for you to readjust this and provide for Mr. Edison to have a certain percentage, based upon the factory price of phonographs and supplies. Mr. Frazar happened to mention to me in his office a few days ago, that his partners in China and Japan were considering the formation of a Company. I notified him, by letter, that his contract with his firm would not be assignable, and that the formation of a Company would have to be the subject of further negotiations between himself and Mr. Edison.[40] Frazar has an expert (Churchill) in China, and about 25 machines. Nothing has been billed to him, and we have given him no guarantee as to the price of phonographs. The whole matter can be shaped to suit present circumstances. You can handle it as though it had just come up for adjustment at the present time, as there are no complications.

Treasurer's bond Phono. Works. The Treasurer of the Edison Phono. Works[41] is required by the By Laws to give a bond for $250, for the faithful discharge of his duties. You should have this bond prepared and filed with the Company's records.

Phonograph Works, stock issued for services. When Batchelor, Tomlinson and myself were elected Directors of the Edison Phono. Works, we were each given five shares of stock to qualify. These were entered upon our books as having been issued for "services rendered," but Mr. Lewis advises me that there is no provision in the N.J. statutes by which stock can be issued for services. It must be issued for property or for cash. We could change the record on the books by giving the Phonograph Works Mr. Edison's check for this stock, at par (all the cash stock was issued at par), and then adjust the matter in his general account, which I refer to below.

Mr. Edison's general account with Phono Wks. There is an open account in favor of Mr. Edison on the books of the Edison Phono. Works for manufacturing done at the Laboratory, on their behalf. Our charges against the Phonograph Works were made upon the same basis as our charges for experiments, and are altogether too high for manufacturing. If you will look at our experimental sheet, which Randolph will show you, you can see exactly how we charge for experiments, and can decide as to the amount which should be allowed the Phonograph Works on the above.

A O Tate

TDS (letterpress copy), NjWOE, Lbk. 31:140 (*TAED* LB031140). [a]Illegible copy.

1. Tate planned to leave on 2 July for an extended working trip to England and France. Tate to Philip Dyer, 29 June 1889, DF (*TAED* D8920AAV); Tate to Insull, 30 June 1889, Lbk. 31:151 (*TAED* LB031151).

2. Charles Sumner Wirt (1858–1924) was an assistant to William Jenks at the Edison Electric Light Co.'s Standardizing Bureau in Edison's laboratory. Since 1881, he had worked at the Edison Machine Works, the Western Edison Light Co. in Chicago, and Bergmann & Co. Doc. 2576 n. 4; "Wirt, Charles," Pioneers Bio.

3. Bloomfield was a town of about 5,700 residents northwest of Newark, from which it was separated in 1812. To the east, between Bloomfield and the Passaic River, was Belleville, separated from Newark in 1839 and home to about 3,000 residents. The region was the site of stone quarries, copper mines, and smelters. Edison was buying in a specific area known as Silver Lake for the pond created by a dam on a small river there. (The dam—and the lake—disappeared in a storm in July 1889 but the name held fast.) By late summer, Edison reportedly owned about fifty acres (*WGD,* s.vv. "Bloomfield" and "Belleville"; Shaw 1884, 7, 13–14; Hill 2007, 21, chap. 9). He acquired at least nine parcels from multiple sellers between November 1888 and September 1890. The editors have not tried to correlate their exact locations from the legal descriptions of the tracts (see deeds accompanying Michael Daly to TAE, 24 May 1889, Miller [*TAED* HM89ABF]). Some further details may be gleaned from Edison and Tate's correspondence with attorney George Kingsley and with Mutual Life Insurance. Edison himself was not entirely sure about what he was buying and asked for a tracing of a map held by David Ropes, one of the sellers (Tate to

Kingsley, 7 June 1889, Lbk. 30258 [*TAED* LB030258]); see also notes 7–8; see also Doc. 3389).

4. John Randolph (1863–1908) began working for Edison in 1878 as an office assistant. He was now helping with financial records and correspondence. Doc. 2647 n. 3.

5. George P. Kingsley (1842–1899), a native of Orange, N.J., graduated from New York University and attended classes at Columbia College Law School before being admitted to the bar in 1866 and setting up practice in Orange. Shaw 1884, 1:290; "Obituary Notes," *NYT,* 20 Jan. 1899, 7.

6. The Orange National Bank, one of several used by Edison and his businesses, began operating in 1828 as the Orange Bank in the County of Essex and was re-chartered under its present name in 1865. Its treasurer in 1884 was listed as G. P. Kingsley. *The 100th Anniversary of the Orange National Bank*; Shaw 1884, 2:754; *TAED,* s.v. "Orange National Bank."

7. Edison purchased land from the widow (Anna née Cook, 1823–1901) and son (Standford) of the late Charles Ferrand (1799–1874), a Bloomfield farmer. The property was one of several that he bought in Bloomfield and Belleville since late fall 1888. By coincidence, the home in Fort Gratiot, Mich., in which Edison lived as a boy was sold to his father by Bethuel Ferrand, a distant relative of Charles Ferrand. Tate to Standford Ferrand, 7 June 1889, Lbk. 30:257 (*TAED* LB030257); Nelson 1913, 1:383–85; Baldwin 1995, 22.

8. David Nichols Ropes (1814–1889), a native of Salem, Mass., earned his wealth in the manufacture of table cutlery. He married Lydia Laurelia Bisbee (1826–1910) of Connecticut in 1846. Ropes moved to Orange in 1855 to pursue business in New York City and became a prominent landowner, buying and reselling a large number of lots. He completed the Watchung line of the Greenwood Lake Railway and served two terms as mayor of Orange. After the panic of 1873, many of the Ropes properties were encumbered by debt and some were foreclosed upon or sold at a loss. The Mutual Life Insurance Co. of New York evidently had ownership interest in at least one of the tracts being deeded to Edison, resulting in some uncertainty about the property title. Whittemore 1896, 274–76; Obituary, *New York Daily Tribune,* 25 July 1889, 7; Find A Grave memorial nos. 172892731 (David) and 172892778 (Lydia), online database accessed through Ancestry.com, 28 Mar. 2018; U.S. Census Bureau 1982? (1900), roll T623, p. 7 (enumeration district 159, Orange Ward 2, Essex, N.J.); TAE to Mutual Life Insurance, 31 May 1889; Tate to Kingsley, 6 June 1889; Lbk. 30:164, 244 (*TAED* LB030164, LB030244).

9. Kingsley had acknowledged Edison's payment on the Ropes property and one other a few weeks earlier. TAE to Kingsley, 8 June 1889, Lbk. 30:271 (*TAED* LB030271); Kingsley to TAE, 8 June 1889, DF (*TAED* D8918AAD).

10. The first evidence of work on the Silver Lake buildings is a bookkeeping journal entry in May; subsequent entries referred to Buildings 1 and 2. The "Chemical Works" was likely Building 2, which Jonas Aylsworth identified as the place where wax production was eventually moved from the Edison Phonograph Works. The battery building was likely Building 1. In September and October, draftsmen

P. C. Stuart and Eb. W. Thomas worked on a "Duplicating Building" for the Edison Manufacturing Co., which one of Thomas's time sheets differentiates from Building 2. Journal #5:203, 226, 230, 236, 240–41, 243, 248–49, 254, 256, 261, 266, 272, 277, WOL (*TAED* NL016A1 [images 103, 115, 117, 120, 122–23, 126, 128–30, 132, 135, 140]); Aylsworth's testimony, p. 58, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046 [image 112]); Time Sheets, WOL.

11. Not found.

12. Tate had asked Sherburne Eaton for advice about properly crediting two payments recently made on Jesse Lippincott's personal checks. Eaton instructed him to clarify whether these and subsequent remittances were on account of the sale of Edison Phonograph Co. stock, purchase of phonograph machines, or reimbursement of Edison's ongoing experimental expenses. Tate to Eaton, 21 June 1889, Lbk. 30:479 (*TAED* LB030479); Eaton to Tate, 25 June 1889, DF (*TAED* D8962AAI).

13. The editors have not identified George Munro apart from his role at Edison's Phonograph Co. George Gouraud organized the firm by late summer or early fall 1888, presumably to exploit the rights granted him by Edison, but its exact scope is unclear. Its offices were on Victoria St. in the City of London. A. Schanschieff to Edison's Phonograph Co., 27 Sept. 1888, DF (*TAED* D8850ADU).

14. The editors have not found further information about J. L. Nixon beyond a postal address in Russell Square in the City of London. Nixon to TAE, 15 June 1889, Kellow (*TAED* HK132AAJ).

15. Having loaned £25 to Wiley but gotten no replies to entreaties sent to him in New York, Munro appealed to Tate for advice, enclosing copies of his correspondence with Wiley. Tate paid Munro in full ($123.75) on 26 June and arranged a payment to Nixon in Edison's name the same day. Munro to Tate (with enclosures), 12 June 1889; Nixon to TAE, 15 June 1889; voucher to Munro, 12 June 1889; all Kellow (*TAED* HK132AAC, HK132AAJ, HK132AAI1); Tate to Munro, 26 June 1889; TAE to Nixon, 26 June 1889, Lbk. 31:114–15 (*TAED* LB031114, LB031115).

16. Distinguished publisher John Wiley (1808–1891) grew up in New York City but had lived in East Orange, N.J., since 1851. In about 1826, Wiley took his father's place as partner in a publishing house known for its literary output. The firm's name was changed to John Wiley & Sons in the late 1860s with the addition of John's sons Charles and William Halsted Wiley; over the following two decades, William, in particular, remade the company into a leader in scientific and technical publishing. "Obituary. John Wiley," *NYT,* 22 Feb. 1891, 8; *NCAB* 12: 503–4.

17. Edison's contracts with Jesse Lippincott included specific provisions for the repurchase of Edison Phonograph Co. stock from Mary Hemenway (see Doc. 3215 see n. 6). Tate had been aware of the incorrect valuation of Hemenway's investment since at least April, when he called the error to Sherburne Eaton's attention. Lippincott acquired her shares at a premium for $23,400 at the end of the year. Tate was trustee for a pool in which stockholders held their shares in common. Tate to Eaton, 19 Apr. 1889; Lippincott to TAE, 26 Dec.

1889; both DF (*TAED* D8956AAK, D8962ABD); Tate to Lippincott, 6 Nov. 1889, Lbk. 33:420 (*TAED* LB033420).

18. Thomas Butler worked in the New York office of the Edison Machine Works and held positions in a number of Edison companies. He was Insull's immediate predecessor as George Gouraud's secretary in London. He came to New York about the latter part of 1886, working initially as Insull's private secretary. Doc. 1645 n. 3; Butler to TAE, 22 Dec. 1884; Butler to Insull, 26 Oct. 1886; both DF (*TAED* D8413ZBG, D8633ZAO); Insull 1992, 18.

19. Eugene Howard Lewis (1852–1907) grew up in Wisconsin. After graduating from Yale (1873) and Columbia Law School (1875), Lewis was admitted to the New York bar in 1875. The next year he became the managing clerk of a New York firm in which Sherburne Eaton was a partner and developed some professional acquaintance with Edison by the beginning of 1883. Lewis and Eaton established their own partnership in December 1884 and mainly served Edison and his lighting businesses. "Death List of A Day," *NYT,* 3 Mar. 1907, 7; Yale University 1910, 754–55; Lewis to TAE, 5 Jan. 1883, DF (*TAED* D8370E).

20. Benjamin F. Stevens (1824–1908), born to a prominent Boston family, was president of the New England Mutual Life Insurance Co. since 1865 and a director of the Edison Phonograph Toy Manufacturing Co. ("B. F. Stevens Passes Away," *Boston Daily Globe,* 12 Apr. 1908, 17; William Jacques to Tate, 8 June 1889, DF [*TAED* D8964ABE]). Stevens was among several of the company's officers or directors who met with Edison at Orange on 17 June. He evidently raised questions about the wisdom of appointing Mr. Stevenson to oversee the agency-based operations of the Phonograph Toy Co., and Tate wrote him on 29 June that Edison had withdrawn his support for Stevenson (Stevens to Tate, 14, 21, and 27 June 1889; all DF [*TAED* D8964ABN, D8920AAR, D8964ABX]; Tate to Winfield Hutchinson, 15 June 1889; Tate to Stevens, 29 June 1889; Lbk. 30:394, 31:119 [*TAED* LB030394, LB031119]).

21. Possibly John Lindsay Stevenson (1834–1894), a prominent Boston wholesaler and freemason. Rand 1890, s.v. "Stevenson, John Lindsay"; *Massachusetts Death Records, 1841–1915,* online database accessed through Ancestry.com, 26 Mar. 2018.

22. The Edison Phonograph Toy Manufacturing Co. was incorporated in Maine in October 1887 to make and sell dolls and other toys with phonograph attachments. William Jacques was its founding president (Docs. 3076 n. 3 and 3100 n. 5). The company's affairs, and specifically its relations with Edison, were muddled at this time. Edison claimed that Jacques and his partners had forfeited their foreign sales rights (see Doc. 3360 n. 2; Wile 1987, 9–12). That declaration triggered a sharp drop in the stock price and unsettled investors who, according to one, had been assured of Edison's active role in the company (William Clarke to Tate, 25 Apr., 2, 6, and 7 May 1889; Jeanie Spalding to Tate, 20 May 1889; all DF [*TAED* D8964AAN, D8964AAP, D8964AAR, D8964AAS, D8964AAZ1]). It also gave Edison leverage to negotiate more favorable terms. Tate went to Boston on his behalf in May, and several directors traveled to Orange in mid-June (TAE letter of introduction for Tate, 2 May 1889; TAE power of attorney to Tate, 11

May 1889; both Miller [*TAED* HM89AAW, HM89ABD]; see note 17). Among the points discussed were domestic and foreign manufacturing rights and the disposition of Edison's future patents. A draft agreement reportedly included provisions for Edison to maintain at least a one-eighth interest in the company under all circumstances and a guarantee of at least forty percent more stock than Ezra Gilliland and Oscar Madden held together. Agreements signed on August 6 did not include those terms but did grant the company the right to manufacture and sell in all countries except the United States, with the actual manufacturing for the entire world (including the U.S. patents of William Jacques) sub-licensed back to Edison. At the same time, the firm planned to increase its capital stock from $600,000 to $1,000,000 (TAE draft memorandum of agreement with Edison Phonograph Toy Mfg. Co., 24 May 1889; Tate to Eaton, 13 June 1889; both Lbk. 30:52, 337 [*TAED* LB030052, LB030337]; TAE agreements with Edison Phonograph Toy Mfg. Co., both 6 Aug. 1889, Misc. Legal [*TAED* HX89047, HX89048]; "The Edison Phonograph Toy Company," *Electrical Review* 14 [6 July 1889]: 1).

23. Tate's precis is accurate as far as it goes, but his memorandum also included this advice to Edison: "If there are any grounds whatever upon which the Crawford contract can be abrogated, it is very important that the Boston Company should take advantage of them. Otherwise Crawford is going to control the bulk of the European trade." Tate to TAE, 28 June 1889, Lbk. 31:117 (*TAED* LB031117).

24. Theron Clark Crawford (b. 1849), journalist, traveler, author, and promoter, used his first and middle initials. Born in Michigan, Crawford entered the newspaper business in Milwaukee and then went to Chicago and Washington, D.C., where he took over the capital bureau of the *New York World*. The *World* posted him to London in the early 1880s and Crawford began to travel frequently between Britain, the United States, and Europe. After returning to the U.S. from London in August 1888, at the behest of the *World* he reported on the infamous Hatfield-McCoy feud in a lengthy account published in 1889 as *An American Vendetta* (Johnson 1892, 2; Crawford 1889, 7–8). In October 1888, Franck Maguire promised Tate that he would "bring Crawford of the World" to the laboratory in reference to a contract. Maguire recalled in late May 1889 that "In October or November last Mr T. C. Crawford and myself made a sort of informal contract with W. W Jacques and [Lowell] Briggs for phonograph doll for France. I understand from them that they have turned over the foreign business to Madden & Gilliland." Maguire now believed that the contract had lapsed, though Tate could not verify that claim (Maguire to Tate, 23 Oct. 1888, 29 May and 6 Nov. 1889; Tate to TAE, 29 June 1889; all DF [*TAED* D8805AID, D8955ABY, D8964ADA, D8964ABZ]; Tate to TAE, 28 June 1889; Tate to Stevens, 29 June 1889, Lbk. 31:117, 123 [*TAED* LB031117, LB031123]). Crawford was also deeply involved in getting Buffalo Bill's Wild West Show to Paris for the Exposition Universelle, a tour that ended in a conspicuous absence of profits for its investors ("Looking for the Profits," *NYT,* 15 Dec. 1889, 9; Jonnes 2009, 107–8).

25. The editors have not found this letter. Stevens made such a statement in a 27 June letter to Tate, whose acknowledgment suggests

the reference to 25 June may be in error. Stevens to Tate, 27 June 1889, DF (*TAED* D8964ABX); Tate to Stevens, 29 June 1889, Lbk. 31:123 (*TAED* LB031123).

26. Franck Maguire submitted essentially the same information to Tate a month earlier. Maguire to Tate, 29 May 1889, DF (*TAED* D8955ABY).

27. Tate to Stevens, 29 June 1889, Lbk. 31:123 (*TAED* LB031123).

28. Tate made the same point to Edison two days earlier in transmitting a recent letter from Albert Dick. Tate to TAE, 28 June 1889, Lbk. 31:117 (*TAED* LB031117).

29. At Crawford's insistence, the company later agreed to honor his rights through the end of 1889. That period evidently was extended, and Crawford declared his readiness to take on the business in late 1890. Crawford to Edison Phonograph Toy Mfg. Co., 30 Oct. 1889; Daniel Weld to Crawford, 9 Nov. 1889; Weld to John Dos Passos, 11 Nov. 1889; Weld to Tate, 12 Nov. 1889; Crawford to TAE, 8 Nov. 1890; all DF (*TAED* D8964ADD, D8964ADF, D8964ADG, D8964ADC, D9060AEJ).

30. This agreement transferred Edison's manufacturing rights to the new Edison Phonograph Works. A portion of stock he received was to be placed in a trust where they could be voted but not earn dividends until the company reached a certain profit level. TAE agreement with Edison Phonograph Works, 12 May 1888, CR (*TAED* CK101022).

31. Chartered in March 1888, the Garfield Safe Deposit Co. operated in the Masonic Temple building in New York on Twenty-third St. at Sixth Ave., adjacent to the Garfield National Bank. The firm was noted for the design of its vault, built independently of the building itself, and the large safe inside. "New Safe Deposit Vaults," *NYT,* 31 Mar. 1888, 8; "Strong Boxes of Ancient and Modern Times," *Illustrated American* 9 (13 Feb. 1892): 584–90.

32. The agreement was sent to Edison on 5 July. Edison inquired "Where is it" on the cover letter, and the editors have not found it. Eaton & Lewis to TAE, 5 July 1889, DF (*TAED* D8957AAG).

33. Born in Frederick, Md., William S. Logue (1847–1906) served in the U.S. Military Telegraph Corps. during the Civil War. Afterward he went to the American Telegraph Co. in Baltimore, the first of several commercial companies with which he was connected. Starting work for Edison in 1886, he assumed increasing responsibility for installing and testing phonoplex telegraph equipment in railroad offices in the United States and Canada. Logue remained connected with Edison businesses the rest of his life and died traveling as general sales agent of the Edison Manufacturing Co. "Death of William S. Logue," *Telegraph Age* 24 (1 May 1906): 208; *TAED,* s.v. "Logue, William S."

34. Altoona, in central Pennsylvania, was a vital node in the Pennsylvania Railroad network and the home of large repair shops and related industries. It was built by the railroad in the 1850s to help push its tracks between Harrisburg and Pittsburgh through the Allegheny front (*WGD,* s.v. "Altoona"; Ewing and Slep 1880, 5–14, 59–65, 157–83). The railroad subscribed to Edison's phonoplex telegraph system, and Tate asked to test a new Edison battery in regular service on a circuit from Altoona. Based on laboratory experience, he suggested the battery might last six months. The railroad agreed, and Edison instructed Tate

to "Notify Logue Battery is ready I want him to be in Altoona when it arrives" (Tate to William Taylor, 25 June 1889, Lbk. 31:63 [*TAED* LB031063]; Taylor to Tate [with TAE marginalia], 27 June 1889, DF [*TAED* D8966ABW]).

35. Albert Brown Chandler (1840–1923) was a longtime telegraph executive and Edison acquaintance. Chandler had recently headed the Fuller Electrical Co. but now was president of the United Lines Telegraph Co., which was formed in 1885 and almost immediately took over the property of the bankrupt Bankers and Merchants' Telegraph Co. Doc. 2560 n. 2; Find A Grave memorial no. 21428746, accessed 3 Apr. 2018; death record for Albert Brown Chandler in *Vermont Death Records, 1909–2008,* online database accessed through Ancestry.com, 3 Apr. 2018; "Some New Corporations," *NYT,* 30 June 1885, 3; "The United Lines Company," *NYT,* 12 Aug. 1885, 8; "Has Mr. Garrett A Veto," *NYT,* 8 Oct. 1887, 1.

36. Charles Grover Burgoyne (c. 1847–1916) was born in Virginia but served with a Pennsylvania regiment in the Civil War. He moved to New York in the early 1880s and established the Charles G. Burgoyne printing business. The firm thrived and became especially well known in the field of law. Burgoyne set up a winter home in Florida in the 1890s and eventually became mayor of Daytona. "Obituary," *Inland Printer* 57 (May 1916): 251; "Of Interest to the Craft," *Inland Printer* 9 (Aug. 1892): 989.

37. Insull and Tate had been using a fifteen-page promotional booklet likely printed in 1886. The thirty-page updated version put out by Burgoyne, probably in 1890, incorporated the older one with minor changes. It also had several pages of new introductory material, full-page testimonials, and a description of the Edison-Lalande battery; a list of licensees supplanted the old price list. See Doc. 2971 esp. n. 2; "Edison Phonoplex System of Telegraphy," both n.d. [1886 and 1890?], PPC (*TAED* CA012A, CA038A).

38. The Edison Electric Light Co. of Europe, formed in 1880 and based in New York, licensed electric lighting patents to Edison companies in various European countries. See Docs. 1736 esp. n. 6 and 2667.

39. That is, Edison General Electric.

40. Tate explained that in enterprises based on his inventions, Edison "desires an interest which will give him a voice in the control of the Company's affairs, and in parting with such portion of his rights as would be represented by the stock placed outside of his hands, he should receive a substantial consideration." Tate also held out the possibility of entertaining "a cash offer for the whole business." Tate to Everett Frazar, 21 June 1889, Lbk. 30:481 (*TAED* LB030481).

41. Tate resigned from this position effective 1 July, and Insull was elected to take his place. Edison Phonograph Works minutes, 25 June 1889, Lbk. 31:153 (*TAED* LB031153).

–7– July–September 1889

Edison had been a household name in the United States and much of the world since the phonograph burst into the popular press in 1878. Nothing in the intervening decade, however, could have prepared him for the adulation that awaited his arrival in France for the latest world's fair, the Exposition Universelle in Paris. Edison and his wife Mina, traveling with Francis and Margaret Upton, slipped out of New York unannounced. But their steamship had not even tied up at the wharf in Le Havre, France, when an advance party of business associates, journalists, and officials rode out in a tugboat to greet him. From that moment, Edison was caught in a month-long whirlwind of ceremonies, celebrations, and attentions from the nation's leading lights.[1] Mina complained of "having so many men claim" her husband—and that was only the second day—but she went with him to the banquets, the receptions, the theater, and the new Eiffel Tower.[2] By the time they left Paris to visit Germany and England, Edison had been toasted, applauded, and serenaded. He departed as a prize-winning exhibitor at the Exposition, a commander of France's Legion of Honor, and a newly minted Italian count (and Mina a countess).

The Exposition was held to mark the centenary of the start of the French Revolution. Europe's crowned heads were disinclined to commemorate the overthrow of the Ancien Régime, and most of their nations declined to participate officially.[3] Edison, however was an emblematic citizen of a fellow republic. He was also a symbol of the material and technological progress of a democratic age, and France threw open its doors for an ecstatic welcome. Alfred Tate, to whom fell the task of controlling public access to Edison, relayed back home the common opinion in Paris "that nothing has ever Equalled the reception which has been given Mr Edison by representative bodies of the French nation."[4] Newspapers reported daily on his actions, exhausting their supplies of superlatives. He was, said *Le Figaro,* the "king of Paris." Extending this metaphor, the paper asked rhetorically, "Is there a majesty higher and more radiant than genius?"[5]

Edison's creative work was on full public view at the Exposition. He had assembled a retrospective of his career and shipped hundreds of machines and models of his inventions (at his expense) to Paris, where William Hammer set them up them throughout 9,000 square feet of the Palais des Machines, making Edison's the largest single exhibit at the Exposition.[6] The phonograph was a focal point. Between the main display in the Palais des Machines and two satellite locations, it attracted tens of thousands of curious listeners and onlookers each day. It also prompted Edison to commission scores of new musical recordings back at the laboratory.[7] Opinions about the phonograph exhibit were positive, though not unanimously so.[8] The complete Edison display was one of about fifty awarded the Exposition's highest prize.

Edison spent much of his time touring, eating, being feted, attending the theater, and visiting art galleries, but he also worked on business.[9] His presence in Paris, and that of Alfred Tate (who had preceded Edison across the Atlantic, going first to London and then to Paris), created opportunities for negotiations with agents of Jesse Seligman about combining the international phonograph rights with those of the rival graphophone. These talks partly accounted for the stream of postal and cable correspondence that Tate directed to Samuel Insull back home,[10] but they produced no concrete results. George Gouraud, Edison's foreign agent for the phonograph, also came over from London, where Tate had been quietly looking into his business affairs. Gouraud had not overcome Tate's skepticism about his ability to form new national companies to develop a global phonograph market. Edison, though, seemed reassured by seeing his longtime partner in Paris and resolved to stick by him rather than try (as Tate advocated) to nudge Gouraud toward failure in hopes of making better arrangements with someone else.[11] When he journeyed to Berlin, Edison was the guest of Werner von Siemens, the lion of German electrical manufacturing. The two men apparently came to some agreement about a matter left unresolved in the formation of Edison General Electric (EGE) the previous winter: a license to manufacture Siemens & Halske armored electrical cable in the United States for the immense American market. Despite this friendly visit, no formal arrangements were made before the end of 1889 about the proposed cable factory.[12]

Edison was away from home for two full months. On the eve of his departure, Insull reflected that "Everything goes on in a hum drum kind of a way, Mr. Edison giving little or no attention to experimental work."[13] In fact, Edison had plenty of work planned.[14] Some of it awaited his return, but the laboratory was organized and equipped to carry on without him—and it did so. The payroll remained steady through early August (at about $1,000 per week) before rising in September (to about $1,250 per week).[15] Some of that effort went toward constructing a new kinetoscope instrument and setting up a separate photographic studio for making motion pictures away from the vibrations of the laboratory. Other notable projects included Charles Batchelor's new body for the toy (talking doll) phonograph which, after months of false starts and delays, appeared ready for manufacturing; Batchelor's design work with Arthur Kennelly on a new motor, transmission, and electric distribution system for streetcars; a new phonograph for squeezing longer recordings onto each cylinder; ongoing experiments on recording wax; and an electric brake for railroad cars.[16] Manufacturing, too, continued apace. The new factory of the Edison Phonograph Works was turning out machines and cylinders, its output in fact far exceeding actual sales.[17] Batteries and wax were being made at the Phonograph Works[18] while new factory buildings at Silver Lake were being prepared to manufacture them on a large scale. Sometime before he left, Edison personally wrote out two drafts, totaling almost 90 pages, of instructions for recognizing and correcting dozens of problems with the phonograph. The Edison Phonograph Works incorporated his material into a printed "Inspector's Handbook of the Phonograph."[19]

During the summer, Edison had been making big long-term plans for manufacturing. For one thing, he aimed to produce phonographs for whatever global markets could be developed.[20] He was still acquiring nearby parcels of land where he intended to build a "factory Village." According to a draft proposal to a prospective investor (tantalizingly, still not identified), he planned to make chemicals, turn out duplicate phonograph recordings, and build giant iron-ore milling machines.[21] A few weeks before leaving New York for Paris, he was grubbing around iron mines in the vicinity of Bechtelsville, in southeastern Pennsylvania. Based on what he saw there, he vowed to his consulting engineer John Birkinbine that he would "waste no time on proving the benefits of the [separation] process to mine owners." He was instead "buying mines myself [and] have lately bought ½ doz[en]" that he planned to run in conjunction with his ore separation process.[22] Insull described Edison as "practically intoxicated" by the prospect.[23]

Edison and Mina's extended absence in Europe and Britain contributed to a reshuffling of their families for the summer. Mina's parents reportedly planned for Edison's two boys to stay at their Akron home, but Tom, Jr., and William ended up spending most of August on the Michigan farm of Edison's brother William, possibly because of the illness of one of Mina's sisters in Europe.[24] Daughter Madeleine, just over a year old, seems to have remained in Akron the whole time. Mina keenly missed the child, her first. One can only imagine how she felt upon learning from her mother that the baby called out "Mama Mama" in response to hearing Mina's recorded letter played on the phonograph.[25] Marion Edison, who had left Mina's sisters (with whom she did not get along) on the Continent to visit Great Britain with her chaperone Miss S. W. Brigham, returned to Paris to be with her father and stepmother. There she became friends with Mlle. Myria de Mayer, a girl or young woman who ended up returning with the Edisons to Glenmont with the understanding of bettering her English and Mina's French. Marion stayed abroad.[26]

In a season of unique events, one other stands out. Edison testified as an electrical expert at a 23 July hearing about the punishment handed down to convicted murderer William Kemmler, the first man sentenced under a New York law prescribing electrocution as the state's method of execution.[27]

1. The headnote accompanying Doc. 3392 provides an overview of Edison's reception in Paris as well as a detailed account of his activities there and on his subsequent travels through Germany and England.

2. Doc. 3394.

3. Swift 2008, 101.

4. Doc. 3402.

5. "Edison au Figaro," *Le Figaro,* 27 Aug. 1889, 1.

6. Hammer 1889a; Hammer 1889b, 1.

7. See Doc. 3397.

8. Writing from London before going to Paris himself, Alfred Tate reported that three prominent British industrialists (John Pender,

James Anderson, and Frederick Leyland) had heard the phonograph at the Exposition and pronounced it "very unsatisfactory." Tate to Samuel Insull, 22 July 1889, DF (*TAED* D8959ACP).

9. As Edison recalled years later, his visit to the Louvre formed (or confirmed) his low opinion of Old Masters paintings (see App. 1.B.44). While in Paris, he and Mina purchased a large canvas by contemporary American painter Abraham Archibald Anderson for $2,500. The oil painting, titled *Le matin apres le bal* (or *Morning After the Ball*) was displayed at the Salon and reportedly sold more photographic reproductions than any other work there. The Edisons had it mounted over the main stairway at Glenmont. Anderson later recalled serving as Edison's translator on numerous occasions during the Exposition and said that the inventor often visited his studio in search of quietude. Edison also posed for Anderson, and the resulting formal oil portrait of him with the phonograph (see frontispiece) is now at the Smithsonian Institution's National Portrait Gallery. Anderson 1933, 24–25, 31–34; Herron 1998, 1:41; Jonnes 2009, 222–23; "À Travers Paris," *Le Figaro,* 30 Aug. 1889, 1; Smithsonian object NPG.65.23.

10. See Docs. 3377, 3383, 3398, 3402, and 3409.

11. See Docs. 3406 and 3409.

12. See Docs. 3378, 3400, 3414, and 3418.

13. Doc. 3387.

14. See Doc. 3391.

15. Time Sheets, WOL.

16. See Docs. 3388, 3391, 3399, 3404, and 3417.

17. See Doc. 3387 esp. n. 11.

18. See Doc. 3399.

19. Edison drafts, n.d. [Aug. 1889?], DF (*TAED* D9899AAS2, D9899AAS3); Edison Phonograph Works, Aug. 1889, PPC (*TAED* CA025B).

20. Tate to Insull, 23 July 1889, DF (*TAED* D8959ACR).

21. Doc. 3389.

22. Doc. 3380.

23. Doc. 3387.

24. See Doc. 3419 n. 5.

25. Mary Valinda Miller to Mina Edison, 4 Sept. 1889, MFP (*TAED* X018D1AS1N).

26. One of de Mayer's parents gave Mina written approval for the daughter to join her in the U.S. for three months or more. According to Tate's much later recollection of this episode, she stayed for about a year. E. de Mayer to Mina Edison, n.d. [Sept. 1889], FR (*TAED* FT001AAC); Tate 1938, chap. 33.

27. See Doc. 3379 n. 2.

–3373–

To John Harjes

[Orange,] July 1, 1889.

My Dear Mr. Harjes,—[1]

I have been away so much lately that I have not before had an opportunity to reply to your very kind letter, under date May 8th, 1889,[2] and in addition to this I was not altogether sure that my business here would allow me to take a holiday in Europe. I find now that I can get away, and it is my present intention to sail about the 3rd of August. It will give me great pleasure to accept of your kind hospitality at any time convenient to yourself after the 18th of August next. The arrangements in regard to phonograph I will make when I get to Paris. I have a man there now taking records of the leading musical artists,[3] and he will have a good collection by the time I arrive. With kindest regards I am, yours very truly

Thos A Edison

TLS (letterpress copy), NjWOE, Lbk. 31:175 (*TAED* LB031175).

1. John Henry Harjes (1830–1914) headed the private international banking firm Drexel, Harjes & Co., the Paris affiliate of Drexel, Morgan & Co. The Bremen-born Harjes immigrated to Baltimore in 1849 and became a United States citizen in 1855. He and his brother established the Philadelphia investment banking firm of Harjes Brothers in 1853. Fifteen years later, Harjes joined with Anthony Drexel to form Drexel, Harjes & Co., of Philadelphia and Paris. Harjes immediately went to Paris to head the firm's operation there, becoming one of the most respected and influential Americans in the French capital. Harjes and his firm had longstanding ties with Edison over his telephone and electric lighting interests. Doc. 1846, n. 3; Johann Heinrich Harjes birth record, 5 Feb. 1830, *Germany, Select Births and Baptisms, 1558–1898,* online database accessed through Ancestry.com, 22 Jan. 2018; U.S. Dept. of State, n.d., roll M1372_ 610, Harjes passport application, 20 Oct. 1902; "J. H. Harjes Dies in France," 16 Feb. 1914, *NYT,* 7; Rottenberg 2001, 188.

2. The editors have not found this letter, which James Hood Wright forwarded to Edison. Edison also acknowledged to Wright that he had answered Harjes. TAE to Wright, 1 July 1889, Lbk. 31:174 (*TAED* LB031174).

3. That is, Adelbert Wangemann.

–3374–

From John Verity

[London,] July 5th '89

Private

Dear Mr Edison.

I was indeed glad to hear from your daughter the other day that you were really coming to England after all.[1]

Your presence will be a wonderful help to those who are trying to push forward the Electric Lighting industry, and will give a great impetus to our Metropolitan Elec: Supply Company.[2]

You will remember when I left America[3] I promised to do my utmost to get one of your three-wire stations laid down by our Company here, and Sir John Pender was very favourable to it. It was therefore a heavy blow to me to hear that Westinghouse has recently purchased from Hopkinson his three-wire patents for this country,[4] as this may prevent our Company having a direct association in this matter with yourself. I look forward, however, to your presence here as a means of clearing the air, and straightening out electric supply matters generally.

Sir John Pender, Sir James Anderson,[5] and other leading financial men who have been especially connected with Telegraphy will be very anxious to give you a good reception & welcome to the country,[6] and as soon as you arrive in London, I hope to have the pleasure of calling upon you, from them, with reference to it.

I should be very glad if you could find time to let me know the ship you will be going by, and about how long you and your wife will be staying in London, so that I may speak to Pender about it.[7]

Hoping you will have a pleasant voyage across & trusting that Mrs Edison is quite well, I am, Yours very sincerely

Jno. B. Verity.[8]

P.S. I don't think Col. Gouraud is looked upon very favourably by many in England just now and I am afraid you may hear some rather hard things said about him.[9]

<OK E[dison]>

LS, NjWOE, DF (*TAED* D8942AAB). Letterhead of 31 King St., Covent Garden, w.c.

1. Marion Edison seems to have visited Moorcroft, John Verity's home in Surrey, where he had recently used his isolated electric lighting plant to make a small public lighting demonstration. She told Mina that "The Veritys were more than kind to me while I was in London." Marion Edison to Mina Edison, n.d. [July 1889?], FR (*TAED* FB004AAF1); Doc. 2644 n. 10; "Weybridge," *Electrician* 23 (24 May 1889): 54.

2. Formed in 1887 as the South Metropolitan Electric Supply Co. and renamed in 1888, the firm aimed to build and operate electrical power systems in London, beginning with the parishes of Saint James, Westminster (Picadilly), and St. Martin-in-the-Fields. Its principals included submarine telegraph pioneers John Pender and James Anderson; Verity was also a founding director and John Hopkinson a consulting electrician. The company had not necessarily committed itself to a particular electrical system at this time but was clearly inclined towards alternating current (AC). Its prospectus from August 1888 referred to recent engineering advances leading to the feasibility of large-scale electric distribution at rates competitive with gas. Verity tactfully broke the news to Edison in early 1889 that local conditions

would lead the company to adopt high-voltage distribution and "The Westinghouse took the lead" for such a system. *Morning Post* (London), 3 Dec. 1887, 6; "Advertisements & Notices," *Belfast News-Letter,* 2 Aug. 1888, 4; Verity to TAE, 3 Jan. 1889, DF (*TAED* D8942AAA).

3. Verity arrived in New York aboard the *Etruria* on 28 January 1889 for a stay of undetermined length. While in the United States, he interviewed Edison for a London newspaper and investigated underground conductors. He may also have been negotiating the purchase of the British rights to Frank Sprague's electric motors. *Passenger Lists* 1958, microfilm M237_524, p. 12, line 510; "Mr. Edison and the Bacteria," *Pall Mall Gazette* (London), 11 Mar. 1889, 1; Verity 1889, 338; "Notes: Mr. F. J. Sprague," *Electrical Engineer* 3 (19 Apr. 1889): 307.

4. Electrical engineer and physicist John Hopkinson (1849–1898) was a consultant with the Edison Electric Light Co., Ltd., in 1882 when he designed a copper-saving "three-wire" distribution system similar to the one Edison developed at the same time. He also guided a scientific redesign of the dynamo, resulting in the Edison-Hopkinson dynamo. By 1888, Hopkinson was a consulting engineer for the Metropolitan Electric Supply Co. (Docs. 2180 n. 9, 2407 n. 4, 2419 [headnote]). The three-wire system substantially reduced the amount of copper in each circuit. Hopkinson reportedly sold his British patent rights to the Westinghouse company for $90,000 (Doc. 2424 [headnote]; "The Death of Dr. John Hopkinson," *Electrical World* 32 [3 Sept. 1898]: 243; R. Black 1983, 50–51; Arapostathis 2013, 153–54).

5. Sir James Anderson (1824–1893), knighted for his role in laying the first successful transatlantic telegraph cable, had been associated with John Pender in the Eastern Telegraph Co., which acquired foreign rights to Edison's automatic telegraph system in 1873. Anderson was a co-owner (with Pender and others) of the weekly *Electrician.* At some point before 22 July, he and Pender visited the Edison phonograph exhibit in Paris and deemed it, in Alfred Tate's words, "very unsatisfactory." Doc. 381 n. 4; Israel 1998, 84, 88; H. Wilkinson 1896, 180; "Official Returns of Electrical Companies," *Tel. J. and Elec. Rev.* 23 (10 Aug. 1888): 155; Obituary, *Electrician* 31 (12 May 1893): 38; Tate to Samuel Insull, 22 July 1889, DF (*TAED* D8959ACP).

6. Pender, having heard from Verity of Edison's planned trip to England, invited him (and Mina and Marion Edison) to Foot's Cray, his country home outside London. Edison declined the invitation just before leaving New York but did end up visiting Pender. Pender to TAE, 19 July 1889, DF (*TAED* D8905AEM); TAE to Pender, 30 July 1889, Lbk. 31:460 (*TAED* LB031460); see Doc. 3419.

7. Verity's schedule changed with his departure on 3 August for business in Minnesota and Manitoba. During that trip, he visited the new Edison central station in Philadelphia, and immediately on his return to London he cabled Edison: "Urgent you should come see Pender hope to get you central station order lost." Verity to TAE, 12 July and 20 Sept. 1889, both DF (*TAED* D8942AAC, D8942AAF).

8. John Benjamin Verity (1863–1905) was a principal in B. Verity and Sons, the Covent Garden lighting business founded by his grandfather around 1820. Verity had consulted with Edison and his surrogates in designing elaborate lighting fixtures (with novel swivel joints) for public

lighting demonstrations in London and had since moved his company into the isolated electric lighting business. Verity became a member of the Institution of Electrical Engineers in 1889. Doc. 2644 nn. 1, 2; Obituary, *Electrical Review* 56 (21 Apr. 1905): 659; Hammer 1904, 452.

9. Verity had disparaged George Gouraud's management of the phonograph in November 1888 and suggested putting together a new company combining the phonograph and graphophone interests in Britain. During his January 1889 visit, he seems to have raised the possibility again on behalf of prominent business leaders Sir George Elliot and Spencer Balfour. Verity to TAE, 6 Nov. 1888; Samuel Insull to Tate, n.d. [c. 1 July 1889]; both DF (*TAED* D8850ADZ, D8959AGT).

–3375–

Samuel Insull to Walter Mallory

[Orange,] July 6, 89.

Dear Sir:—

Referring to your favor of July 1st,[1] Mr. Edison desires me to state that the contact machine[2] is finished and will be tried on Monday. The other machine is coming along slowly.[3]

With reference to your second letter of same date,[4] Mr. Edison is still working on bricking the ore.[5] He desires me to inform you that the Swedish Government recently tried experiments to brick ore,[6] and failing to do so, made an experiment to find out how much fine ore could be used, with result that it was found that 70% could be utilized in an ordinary blast furnace, this amount being worked without the slightest difficulty. From this Mr. Edison gathers that the trouble of dealing with fine ore was an assumed one and had not any real foundation. Yours truly,

Saml Insull

TLS (letterpress copy), NjWOE, Lbk. 31:189 (*TAED* LB031189).

1. Mallory made a brief inquiry from Chicago about "what the prospects are for shipment of the new machine— Am anxious to get at work again" at the Humboldt, Mich., plant. Mallory to TAE, 1 July 1889, DF (*TAED* D8950AAJ).

2. The Edison ore separator at Humboldt was a "non-contact" design, a category of machine in which ore falling from a hopper would stream past the electromagnet without touching it. In a contact machine, the magnets touch the ore, either directly or through a thin conveyor belt (Davies 1894, 468). In a 12 May caveat (Doc. 3353), Edison first proposed using a contact machine to separate iron-bearing rocks prior to the fine crushing. Arthur Kennelly designed and tested windings of the radial electromagnet for this machine in July and September. The process required the magnets to be de-energized at regular intervals, and in early September Kennelly and Batchelor worked on designs to overcome sparking at the commutator used to interrupt the electrical circuit. In a journal entry of 22 October, Batchelor described alternative

designs for a contact separator for Mallory's ores. Edison and William K. L. Dickson filed a patent application embracing two types of contact separators in January 1890. Kennelly Notebooks #1:163 and #2:21, 42–45, both Lab. (*TAED* NM023161 [image 171], NM024044); Cat. 1337:69 (item 581, 5 Sept. 1889), Batchelor (*TAED* MBJ004069B); U.S. Pat. 434,588.

3. Edison proposed using water separators in connection with gold ores in a 3 February 1889 caveat and included designs for such machines in draft caveats of 12 and 20 May 1889 (Docs. 3353 and 3358). The device under construction is what Edison designated (in Doc. 3391) the "Water Seperating Iron Ore Machine" and which was entered in laboratory accounts as the "Water Contact Ore Milling Machine." The prototype was finally completed by the beginning of October and tested by Arthur Kennelly. Subsequent tests by Batchelor and Mallory suggested serious drawbacks to the use of water, which was used to help disperse magnetic particles from the finely crushed rock. The particles were drawn out of the water by a revolving magnet wheel and then released by the action of a make-and-break switch that de-energized each pole in sequence (see note 2). Mallory found that the switch mechanism did not work well and that the water caused electrical problems. He foresaw more trouble from using water in the frigid Lake Superior region. Caveat 114, PS (*TAED* PT031AAE); Ledger #5:532, WOL (*TAED* NL011A1 [image 189]); Kennelly to Batchelor, 1 Oct. 1889, DF (*TAED* D8968AAO); U.S. Pat. 430,280; Cat. 1337:81, 83 (items 596, 598; 13 and 19 Oct. 1889), both Batchelor (*TAED* MBJ004081, MBJ004083); Mallory to Ira Miller, 21 and 23 Oct. 1889, Mallory Letterbook LM-261:39, Mallory (*TAED* MD002039, MD002065).

4. Mallory asked about Edison's progress toward "lumping the ore." Noting a predisposition of "the Chicago blast furnace men…against the very fine ore," he thought it important to "cater to them until we get it introduced—& then I believe that in a short time they will be glad to get it fine—this is what we want—as there is more bessemer ore used in Chicago than any other city in the United States." Mallory to TAE, 1 July 1889, DF (*TAED* D8950AAK).

5. Edison worked intermittently to aggregate fine ore (see Doc. 3451) and filed a number of successful patent applications over the next decade, but historian W. Bernard Carlson contends that Edison never fully understood how the design of most blast furnaces (particularly the "bosh angle"; see Doc. 3358 n. 34) ill-suited them to fine concentrated ores. Carlson 1983, 49.

6. These appear to have been experiments by Gustaf Granstrom at Norberg, Sweden. According to one report, the test briquettes "all went to pieces" in the furnace. Granstrom made further experiments without bricking the fine ores and concluded that "the manufacture of briquettes was entirely unnecessary." Cook 1889, 605.

Paris July 14th *18*89.[a]

From Adelbert Wangemann

Dear Sir,

On my arrival here I found as Expected the phonograph running scratchy, some records fair & ~~some~~ all the[b] talking with either to deep or to light a cut or faulty setting off Knife.[c] I have worked daily from 9 o'cl to 11 o'cl P.M. in the Exhibition helping partly Mr Hammer & instructing the boys on all points & making records & showing the Phon to important & prominent people visiting the Gallerie des Machines. Mr Hammer having been ill with fever, I had to take right hold in the Exposition. The Phonograph now is run what I consider to your satisfaction. Few days after my arrival the jury of the Phonograph class[1] came & I arrived just in time to show off the phon. well to them—[d] We expect the jury again next week, when they will come in parties from 2 & 3 at a time, as the president of the jury[2] told me to get points for[e] the proper report. Mr Abdank[3] (the american juror) told me privately you would have the gold medal on the phon without doubt—on the other Exhibit Mr Hammer spoke to the jury. The graphophone have here 8 instruments of which 4 are in running order. I refrained from commenting on the graphophone here to the jury (although ~~they~~ some[f] wanted me too.) I gave only few facts, as for instance: speed of <u>foottreadle phon & graphophon</u> could not be as perfect as the ingenious motor & governor of Phon would give.— That the Phon recorded perfect out of the various reasons[f] But the best was the fact stated, (as Known to most every juror) that the graphophone was recorded in the [~~pac~~?][g] presence of 2 or 3 people who listened to it <u>one</u> at a time which record would not be[f] shown thereafter, while your Phon was heard by 7 people at a time & reproduced to hundreds & thousands of people as they could see outside—[h] for a test I run one piano cylinder from Monday morning till Friday afternoon daily when it commenced to show[e] signs of wear. Then ~~we got~~ I reproduced[i] for a well Known[j] painter here a cylinder from ~~c~~Cincinati Ohio absolutely perfect, all the Emotion of the old fathers voice in speaking & singing were there!— The same persons graphophon cylinders could not be reproduced <u>at all</u>! I naturely gave with the painters allowance his adress to the jury.— Outside of that I called there attention to the comparisson of the whisp~~b~~er, the ordinary voice & the loud voice in the Phon & the graphophone.—but Music took them—

The president remarked before going[k] in french, that the

Phonograph had been represented to him as similar to the graphophone, but he were astounded to find an instrument so[f] close on perfection & outdoing the most Keenest demands of the most scientific for recording any noise whatsoever.—

I have been taking some french[f] brass bands around the Exhibition grounds which draws crowds every time. I also took the american concert in the Trocadero.[4]

I have ~~a~~ one[f] large room at Pleyel Wolff & Co[5] the largest piano factory here & another at "Erasto"[6] free of charge in which I shall take records for the Exhibition & for the Laboratory for duplicating in probably one week.— At present I think it better for your interest to stay right in the Exhibition until the graphophon is Knocked out.—

On the presidents[7] visit to the American section industrielle I had from the top of pavillon shouting phonographs, one vive le president Carnot vive la Republique vive la France The other cornet with the Marseillaise It was heard 3 to 400 feet away while the president inspected the American section & no waving of the American commission or the graphophone people could stop that Phon. Especially not[f] while he was listening to the graphophone.

Machinery Hall is too noisy to take good records & not as good as it ought to be for Exhibiting. We have string after string of people (about 15 000 a day in one place[l]) in a few words: the general opinion Expressed freely is: However great the Exhibition is, the only two most marvellous things here are the Tour Eiffel[8] and the Phonograph.— The newspapers state as per inclosed[9] the Ch. S. Tainter graphophone is nothing compared with~~e~~ the E. perfected Phonograph.—

Shipments per Baldwin Express[10m] arrive here in 3–4 weeks the Wells, Fargo Co.[11] guarranties them in 12 to 14 days.—

AL, NjWOE, DF (*TAED* D8946ABT). Paris Exposition letterhead of Thomas A. Edison. [a]"*Paris*" and "*18*" preprinted. [b]"all the" interlined above. [c]"or faulty setting off Knife." interlined above. [d]"to them—" interlined above. [e]Obscured overwritten text. [f]Interlined above. [g]Canceled. [h]"as they could see outside" interlined above. [i]"I reproduced" interlined above. [j]"well known" interlined above. [k]"before going" interlined above. [l]"in one place" interlined above. [m]"per Baldwin Express" interlined above.

1. Edison's exhibit, including the phonograph, was entered with electrical equipment in Class 62 (Group VI). U.S. Commissioners 1890–91, 1:202, 259, 349, 424.

2. Distinguished French hydraulic engineer Alfred Picard (1844–1913) served as president of the jury for Class 62. The panel consisted

of twenty members from five countries, thirteen of whom were French. U.S. Commissioners 1890, 1:83, 96; Hager 2009, s.v. "Picard A."

3. Bruno Abdank-Abakanowicz (1852–1900), usually referred to as Abdank, was a Lithuanian-born mathematician, inventor, and electrical engineer who moved to Paris in 1881. Delegated by the French government to visit the United States to encourage the country to enter the 1889 Exposition, he ended up being named a U.S. juror assigned to Class 62. "Nécrologie," *L'Industrie Électrique* 9 (10 Sept. 1900): 575–76.

4. Built for the Exhibition of 1878, the Trocadéro Palace overlooked the present Exposition site across the Seine. Described by a Charles Dickens guidebook as "a large and peculiar-shaped building," the Trocadéro included a vast auditorium that hosted frequent concerts; during the Exposition, a series of programs featured the music of different nations. The American program, given on 12 July, presented recent works of American art music performed by a Parisian orchestra and American soloists under an American conductor. Bomberger 2002, chap. 5; Dickens, Jr. 1883, s.v. "Trocadéro, Le."

5. Pleyel Wolff & Co. was a Paris manufacturer of pianofortes established in 1808. J. Brown 1886, s.v. "Pleyel Wolff, & Co."

6. Not identified.

7. Marie François Sadi Carnot (1837–1894) was a trained engineer who entered public life and served as president of France's Third Republic from 1887 until he was assassinated in 1894. *Ency. Brit. online,* s.v. "Marie-François-Sadi Carnot."

8. The unique iron structure on the Champ de Mars, formally called the Tour en Fer de Trois Cents Mètres, was popularly named after engineer Gustave Eiffel, whose company designed and built it (1887–1889) as the intended centerpiece of the Exposition. Jonnes, 2009, 3–6, 81–84.

9. Enclosures not found.

10. Baldwin Bros. & Co., a major transatlantic shipping agency, seems to have overlapped closely with Austin Baldwin & Co., another maritime import and freight service with which it shared New York offices. Doc. 1204 n. 2; Weiss 1920, 348–49; New York Produce Exchange 1893, 313; Trow City Directory 1890, 21.

11. Founded in 1852 to offer freight and banking services to California, Wells Fargo & Co. had by this time greatly expanded its shipping routes to serve Europe and Asia. Hungerford 1949, 6–7.

–3377–

Alfred Tate to Samuel Insull[1]

London, July 12th [15], 1889.[2]

Moriarty,[3] representing Seligman,[4] negotiating for three weeks with Gouraud. Tried first to buy his interest. He refused absolutely to consider any proposition except sale of both his and T. A. Edison's. Seligman offered two hundred thousand dollars for these. Gouraud said he would refuse as many pounds. Seligman owns foreign Graphone. Seligman is trying to find Gouraud's price, and told him Insull named six hundred thousand dollars as asking price for combined interests of Gouraud and T. A. Edison.[5] Seligman threatens immediate litigation, saying best experts advise T. A. Edison patents weak and Tomlinson has given same advise as inside information. Seligman states have perfected plans to prevent Gouraud bringing out any company in Europe. I have listened and said nothing. Expect further developments to-morrow.[6]

Tate.

TD (decoded telegram), NjWOE, DF (*TAED* D8959ACD).

1. The editors have inferred the recipient of this message based on its contents and authorship. The telegram is among the first of about a dozen known to have been transmitted (some encrypted) between Insull and Tate in the ten days following Tate's arrival in London on 9 or 10 July; postal correspondence between them alludes to other cables not found by the editors. Decoded versions of some of the messages, like this document, were typed in a similar format on five looseleaf sheets. Much of this communication concerned efforts by Jesse Seligman and his associates to purchase the phonograph rights of Edison and George Gouraud. Tate cables to Insull, 15 (two), 17, and 18 (three) July 1889; Insull cables to Tate, 16 (two), 17 (three), and 19 July 1889; all DF (*TAED* D8959ACC, D8959ACD, D8959ACJ, D8959ACK, D8959ACL, D8964ACJ, D8959ACF, D8959ACF1, D8959ACG, D8959ACH, D8959ACI, D8964ACK); the original encrypted cables are in Edison, T. A.—Secretary—Tate, Alfred Ord, D-89-20, DF, NjWOE.

2. This document is a photocopy of a decoded version, typed at Edison's office, of the original encrypted cable. The original telegram was dated 15 July. D-89-20, DF, NjWOE.

3. Stephen F. Moriarty (1856–1907), a Boston native and son of Irish immigrants, studied law in the office of former Massachusetts governor William Gaston. He was in New York City by the early 1880s, where he partnered in a brokerage business with Jesse Grant, son of the late president Ulysses S. Grant. Moriarty became involved with electric lighting enterprises and, with his brother John, tried to secure the New England rights for the Linotype machine in early 1889. How he came to the graphophone business is unclear, but at the beginning of 1889 he was moving among Republican capitalists such as Jesse Seligman and Thomas Cochran. *Massachusetts Town and Vital Records, 1620–1988,* on-line database accessed through Ancestry.com, 20 Apr. 2017; Martland 2013, 62 n. 7; "Penniless Mr. Moriarty," *NYT,* 23 May 1884, 8; "Stephen F. Moriarty's Meagre Assets," *New York Tribune,* 23 May 1884, 5; *Boston Directory* 1878–79, 634, 364; "New England Notes," *Electrical World* 9 (16 Aug. 1887): 196; "Quay and Platt Confer," *Philadelphia Inquirer,* 4 Jan. 1889, 1; Mergenthaler Printing Co. to F. H. Howes, 24 Apr. 1889; Gouraud to TAE, 20 July 1889; both DF (*TAED* D8920AAM, D8959ACN).

4. Jesse Seligman (1827–1894) spent much of his working life with J. & W. Seligman & Co., the New York-based international bank that emerged after the Civil War from the Seligman family's mercantile interests. Seligman was born in Bavaria, came to the United States in 1841, and became head of the New York house in 1880. He and his family had long connections with Edison, notably concerning an

improved stock printer and the railway telegraph (*ANB,* s.v. "Seligman, Jesse"; *NCAB* 4:226; *Jewish Ency.,* s.v. "Seligman"; see Docs. 2753 n. 9, 2784, 2865, 2890 n. 3). J. & W. Seligman & Co. was located at 15 Broad St. in the Mills Building (Muir and White 1964, 88; Doc. 2318 n. 2).

Seligman was trying to consolidate foreign patent rights on the phonograph and graphophone, though the editors have not learned how he was drawn into sound recording or the extent of his interests at this time. Years later, Tate recalled Edison contacting Seligman about the phonograph in 1888 and, after a meeting in New York, hosting him and colleagues for a demonstration at the laboratory that, in Tate's telling, did not go well. At Seligman's request, he and Edison met in April 1889 in New York, after which Edison designated Insull to represent him in negotiations with the Seligman bank. Tate 1938, 152–53; Seligman to TAE, 13 Apr. 1889, DF (*TAED* D8901AAH); Tate to Seligman, 16 and 26 Apr. 1889; TAE to J. & W. Seligman & Co., 29 Apr. 1889; Lbk. 29:128, 250, 258A (*TAED* LB029128, LB029250, LB029258A).

5. Cf. Doc. 3381.

6. Tate elaborated on these events in a long letter the following day. In his account, the Seligman-Moriarty strategy included trying to sever Gouraud's interests from Edison's by raising doubts about the value of the patents and Edison's ability to compete on price with the graphophone, as well as about the willingness of Insull and Tate to work with him in good faith. According to Tate, Gouraud concluded that a battle over patent priority might be won in court but would raise doubts about the phonograph in the public eye and possibly thwart his hope of forming a stock company. Tate to Insull, 16 and 20 [pp. 27–28] July 1889, both DF (*TAED* D8959ACE, D8959ACO).

–3378–

To Henry Villard

[Orange,] July 17, 1889.

Dear Sir:—

Referring to your verbal request for my opinion as to making a contract with the house of Siemens & Halske, I beg to state that I am in favor of an arrangement being made, whereby close business relations would be established between the General Company and that firm.[1] I think it would be desirable to obtain from Siemens & Halske a complete plant for the manufacture of underground cables of telegraph, telephone and electric lighting service (except such portions of the plant as can be manufactured in our own establishments to better advantage),[2] on the general basis set forth in the draft contract which you sent me, providing that the contract allows the General Company to use its own electric tube system and the factory which they now have in such cases as the technical authorities of our Company may deem necessary. I see no objection to our using the Siemens cable system instead of our own, with the exception of the reservation above made, and I am confident that the General Company could work up a large and profitable outside business in Siemens cables in a comparatively short space of time. Yours very truly,

Thos A Edison

TLS (letterpress copy), NjWOE, Lbk. 31:314 (*TAED* LB031314).

1. Cooperation with Siemens & Halske was one of the benefits of the Edison General Electric (EGE) consolidation promised to its shareholders, and negotiations with the Berlin firm had been underway for months (Edison General Electric circular letter to stockholders, 26 Apr. 1889, DF [*TAED* D8938AAN]). The initial expectation was that Villard would personally make an agreement with Siemens & Halske. A detailed contract was drafted that would have foreclosed Siemens & Halske's intention to build its own cable factory in the United States; Edison promised to build such a factory himself under license and to rely solely upon it to supply cable for electric lighting and railway purposes. In March 1889, however, the EGE board decided that the company itself—rather than Villard—should be party to the contract, though the early draft with Villard was the starting point for subsequent drafts between the two firms (of which there are several in Villard's papers, including an undated typed agreement with questions and annotations attributed to Sherburne Eaton [Box 77, Folder 531, Villard]; other correspondence related to details of the proposed contract with Villard is in Box 78, Folder 552, Villard). In June, Siemens & Halske furnished a detailed estimate for constructing and outfitting a factory with the capacity to produce a mile of heavy three-conductor cable per day; the expected cost was $300,000 (Villard draft agreement with Siemens & Halske, n.d., Box 77, Folder 535, Villard; EGE board resolution, 12 Mar. 1889; Siemens & Halske estimate, 15 June 1889, both Box 77, Folder 534, Villard; see Doc. 3400 n. 19).

2. Edison signed an amended letter to Villard the next day. It was identical to this one except that the remainder of this sentence was replaced by the phrase: "and give the cable a fair trial, having the right to use the cable thereafter so far as the conditions of our business may make it desirable for us to do so." TAE to Villard, 18 July 1889, Lbk. 31:335 (*TAED* LB031335).

–3379–

Harold Brown to Samuel Insull

New York, July 17, *18*89.[a]

Dear Sir,

The Attorney General[1] wishes me to ask you to communicate with Mr. Edison and Mr. Kennelly to ascertain whether they will not be willing to appear before the referee on the Kemmler case for the State,[2] and state whether in their opinion the apparatus supplied to the State[3] for electrical executions can be so applied as to produce certain and painless death. There has been so much absurdity in the testimony of Mr. Westinghouse's witnesses, that Mr. Edison could dispose of by a word. If necessary the commission could come to him instead of the reverse. Mr. Johnson thinks this important. Will you kindly communicate with Mr. Edison and let me know at 45 & 47 Wall St.[4] Yours Truly,

Harold P. Brown.

ALS, NjWOE, DF (*TAED* D8933ABF). Letterhead of Edison General Electric Co. [a]"*New York,*" and "*18*" preprinted.

1. Charles F. Tabor (1841–1915) served as attorney general for New York State from 1888 to 1891. The Michigan-born Tabor moved with his parents to Erie County, N.Y., at age two. He studied law in the office of the Buffalo law firm Humphrey & Parsons and passed the bar in 1863. As attorney general he broke up the Sugar Trust in New York. He also obtained a decision from the U.S. Supreme Court affirming the constitutionality of the state's electrocution law. White 1898, 2:12; "Former Attorney General of State Who Died Today," *Buffalo Evening News,* 3 Mar. 1915, 1; U.S. Census Bureau 1982? (1900), roll 1031, p. 9 (enumeration district 199, Buffalo 24, Erie, N.Y.); Brandon 1999, 130.

2. Convicted murderer William Kemmler, condemned to death by electrocution under New York's new law, appealed his sentence on the ground that the untried punishment was unconstitutionally cruel and unusual. Referee Tracy Becker began taking expert testimony on 9 July in the Manhattan office of Kemmler's attorney, Bourke Cockran. A central question was whether electricity could reliably be counted on to kill a human quickly and, if so, under what circumstances (Essig 2003, 173–89). Edison and Arthur Kennelly each appeared on 23 July, testifying in part about the measurements Kennelly made, starting on 19 July, of the electrical resistance of 39 Edison laboratory employees and 220 phonograph factory workers, particularly the conditions affecting the passage of current through their bodies (Edison's testimony, pp. 623–27, 636–43; Kennelly's testimony, pp. 655–66; both *Kemmler v. Durston,* Lit. (*TAED* QE003A0623, QE003A0655); Kennelly notebook #1:156, 161, Lab. (*TAED* NM023156, NM023161); "The Kemmler Electrical Execution Investigation," *Electrical World* 14 [3 Aug. 1889]: 76). Kennelly was also asked about his 1888 tests on live animals (see Docs. 3224 [headnote] and 3292).

3. Cf. Doc. 3337. Brown reportedly purchased for New York State three Westinghouse 1,000-volt alternating current (AC) dynamos. His choice of manufacturers was informed, he wrote in a polemical pamphlet, "by the fact that twelve to fifteen men had been accidentally killed by this company's current" and by other companies' admissions of the lethality of AC. One machine was to be installed in each of the three state prisons where executions were to take place—Auburn, Clinton, and Sing Sing—though one was temporarily sent to John Hopkins University for efficiency tests. The machines together cost $8,160, less than the state's appropriation of $10,000, though each prison also had to be provided with an oak "electric chair," an electrical cap and shoes, and other equipment including exciters, various meters, resistance coils, and 4,000 feet of insulated wire. "Electrical Executions," *NYT,* 8 May 1889, 4; Brown 1889c, v; "Death by Electricity" and "Contractor Brown's Machines," both *St. Louis Post-Dispatch,* 23 May 1889, 8.

4. Brown had recently relocated his electrical engineering consulting practice to this address. Letterhead, Brown to TAE, 17 Mar. and n.d. [May?] 1889, both DF (*TAED* D8933AAX, D8933AAZ).

–3380–

Draft to John Birkinbine

[Orange, c. July 18, 1889][1]

Birkinbine

I have firmly resolved to waste no time on proving the benefits of the process to mine owners I am buying mines myself have lately bought ½ doz & propose putting up mills myself[2] Someday they will come & trade with me without any parleying[3]

E[dison]

ADfS, NjWOE, DF (*TAED* D8949ABK1).

1. Edison wrote this draft on a letter from Birkinbine dated 13 July. He was in Bechtelsville, Pa., from 8 to 17 July, according to news reports, and could not have responded until he returned to Orange. Birkinbine to TAE, 13 July 1889, DF (*TAED* D8949ABK); "Edison's Machine for Preparing Ore," *New York Tribune,* 14 July 1889, 1; "Edison's Ore Plant," *St. Louis Republic,* 18 July 1889, 2; "Edison's Scheme a Success," *Pittsburgh Dispatch,* 18 July 1889, 5.

2. See Doc. 3309 (headnote).

3. Birkinbine raised two subjects in his 13 July letter (see note 1). The first was a Maryland property with magnetite ore that he thought might be suited to concentration by Edison's separator. The other was his conversation with Jesse Boyd, manager of the Cornwall Ore Banks Co. near Lebanon, Pa. Boyd was "rather skeptical" about the value of magnetic concentration but Birkinbine persuaded him to submit forty to fifty tons of ore and witness a demonstration at Edison's plant in Bechtelsville, Pa. Lesley and D'Invilliers 1886, 491–92, 555.

–3381–

Samuel Insull to Alfred Tate

Orange, N.J. June [July] 18, 1889.[1a]

My Dear Tate,—

You will get a confirmation of the various cablegrams[2] which have passed between us from my Dey St. Office.[3] It is, therefore, unnecessary for me to confirm them again in this letter.

With reference to Connery[4] and the Mexican Company,[5] I enclose herewith some copies of letters which we have received from Mr. Connery, and on these letters Mr. Edison extended Mr. Connery's option for two months. I wired you last night to this effect and asked you to get Mr. Gouraud's confirmation of the matter.[6]

I also enclose herewith letter from Glass, with relation to some territory which he has been in communication with Gouraud about. I have written Glass, stating that I have forwarded his letter to you, with the request that you see Mr. Gouraud and cable me the reply.[7] I will advise Glass by wire as soon as I get your telegram.

Referring to the Seligman matter, you surely remember seeing Jessie Seligman with me on the day of the Naval Parade.[8] You will also, I am sure, remember me absolutely refusing to make an offer for the phonograph as coming from Mr. Edison. I told Mr. Seligman that he would have to deal with Gouraud first, and when Mr. Seligman pressed me for a figure at which his Syndicate[9] could purchase Mr. Edison's interest in Gouraud contracts, I told him that it was useless to try to deal with Mr. Edison until he had dealt with Mr. Gouraud. You will probably recollect that finally I named seven hundred and fifty thousand dollars for Mr. Edison's interest, plus manufacture, and the contract to provide for certain limitations so far as the use of Mr. Edison's name is concerned.[10] This was named entirely upon my own responsibility. In doing so you will recollect that I refused absolutely to involve Mr. Edison.

Under these circumstances, Mr. Moriarty might almost be complimented in the same manner in which the illustrious O'Connell[11] complimented Mr. Disraeli,[12] when he politely referred to that gentleman's connection with one of the participants in the little crucification affair that occurred about eighteen hundred years ago.[13] I would like you to have been present at the interview that occurred right after the receipt of the first telegram, detailing what Moriarty was doing.[14] It so happened that prior to your telegram getting here, the Seligmans had sent for me, and when I went to their office I had the advantage of the information which you had sent. Of course Seligman disclaimed all responsibility for Mr. Moriarty's threats, and I told them that it was nonsense to talk about any such figure as $200,000 for Mr. Edison and Mr. Gouraud's interest.[15]

Directly I finish dictating this letter I am going to see the Seligmans again, and answering bluff with bluff, I am to tell them, on behalf of Mr. Edison, that they can either deal with Mr. Gouraud or else go ahead with their own business, and we will go ahead with ours.[16]

While the Seligmans' position may be very strong financially—and is undoubtedly very strong financially—they realize the great importance of Mr. Edison's name, to enable them to successfully launch Companies in Europe. You will remember that at the conversation at the Phonograph Works, on the Saturday before you left, I intimated that the Seligmans could probably frustrate our efforts to establish Companies if they so desired. The clannishness of the Jew bankers of Europe is proverbial.[17] On the other hand, you should also remember that people whose influence may be very great to do us harm, may not be equally as great in preventing us from doing them harm. The scaring of investors is a role which we are just as capable of filling as Seligman Brothers and their Jewish friends.[18] Nobody realizes this better than Mr. Gouraud, I am sure.

We are particularly anxious to hear from you as to Mr. Gouraud's 'other connections.'[19] My own opinion is that he has none, and that the letter which he wrote out here, and on which you really went to London,[20] was written in consequence of the overtures made by the Seligman people or their representatives.

We have a letter from Gouraud which says: "I now give you firm order for 1,000 machines."[21] Nothing is said whatever about payment, and we wired you in consequence, asking you to arrange a credit here in New York, so we can get our money on presentation of invoices and bills of lading. I hope to hear from you on this subject within a day or two.

Tomlinson, Gilliland and Toppan[22] sailed for Europe last Saturday. I have no definite information as to the cause of their visit to London, but I have always believed that Seligman originally went into the Graphophone business at the solicitation of Tomlinson. You may remember my suggesting such a thing last May. I have absolutely no evidence that this is a fact, but I consider that these three gentlemen will be worth watching. Gilliland used to stay at the Langham.[23] Anyway you can find out a good deal about their movements I am sure at the American Exchange in London.[24] If you want any assistance in finding out what these gentlemen are doing, my father will very gladly help you in watching their movements.

We have got a great deal of correspondence here from Gouraud.[25] There is nothing in it of very great consequence, and in view of the fact that you are in London and fully posted as to what we want, I think that I will allow the enemy to answer the letters, and simply put them on file. Anyway we don't want to have any communication with Gouraud, except through you, and if we answer his letters, it will end in our getting a great deal of correspondence from him, about which you will know nothing.

There is nothing particularly new to write you about so as general business is concerned. The Phonograph Works is running along pretty well, and I think that by the time Mr. Edison gets back from Europe, we will be able to show him a pretty good balance sheet.

I enclose you herewith extracts from some letters, which indicate that the phonograph is rapidly forging ahead of the graphophone.[26]

Mr. Edison has been away for a week in Pennsylvania and returned last Sunday. If all he says and all Livor[27] says, turns out so, the iron concentrating business will be a tremendous bonanza, and I shall retire to the solitude of a country seat in the South of England upon the income which I will get from my interest in the New Jersey and Pennsylvania Concentrating Works.

I hope before you get this letter you will have seen some of the people I gave you introduction to and will have posted us as to the general state of affairs of phonograph matters, and the exact negotiations which Mr. Gouraud has in hand. Yours very Sincerely[b]

Saml Insull

TLS, NjWOE, DF (*TAED* D8959ACM1). Letterhead of Edison laboratory; letterpress copy in Lbk. 31:337 (*TAED* LB031337). [a]"*Orange, N.J.*" preprinted. [b]Closing handwritten by Insull.

1. The typist mistakenly dated this letter as 18 June, an error that was corrected by hand on the letterpress copy.

2. See Doc. 3377 n. 2.

3. Insull often worked from the New York office of the Edison Machine Works at 19 Dey St., also home to other Edison businesses and the former Edison Phonograph Co.

4. A New Yorker of Irish origin, Thomas Bernard Connery (1838–1923) graduated from Columbia College Law School but never practiced. He distinguished himself instead as a journalist and editor at the *New York Herald* from 1864 to 1884, most of that time as managing editor. After a brief turn as editor of the *New York Truth,* he courted a career in diplomatic service. He was nominated as secretary to the U.S. legation to Mexico in January 1887 and served in Vera Cruz until the end of Grover Cleveland's first administration in 1889 (*NCAB* 3:528; "Thomas B. Connery, Journalist," *Washington Post,* 11 Feb 1923, 3; "Mr. Connery For Turkey," *NYT,* 14 Dec. 1886, 1; "Executive Nominations," *NYT,* 26 Jan. 1887, 3). Connery had been acquainted with Edison for years and had sold him property in Washington, D.C., in 1884 and invested in the Edison Ore Milling Co. (Docs. 1969 n. 3 and 3061 n. 3; Fitch, Fox, and Brown to TAE, 25 Aug. 1884, DF [*TAED* D8403ZFX]). With Edison's backing, Connery obtained from Gouraud

in late 1888 a conditional phonograph franchise in Mexico. The terms, not altogether to Connery's liking, were amended in October 1889, notably to cut by half the number of machines he was obligated to buy (see Docs. 3241 and 3297; TAE to Gouraud, 30 Aug. 1888, Lbk. 26:294 [*TAED* LB026294]; Tate to TAE, 2 Oct. 1888; Tate to Dyer & Seely, 6 Oct. 1888; both DF [*TAED* D8818AUI, D8818AUO]; TAE agreement with Connery and Gouraud, c. 17 Nov. 1888; TAE power of attorney to Connery, 3 Jan. 1889; both Miller [*TAED* HM89ABC, HM89AAA]; TAE agreement with Connery and Gouraud, 5 Oct. 1889, Misc. Legal [*TAED* HX89053]).

5. Merchant banker Juan Manuel Ceballos of J. M. Ceballos & Co. in New York had recently taken an interest in establishing the Mexican company with Connery. Edwin Fox to TAE, 12 July 1889, DF (*TAED* D8961AAC).

6. Connery wrote on 12 and 16 July; the editors have not found the telegram to which he referred. Edison approved the extension on the likelihood of Connery and Ceballos forming a "strong Co. with monopoly franchise." Insull instructed Tate to get approval of the extension from Gouraud, whose assent was relayed to Connery a few days later. Connery to TAE, 12 and 16 July 1889, DF (*TAED* D8961AAD, D8961AAG); Insull to Tate, 16 and 17 July 1889, both DF (*TAED* D8959ACF, D8959ACI); TAE to Connery, 20 July 1889, Lbk. 31:347 (*TAED* LB031347).

7. The editors have not found the letter from Louis Glass, evidently addressed to Tate on 11 July. Insull advised him on 18 July of having sent it to London (Insull to Glass, 18 July 1889, Lbk. [*TAED* LB031323]). Glass had applied directly to Gouraud in February for phonograph rights in Central America and the Sandwich Islands, which he planned to commercialize with partners. With Gouraud having made no answer, Tate again brought the request to his attention in April with his strong endorsement (Glass to Tate, 2 Apr. 1889, DF [*TAED* D8958AAA3]; Tate to Gouraud, 11 Apr. 1889, Lbk. 29:63 [*TAED* LB029063]).

8. That is, 29 April, when a naval parade in New York Harbor kicked off the city's three-day centennial celebration of George Washington's first inauguration. Edison made Insull his representative for dealing with the Seligmans on that day. *AACR* [1889], s.v. "New York City"; TAE to J. & W. Seligman & Co., 29 Apr.1889, Lbk. 29:258A (*TAED* LB029258A).

9. Probably the capitalists led by attorney Thomas Cochran who reportedly paid $500,000 for graphophone rights outside the U.S. and Canada. The group began to outfit a factory in Hartford, Conn., in July for making graphophones and phonographs, and incorporated as the International Graphophone Co. on 26 August in New York City. "A Graphophone Syndicate," *NYT,* 17 May 1889, 2; "The Phonograph-Graphophone: The New Work at Colt's," *Hartford Courant,* 23 July 1889, 1; "The Telephone," *Electrical World* 14 (7 Sept. 1889): 175.

10. Cf. Doc. 3377.

11. Daniel O'Connell (1775–1847) was an Irish patriot, orator, and statesman. Widely known as "The Liberator" or "The Emancipator," his election to Parliament in 1828 helped to force reforms that allowed Catholics to hold many public and elected offices yet effectively suppressed the voting franchise of most Irish by raising the freeholders'

qualification. In addition to Irish independence, O'Connell notably supported the abolition of slavery, the separation of church and state, and the emancipation of Jews. Rodriguez 2007, s.v. "O'Connell, Daniel"; *Oxford DNB,* s.v. "O'Connell, Daniel."

12. Novelist and statesman Benjamin Disraeli (1804–1881) was twice the prime minister of Great Britain (1868, 1874–80) and the architect of its modern conservative party. A convert to Christianity whose Jewish origins were a magnet for antisemitism throughout his career, Disraeli displayed his own anti-Catholic prejudices, notably in disparaging remarks about Daniel O'Connell in 1835. *Oxford DNB,* s.v. "Disraeli, Benjamin, Earl of Beaconsfield"; Wohl 1995, 375–80.

13. Speaking of Disraeli in 1835, O'Connell had infamously associated him with Gestas, the impenitent thief crucified with Christ in New Testament accounts. Insull's remark implicitly drew upon a "good Jew/bad Jew" dichotomy, a convention that would later appear in the rhetoric of an older Edison. *Cassell's* [1879?] 7:258, 260; Mitchell 1998, 23–24; Meyer 1989, 35; Shands 1928, 84–87; Israel 1998, 444–45.

14. Insull presumably referred to Doc. 3377.

15. The editors have not found a request for the meeting with Insull. Afterward, Insull telegraphed his account of it to Tate with instructions to share the information with Gouraud. Insull to Tate, 17 July 1889, DF (*TAED* D8959ACI).

16. The editors have not found evidence of a followup meeting with Seligman, but Insull wired Tate on 19 July: "Parties here other than Seligmans desire purchase phono rights England, France, Italy, Germany, Austria, Spain, Switzerland. Ask Gouraud shall we negotiate and on what terms. If to be paid in cash or in cash and shares." After relaying the offer, Tate replied that Gouraud "will consider any proposition for purchase but cannot authorize negotiations New York his behalf account probable complications   Prefers deal direct." Tate thought Gouraud's reticence was because the "Seligman negotiations have excited his suspicion and he therefore wants to handle everything himself." Soon after, Tate queried Insull: "Do you know that the Seligmans themselves own the graphophone. Young Seligman told me they do, but it is important that we should know positively." The "Young Seligman" may have been Theodore, Jesse Seligman's eldest son and a Harvard Law School graduate, who soon joined Moriarty in acquiring the European rights of the International Graphophone Co. Insull to Tate, 19 July 1889; Tate to Insull, 16, 22, and 23 July 1889; all DF (*TAED* D8964ACK, D8959ACE, D8959ACP, D8959ACT); Harvard College 1901, 73; Moriarty and Seligman agreement with International Graphophone Co., 30 Aug. 1889, Misc. Legal (*TAED* HX89052A).

17. The stereotype of clannish Jews is a classic expression of antisemitism. A few weeks later, after conferring with Edison, Insull noted that they "had an absolute understanding as to how to deal with anything that might turn up from the 'Children of Israel.'" Michael and Rosen 2007, xviii; Insull to Tate, 7 Aug. 1889, DF (*TAED* D8959ADD).

18. Insull likely meant J. & W. Seligman & Co., a firm consisting of Jesse Seligman and his siblings, widely known as Seligman Brothers. He may have counted among the "Jewish friends" Messrs. Seligman

Bros., the London branch of the New York firm. Doc. 3377 n. 4; *NCAB* 4:226; Seligman 1894, 14.

19. Tate did not believe that Gouraud was negotiating with anyone else. He also thought it unlikely Gouraud could launch a company and attributed to John Verity information that a group represented by Spencer Balfour had lost interest. Gouraud did not discuss such a possibility with Edison but noted on 20 July, "I am afraid that we shall now be too late for this season so far as 'bringing out a Public Company' is concerned." Tate to Insull, 17 and 20 July 1889; Gouraud to TAE, 20 July 1889; all DF (*TAED* D8959ACJ, D8959ACO, D8959ACN).

20. See Doc. 3369.

21. The editors have not found Gouraud's letter. After learning of its substance by cable from Insull, Tate responded with a long letter expressing his belief that Gouraud's "order for a thousand machines was a 'blind'— I cant see what he could do with them after he got them." Insull to Tate, 16 July 1889; Tate to Insull, 22 July 1889; both DF (*TAED* D8959ACF, D8959ACQ).

22. Frank Winship Toppan (1855–1922), recently retired from the U.S. Navy, was an associate of Ezra Gilliland who had been involved in marketing the Gilliland and Edison railway telegraph system. He was best man at Edison's wedding in 1885 and manager of the Edison Phonograph Works for a short period that ended before March 1889. Louis Glass had informed Tate about Toppan's plans to visit Europe. The traveling party reportedly reached Havre on 21 July and was to be in London the following night; Tate vowed to enlist the aid of Insull's father to "Keep track of them." Doc. 2901 n. 3; Glass to Tate, 8 June 1889; Franck Maguire to Tate, 25 Mar. 1889; Tate to Insull, 22 and 29 July 1889; all DF (*TAED* D8963AAR, D8920AAH, D8959ACP, D8959ADA); "Notes and News," *Science* 12 (7 Dec. 1888): 271; "Personal," *Electrical Review* 14 (20 July 1889): 5.

23. An early example of Victorian grand hotels, the Langham was built in 1864 on Portland Place in West London. *London Ency.*, s.v. "Langham Hotel."

24. The London branch of the American Exchange in Europe at 449 Strand was well known for its travel services for American tourists, but the company was wound up in 1888. *Routledge's Almanack* 1887, 70; "American Resorts in Europe," *Illustrated American* 2 (19 July 1890): 116; "Winding Up of Joint Stock Companies," *The Weekly Notes* 23 (21 Apr. 1888): 201.

25. Finding only two letters and a brief telegram from Gouraud that would have arrived after Tate's departure on 2 July, the editors speculate that others may have gone through Insull's Dey St. office. Gouraud called attention to one concerning Moriarty, which had gone unanswered and unacknowledged. Gouraud to TAE, 28 June, 3 and 20 July 1889; Gouraud to Charles Batchelor, 6 July 1889; all DF (*TAED* D8954ACX, D8959ABZ, D8959ACN, D8959ACB).

26. The enclosure, consisting of short typed extracts from a half dozen letters, was copied into the letterbook following this document (pp. 342–44).

27. A long-time Edison associate, Henry "Harry" M. Livor (1846–1904) had been a stockholder and sales agent in the Edison Machine Works. Livor was currently general manager of the New Jersey and

Pennsylvania Concentrating Works, in which he owned thirty stock shares. Doc. 2956 nn. 2, 5; Insull to Livor, 6 July 1889, Lbk. 3011:98 (*TAED* LB031198); NJPCW minute book, certificate of incorporation, 27 Dec. 1888, CR (*TAED* CJ074001).

–3382–

From Everett Frazar

NEW YORK. July 23rd, 1889.[a]

My dear Mr. Edison:

I must thank you most cordially on behalf of my Japan and China firms as well as for myself, for the time and interest you devoted last night up to 1 a.m. in giving me the opportunity to inspect and hear the various musical phonograms lately prepared in the Laboratory. I shall make special mention of this in my outgoing mail to the East on Friday next. I shall expect to receive Thursday afternoon or early Friday morning the twelve boxes containing six dozen assorted musical cylinders to be sent to Japan by Wells, Fargo express the same day. If Mr. Batchelor will give this his personal attention, as he promised to do, I shall be greatly obliged. Please do not forget to furnish me with a personal phonogram from you to Mr. Lindsley, to be enclosed with mine taken by Mr. English last evening, for Mr. Lindsley, both accompanying the 6 dozen above named. These should all be packed securely in one large case marked Frazar & Co., Yokohoma, Japan, E.P.W[1] #1 Per express, and I should receive same early Friday morning to be in time for the outgoing steamer.[2] I will mention to Mr. Lindsley that the net cost of these cylinders to us is 30¢ each. Yours very truly,

Everett Frazar

TLS, NjWOE, DF (*TAED* D8960AAU). Letterhead of Everett Frazar. [a]"NEW YORK." preprinted.

1. That is, the Edison Phonograph Works.

2. Frazar had recently asked Edison for a personal recorded message that he could send to John Lindsley, and Samuel Insull promised to provide one. Frazar received a packing case by 29 July and asked John English to confirm that it contained six dozen musical cylinders and an Edison recording. If Edison had not already made one, he requested English to have Edison "speak specially of the intricate workmanship of the phonograph, the inability of the Japanese to imitate it, the large number you are turning out and all matters pertaining to the phonograph." He was also expecting Edison to put engraved plates on phonograph machines he had asked to be sent to the emperor of Japan, the king of Korea, and Li Hung Chang, a senior Chinese statesman and

diplomat. Frazar to TAE, 18 Apr. and 16 July 1889; Frazar to English, 29 July 1889; all DF (*TAED* D8805ACF, D8960AAT, D8960AAV); Insull to Frazar, 18 July 1889, Lbk. 31:324 (*TAED* LB031324).

–3383–

Alfred Tate to Samuel Insull

LONDON, July 23 1889[a]

My dear Insull:

The Sunday before I sailed I had a conversation with Mr Edison in regard to the formation of Companies abroad and the question of foreign manufacture at which time he gave me his views as to how he should retain the manufacturing rights. His idea was that when it became necessary for any Company to have a Factory of its own, he would undertake to erect it: run it for a period of say five years and then turn it over on the basis of Earning capacity.

In talking with Gouraud I have indicated that Mr Edison would only consent to the formation of Companies by including some arrangement whereby he ~~had~~ should retain absolute control of manufacture for a period of years, giving all the various reasons why this is necessary that I need not repeat here and have told him of Mr Edison's plan of Establishing a Factory and giving the Company the right to buy it out at the End of a period of years by capitalizing the Earnings.

He says he considers this an excellent idea and that it could be presented in the light of a positive advantage to any Company, as it can.

I have'nt gone into details—just far Enough to make it clear to him that the manufacturing must be left in Mr Edison's hands which fact he understands very clearly. Yours,

A. O. Tate

ALS, NjWOE, DF (*TAED* D8959ACR). Letterhead of Hotel Metropole. [a]"LONDON," and "188" preprinted.

–3384–

From Philip Dyer

ANTWERP. July 24th 18[8]9[a]

Dear Sir.

Your Cable of 23rd inst. duly received. "Strictly Confidential Go to Paris retain three Bed rooms and sitting room in very quiet Hotel for me better retain them your name arrive Havre August tenth wire reply"[1] Yours Very truly

Philip S. Dyer Agent

ALS, NjWOE, DF (*TAED* D8905AER). Memorandum form of Philip Dyer, European agent for American Edison factories. [a]"ANTWERP." and "18" preprinted.

1. Dyer cabled back the same day: "Will retain rooms in Paris, and meet you in Havre." He rented rooms for Edison and his family in the Hôtel du Rhin, Place Vendôme, and was among those who met Edison's ship. In its coverage of Edison's arrival, the Paris daily *Le Figaro* misidentified Dyer as "Mr. Dyt, representing Anvers." Dyer to TAE, 24 July 1889, DF (*TAED* D8905AES); "Edison en France," *Le Figaro,* 12 Aug. 1889, 1; "Une Conversation avec Edison," *Le Figaro,* 16 Aug. 1889, 2.

–3385–

From Marion Edison

EDINBURGH [c. July 26, 1889][1a]

My dear Papa

I know it is bad form, as the English say, to commence a letter with an apology but I cannot possibly do less than apologize for my long delay in writing you You I know will forgive my neglect when I tell you how busy I have been ever since I left home It seems almost too good to be true that I am to see you and Mama so soon. It seems almost years since I saw you last. I have felt homesick for the first time in my life since I came to Europe. I seem so dreadfully far away from home and you Papa dear. I know I shall more than appreciate every thing when I return home for good after having so long been an exile[b] from home. I cannot begin to tell you how delighted I am with all I have seen so far of Europe. I know I can never thank you enough for permitting me come and it will not be my fault if you ever have cause to regret that permission. I am now in England in consequence of your cable[2] I am very glad to see the British Isles first as every one says that they ought to be seen before the Continent. I like England very much better than France I also like the English people very much better than the French. I know that you did not form a very complimentary criticism of the English when you were here[3] but I think when you see more of them you will like them much better. The French I simply detest I think them immodest, irreligious, fickle and insincere I could tire you with a list of their many faults.[4] I suppose you will stay in Paris a couple of weeks before you start traveling. Mama has not written me any of your plans so I do not know exactly what I am to do. We are traveling just as fast as it is possible but I am awfully afraid you will get to Paris before we do. One cannot possibly do Scotland in less than ten days. We only just arrived in Edinburgh last evening so you see we are rather pressed for time as ten days here will bring us about to the fourth of August and then we go to Ireland. I shall feel very much dissapointed if I cannot be in Paris to receive you but the wisest thing to do I suppose would be to finish out my trip as in all probabilities[b] I shall never see England again. I know you will be very much pleased when you see your department in the Exposition. Mr. Hammer deserves to be congratulated as far as that is concerned. I think that it has certainly increased your popularity with the French. I am more than bitter with Col. Gouraud, he has simply made you and the phonograph ridiculous in the eyes of the English people. I knew that man was a scoundrel the first time I saw him He has done everything to advertise himself and put you in the back grounds as much as possible. I do not know how you feel about it but I think it a great imposition. You must expect Papa to be boared to death in Paris with invitations. You cannot know until you go there how really admired you are by the French It makes me so proud to think that I am your daughter I only wish that I was half worthy of such a father. With love,

M.E.E.

ALS, NjWOE, FR (*TAED* FB004AAF2). Letterhead of Balmoral hotel. [a]"EDINBURGH" preprinted. [b]Obscured overwritten text.

1. The conjecture of this date is based on Marion's statement below that "ten days here will bring us about to the fourth of August."

2. Marion probably referred to Alfred Tate's 20 June reply to her urgent request for her father's permission—and funds—to travel to Britain. Tate cabled: "Have forwarded nine hundred eighty four dollars through Drexel, Morgan & Co." Marion Edison to TAE, 17 June 1889, DF (*TAED* D8915AAV); Tate to Marion Edison, 20 June 1889, Lbk. 30:476 (*TAED* LB030476).

3. Edison tested his automatic telegraph system in London in May and June 1873, when Marion was just a few months old. *TAEB* 1, chap. 1 introduction.

4. Marion described the French to Mina Edison in similar phrases in an undated letter written from Leamington, in south central England, likely a few days earlier. That letter is similar in other respects to this one to her father, beginning with an apology for not having written sooner. Marion Edison to Mina Edison, July 1889; FR (*TAED* FB004AAF1).

–3386– [Orange,] July 29, 1889[a]

Patent Application: Ore Milling

<845>[1b]

To all whom it may Concern:

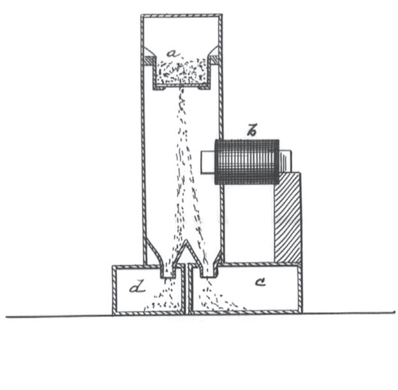
Be it known that I, Thomas A. Edison, a citizen of the United States, residing at Llewellyn Park, in the County of Essex, and State of New Jersey, have invented a certain new and useful Improvement in the Process of Magnetic Separation (Case No.   ) of which the following is a specification:

The object of my invention is to provide for the effective separation of magnetic iron ores and more especially to accomplish such separation in the case of what are called "lean" ores, that is those in which the proportion of iron is very small.

Ores in which the proportion of iron is less than about thirty per cent have never, before my invention, been economically worked even by my ordinary process of magnetic separation because in the crushed ore there are many particles which are composed partly of iron and partly of non magnetic material and those are either drawn among the iron particles and diminish the purity of the product, or if by weakening the magnet it is attempted to avoid this, the loss of iron in the tailings is too great. It will be seen that in the lean ores there is a greater proportion of iron particles which are in contact with non-magnetic particles, than in richer ores in which many iron particles are in contact with one another, and this is the reason why, in crushing, so many composite particles made up partly of iron and partly of non magnetic material or gangue are formed.

By my invention, I am enabled to work these lean ores, which at present it is not attempted to make use of, and to obtain a pure product in an economical manner.

The general process of, and apparatus for, magnetic separation of ore, which I employ are now well understood, and such an apparatus is illustrated in the accompanying drawing, which is mainly a vertical section thereof.



The mingled magnetic and non magnetic materials fall in a stream from the hopper a past the pole of a magnet b, whereby the trajectory, or direction of falling, of the magnetic particles is altered, and the same fall into a receptacle c, while the non-magnetic material continues to fall in a straight line and enters a receptacle d. Such an apparatus is employed to carry out the process which forms my present invention.

In the first step of said process the ore in a pulverized condition preferably about a ten-mesh size, is passed through a separator such as above described, the magnet of which is made of such size, wound in such a manner, energized to such an extent, or otherwise so arranged or used, that it attracts only such of the falling particles as are entirely of iron or practically so not affecting any of those which are made up partly of iron and partly of gangue, these latter falling with the gangue particles into the receptacle d, while only pure iron particles enter the receptacle e.

I then take the tailing containing the composite particles, and pass them through another separator whose magnet is constructed or situated or energized so as to be of greater strength than that of the first separator. The same machine may of course be used for this second step with its magnet more strongly energized than at first. The magnet for this step of the process is of such strength that it draws over the whole of the composite particles composed both of iron and gangue, and these enter the receptacle c while receptacle d receives only gangue particles.

I now take the composite product from the receptacle c, and crush the same by means of crushing rollers or other suitable apparatus so as to detach or disassociate the iron from the gangue, and, after screening if required, this mingled material is again made to undergo the magnetic separating process in the ordinary manner so as to separate the iron from the gangue.

This furnishes a very economical process of separation for these poor ores, and one by which a nearly pure oxide of iron product is obtained and practically no loss of iron takes place in the tailings.

I prefer to employ in the process described, three different magnetic separating machines, which together with the crusher or other means for disassociating the composite particles are arranged relatively so as to provide for a continuous process the material being fed from one machine to another, as will be readily understood.

What I claim is:

1. The within described process of separating magnetic ores, which consists in first magnetically separating the purely metal particles from the composite particles of metal and gangue, then dissociating said composite particles, and then magnetically separating their metal from their gangue.

2. The within described process of separating magnetic ores, which consists in magnetically separating the purely metal particles from the purely gangue particles and the composite particles of metal and gangue, next magnetically separating the said composite particles from the gangue particles, next disassociating the said composite particles, and finally magnetically separating their metal from their gangue.

3. The within described process of separating magnetic ores, which consists in exposing the ore to magnetic attraction to separate the purely metal particles from the tailings consisting of purely gangue particles and composite particles of metal and gangue, then exposing said tailings to stronger magnetic attraction to separate the composite particles from the rest, then disassociating said composite particles and finally magnetically separating their metal from their gangue.

4. The within described process of separating magnetic ores, which consists in exposing the ore to magnetic attraction sufficient only to affect the purely metal particles and not the composite particles of iron and gangue, then exposing the tailings to magnetic attraction sufficient to separate the said composite particles from the rest, then dissassociating the said composite particles and then magnetically separating their metal from their gangue.

This Specification signed and witnessed this 29th[c] day of July[c] 1889.

Thos. A. Edison[d]

WITNESSES: D. H. Driscoll[2d]
I. C. Bennett[3d] E P Rowland[4d]

TD (carbon copy), NjWOE, PS (*TAED* PT032ABZ). Drawing made on separate sheet. [a]Date from document; form altered. [b]Marginalia probably written by Edward Rowland. [c]Written by hand in blank space provided. [d]Names written by hand.

1. This is the patent case number assigned by Edison's attorneys and written on the separate drawing sheet. The application was filed at the Patent Office on 1 August and promptly rejected. The examiner ruled that the process described was not patentable and, even if it were, was anticipated by a prior patent. Edison requested reconsideration but received the same result. He appealed to the Examiner-in-Chief in August 1890 but that decision, too (in October 1890), was adverse. After

yet another year, Edison and his attorneys took the case to the Commissioner of Patents. The commissioner's decision affirmed the previous rulings yet somehow did not end the life of the application. Edison's attorneys took subsequent steps to amend it and to have an interference declared with a patent obtained in the meantime by another inventor. The Patent Office, conceding that it had incorrectly allowed a patent that it should have rejected on the same grounds as Edison's, declared an interference in August 1892. That proceeding dragged on until at least February 1895, when the case file stops. Regardless of what happened after that date, Edison's application did not issue as a patent. Case 845 Case File, PS (*TAED* PT032ABZ); see App. 5.

2. Daniel H. Driscoll was an attorney with Dyer & Seely since about 1888, reportedly specializing in non-electrical technologies. When Henry Seely retired in 1895, Driscoll became a partner in the new firm of Dyer & Driscoll. "New York Notes," *Electrical World* 25 (16 Mar. 1895): 352; Richard Dyer to U.S. Patent Office, 28 Feb. 1895, PS (*TAED* PT010ABS).

3. Not identified.

4. The draftsman Edward Rowland witnessed and dated the separate sheet on 27 July, when he traced the drawing.

–3387–

Samuel Insull to Alfred Tate

[Orange,] July 30, 1889.[1]

My Dear Tate.—

Your favors of July 16th and 20th came to hand yesterday, both together.[2] I think the long delay in their arrival is largely owing to the fact that you do not put on the envelope the name of the steamer by which you want the letters forwarded, and under these circumstances they lie over in the General Post Office to the end of the week.

SELIGMAN NEGOTIATIONS. I do not know that there is much to say from this end of the line. All I can do is to reiterate what I said in my last letter[3] with reference to the Seligmans—that we have no understanding with these people here whatever; that we have absolutely refused to have any negotiations whatever, and that when young Moriarty and young Seligman say that I mentioned six hundred thousand dollars as a price for the whole foreign phonograph interest, they simply lie.[4] Young Seligman knows that they lie, and if they make that assertion on the authority of the people here, the people here lie. I taxed Mr. Jessie Seligman with this some time ago, and he disclaimed altogether that I had made any such statement. He admitted that I refused to name a price even for Mr. Edison's interest; that the sum of $750,000 and the manufacturing was made absolutely on my own authority, and that I especially disclaimed having consulted Mr. Edison in naming that price.

In fact, Mr. Jessie Seligman admits the interview between him and myself, at which you were present, in precisely the same way as you and myself understand it. It rather amuses me to read your letters. They are simply a confirmation of what I have been preaching to Mr. Edison for the last eight years. I have always insisted that Mr. Gouraud would never be able to float anything successfully after his telephone scrapes[5] and I want no better justification of my opposition to Mr. Gouraud getting his present contract with relation to the phonograph than the cable correspondence we have received from you and the two letters above referred to. We have a letter from Gouraud, of which I enclose you herewith a copy.[6] We are not going to enter into communication direct with Mr. Gouraud. You must fix this matter with him yourself, and if you see Mr. Moriarty again with Mr. Gouraud, I would, if I were you, tell Mr. Moriarty that the statement which he makes is false, and that you make that statement on my authority, you having been present at the interview with Jessie Seligman, and that you know from letters received from me, that Mr. Jessie Seligman has especially disclaimed, within the last few weeks, that when he was talking with me he obtained a figure on the whole foreign phonograph including Mr. Gouraud's interest.

ORDER FOR PHONOGRAPHS. I was very sorry to receive your telegram stating that you had accepted an order from Gouraud for fifty (50) instruments.[7] We have Mr. Gouraud's order for a thousand (1,000) instruments, and we are working on these thousand instruments, and in calling on Mr. Gouraud to pay cash in New York for the instruments we are only doing what the contract gives us a right to do.[8] The result of his refusal to pay for the instruments might possibly have ended in our being able to declare his contract void, but I am half afraid that we are somewhat compromised by your having accepted the order for fifty instruments, and by accepting that order have given a constructive consent to the cancellation of the order for a thousand instruments.

At the time of dictating this letter I have not got a final cable from you as to what you have arranged concerning this matter. All I have is your telegram, stating that delay is not yours. I do not even know whether you have returned Gouraud his order for fifty instruments.

Mr. Edison is of course very much disgusted with the state of affairs as shewn by your cables and your two letters. I think the thing that has affected him the most has been the refusal of Gouraud to put up money for phonographs. I believe that the whole matter will so influence him that in the future he will deal very differently with his foreign business.

TOY PHONOGRAPHS. Mr. Stevens sails on the 7th of August. Nothing definite has been done yet with relation to putting toys on the market. I have found a very good man as Gen'l. Manager of the Company, and he is in Boston today negotiating with Stevens and his colleagues.[9] If we come to some arrangement with them, the business will be at once pushed. I have not got the time to attend to it myself, but as soon as they have a good General Manager, I will take an active part in directing his efforts. We have got the plant at Orange ready for turning out the doll movements and can go to work on large quantities with little or no delay. I think that this business is in far better shape than it has ever been before, and I shall be disappointed if the Christmas season does not find us placing large numbers of these toys throughout the country.

Laboratory. There is nothing particularly new to report in connection with the Laboratory. There has been no correspondence of any moment referring to any business of importance. Everything goes on in a hum drum kind of a way, Mr. Edison giving little or no attention to experimental work. The order of the day now is "I will take that in hand when I return from Europe."[10] Batchelor has been away most of the time since you left here.

PHONOGRAPH WORKS. This concern to my mind is in damned bad shape.[11] They have been booming ahead piling up instruments, and now they are scared because they have a large number of instruments on hand. It could not be expected that the North American Phonograph Co. would be able to take off their hands every phonograph that they could turn out. The Phonograph Works should have been run along quietly, simply increasing the capacity of the shop as the demand for machines increased. I have not got full control of the business yet, and as I have more than I can possibly attend to in other directions, I do not propose to waste time and effort in the Phonograph Works until such time as my instructions will be followed absolutely—or, in other words, to such time as I have authority to give instructions. Mr. Edison says that he proposes to fix this before he sails. I am entirely indifferent as to whether he does or not, as the whole of my time, from the moment I get out of bed in the morning to I go to bed at night, is fully occupied, and to take up the Phonograph Works simply means further effort with possible misunderstandings.

I do not see how the attending to this business can in any way add to my reputation as a manufacturer, whereas it is quite possible that my present limited circle of friends might be further limited owing to misunderstandings that might possibly arise with Mr. Batchelor. However, of course, if Mr. Edison fixes matters so that I can work with some authority, I will do all I can to get the concern in proper shape. The idea to-day seems to be that you can run ahead on a large number of machines and when you have got too many, lay off your men and still maintain a good organization. My experience in this connection is somewhat extensive, and I know that every time they shut down, it costs several thousand dollars to get under way again.

GENERAL EDISON CO. Everything is going just as I thought it would. Mr. Coster heartily co-operates with me, and in consequence, Mr. Edison's views are in every respect paramount. The Executive Committee has been formed, and I am, of course, a member of it. Mr. Edison could not wish for any better state of affairs than now exists in the Gen'l. Edison Company. I had Mr. Villard and Mr. Edison at Schenectady on Saturday last, and have started enlarging the Works there, and before I get right through I am sure a quarter of a million dollars will be spent.[12] General Edison Co. stock is a good purchase, as it will pay a dividend of eight per cent this year, and only stands at 90 to-day.

Ore Milling. The plant at Bechtellsville is a remarkable success. There is no doubt but that we are going to make a great deal of money in concentrating iron ores. Livor and Edison are practically intoxicated by the business. According to present prospects and discounting what they have to say and estimating that the cost of production will be twice [as much as?][a] they really estimate, I am sure we have got an extremely good thing. We have increased the capital to $100,000.

You cannot expect to get many letters from me. It is for that reason I cable very fully, but I will try and get a letter off to you once a fortnight.

Porjes. You will have received our cablegram declining Mr. Porjes' invitation, and will have notified that gentleman of same.[13] He simply wants to make social capital out of entertaining Mr. Edison. Mr. Edison occupies too high a position, to my mind, to allow of his accepting any such hospitality as Mr. Porjes offers. The proper place for Mr. Edison to go to is a Hotel, where he will pay all his own bills. However, of course you will have made necessary explanation to Porjes, saying that Mr. Edison will only stay in Paris a short time &c., &c., and Porjes will be disappointed, but of course satisfied.

I have sent you to-day that cable transfer of two hundred pounds.[14] I am afraid you are too close to Leicester Square and "Petite Paris."[15] I hope that your lounging place is not the Alhambra[16] and the Pavilion.[17] My boy I advise you to go it slowly as you may have to "wrap it up in wadding."

With kind regards, I remain Very sincerely yours,

Samuel Insull.[18]

TL (letterpress copy), NjWOE, Lbk. 31:451 (*TAED* LB031451). [a]Illegible copy.

1. One piece of internal evidence suggests that Insull dictated this letter on 29 July (see notes 14 and 18); possibly it was not typed until the next day.

2. These two long letters from Tate, both largely concerned with Jesse Seligman's attempts to acquire phonograph rights from Edison and George Gouraud, are discussed in Doc. 3377 n. 6. Tate to Insull, 16 and 20 July 1889, both DF (*TAED* D8959ACE, D8959ACO).

3. Doc. 3381.

4. Insull cabled Tate twice on 17 July about his doubts of Jesse Seligman's veracity in this matter (both DF [*TAED* D8959ACG, D8959ACI]). These messages were part of the ongoing correspondence mentioned in Doc. 3377 n. 2.

5. The Edison Telephone Co. of London, organized by Gouraud, had only a brief independent life before it was forced to merge with the Bell interests, in part because of a lack of adequate capital. *TAEB* 5, passim.

6. Gouraud's 20 July letter to Edison was retyped as a "Translation" of his nearly illegible script. It largely concerned claims by Jesse Seligman and Stephen Moriarty about terms purportedly offered in New York, and Gouraud's request that Insull repudiate them. DF (*TAED* D8959ACN).

7. Tate cabled at length on 25 July, in part: "Just received written order from Gouraud fifty machines saying expect repeat the same monthly but each orders stand on own merits wants payment to be made monthly for previous deliveries sixty days draft which I have refused will send orders details when he agrees payment New York." In reply, Insull appeared to indicate that either Tate or the Edison Phonograph Works should refuse the smaller order. Tate to Insull, 25 July 1889; Insull to Tate, 25 July 1889; both DF (*TAED* D8959ACV, D8959ACX).

8. Insull received this order several weeks earlier, when he instructed Tate to have Gouraud arrange for prompt payment in New York. Tate considered the large order merely a bluff and part of a larger scheme, involving plans to raise cash by setting up phonograph agencies in other countries, to mislead Edison; he also feared a poorly executed agency plan would damage the market. Later, in a letter still en route to Insull, he argued that Gouraud should be left alone long enough to fail in

his agency endeavor, possibly creating favorable conditions for Edison to buy out his rights. Insull to Tate, 16 July 1889; Tate to Insull, 22, 23 (2 letters), 24, and 27 July 1889; all DF (D8959ACF, D8959ACQ, D8959ACS, D8920AA, D8959ACU, D8959ACY).

9. Edgar S. Allien was one of several managerial prospects referred by Benjamin Stevens. Insull reported that "none of them has impressed me so well as Mr. Allien….. [who] had a long talk with Mr. Edison and myself, and I have got all of his references, some of which are well known business people in New York; others are parties connected with the doll trade." Inquiries were promptly sent to several references in New York. Allien was hired by the Edison Phonograph Toy Mfg. Co. and left on a European buying trip before October. Insull to Stevens, 20 July 1889; TAE to John Hoey, 20 July 1889; TAE to Henry Rogers, 20 July 1889; TAE to R. Dunlap, 20 July 1889; TAE to James Breslin, 20 July 1889; all Lbk. 31:355, 349–52 (*TAED* LB031355, LB031349, LB031350, LB031351, LB031352); Stevens to TAE (with TAE marginalia), 31 July 1889; Edison Phonograph Toy Mfg. Co. report to stockholders, 1 Oct. 1889; both DF (*TAED* D8964ACM, D8964ACR).

10. Cf. Doc. 3391.

11. Insull recently expressed in Doc. 3381 a more sanguine view of the phonograph factory's operations. The factory's overproduction continued through August (708 machines made; 281 shipped) and September (1,016 made; 266 shipped) until the middle of October, when output dropped precipitously. When production picked up again in December, it more closely matched demand (753 machines made; 770 shipped). The manufacture and sales of blank cylinders followed a similar pattern. Cat. 1337:70 (item 582, n.d.), Batchelor (*TAED* MBJ004070).

12. Within a few months, three large buildings reportedly were under construction at the Machine Works in Schenectady at a cost of $105,000. By July 1890, the Works employed 2,500 men and expected to hire 1,000 more. A dozen new buildings were also planned in the pursuit of vertically integrated manufacturing that would include on-site production of refined copper and iron. "Business Notes," *Electric Power* 1 (Nov. 1889): 370; "State News," *Poughkeepsie Eagle-News,* 22 Jan. 1890, 3; "The Old and the New," *Rochester Democrat and Chronicle,* 26 July 1890, 6.

13. Tate wired that Charles Porgès had availed "his house carriages [and] servants" to Edison in Paris, "only twenty minutes from exposition." As Porgès planned to be in Switzerland, Tate thought the arrangement would give Edison more privacy than a hotel. The editors have not found Insull's reply. Tate to Insull, 29 July 1889, DF (*TAED* D8905AEU).

14. This transaction was arranged on 29 July ("to-day") through Drexel, Morgan & Co. in New York. TAE to Drexel, Morgan & Co., 29 July 1889, DF (*TAED* LB031446).

15. A center of various entertainments, theaters, and foreign hotels, London's Leicester Square was increasingly known at this time (in the words of one authority) as both a "West End centre of diversion" and "no place for unescorted ladies." The editors have not learned the basis of Insull's allusion to "Petite Paris" other than the area's growing association with the demi-monde, but the Charles Dickens guidebook

referred generally to Leicester Square as "the capital of the great foreign settlements about Soho." *London Ency.*, s.v. "Leicester Square"; Dickens, Jr. 1879, s.v. "Leicester Square."

16. The Alhambra was a music and dance hall in Leicester Square, originally built in a Moorish style with minarets. It was destroyed by fire in 1882 but had recently been rebuilt and opened anew. *London Ency.*, s.v. "Alhambra."

17. The London Pavilion was a music hall in Piccadilly Circus, a short walk from Leicester Square. Operating since 1861, the structure was rebuilt in or about 1885. *London Ency.*, s.v. "London Pavilion."

18. Thomas Maguire typed a note below the signature line explaining that "Mr. Insull has gone away without signing this letter, and as it must be mailed to-night in order to catch to-morrow's steamer, I have deemed it advisable to attach his signature and send it off."

–3388–

Charles Batchelor Journal Entry

[Orange,] July 31st 1889.

573.[1] Electric Street Car

I have now started to design a system of dynamo, transformer and street car motor based on Edison's ideas of which #549 was one of the successful experiments[2]

The idea is as follows:—

—Comparatively high tension at station.

—Revolving transformer set in a box with manhole every two blocks about, delivering current to line at about 15 to 20 volts[3]

Motor armature always running in same direction and stopping, starting, slowing reversing and fast speed all being done by friction wheel in disc

AD, NjWOE, Batchelor, Cat. 1337:66 (*TAED* MBJ004066B).

1. Charles Batchelor consecutively numbered each entry in this journal.

2. The idea of a transformer dedicated to each section of track goes back at least to February 1889 (see Doc. 3319). Batchelor's journal entry 549, dated 16 April 1888, described and illustrated a friction drive for an electric railroad "that is a decided advance on anything previously done." It consisted of a motor turning always in the same direction at constant speed, which rotated a small friction wheel able to slide on its shaft. The wheel pressed against and rotated a flat disk geared to the driving shaft. The output speed could be varied by sliding the friction wheel on its shaft to bear at different radii of the driven disk, and the direction reversed by moving it all the way to the other side of the disk face. Three weeks later, Batchelor sketched and described in his journal a variant "Double friction wheel" for the street car drive. Edison later devised a wholly different friction mechanism. The advantages he stated in an 1890 patent application for that device presumably would have applied to the present constant-velocity driving mechanism as well:

maximizing the motor's efficiency and maintaining a constant counter-electromotive force to protect the armature windings from a surge of current when starting. Cat. 1337:50B, 68A (items 549, 578; 16 Apr. and 20 Aug. 1889), Batchelor (*TAED* MBJ004050B, MBJ004068A); U.S. Pat. 434,589.

Time sheets indicate that several laboratory staff members, notably Arthur Kennelly and machinists J. W. Dobbins and S. D. Foulkes, had worked on a new streetcar motor in April 1888. However, apart from a bit of work in July and October 1888 no further work was done on this design, and the project was added to the list of "Dead Experiments" in December (Time Sheets, WOL; see App. 3). During the summer of 1889, the laboratory staff instead began working on a different car motor (see Doc. 3391 esp. n. 23), and Arthur Kennelly began working on transformers for the system (Kennelly Notebook #2:37, 39, 50, 52–54, Lab. [*TAED* NM024036 (images 42, 44), NM024044 (image 55), NM024051A (images 57–59)]).

3. Sometime in late September or October, Batchelor summarized the major features of the electrified street car system in an undated notebook entry. The plan was for a central station to deliver current at 1,000 volts through underground conductors to a series of transformers, which would reduce it to about 20 volts. The friction drive was not described but would have the same capabilities as the one described in this document. Each car would have a seven-horsepower motor, enough to drive it between two and nine miles per hour. N-89-08-15, Lab. (*TAED* NB074AAC, images 16–17).

–3389–

Draft Memorandum: Partnerships for Ore Milling and Manufacturing[1]

[Orange, July 1889?][2]

The following is a memorandum of the ~~scheme~~ industrial undertakings[a] which I have been at work on for some time I had no intention of taking in partners as ~~myself and those~~ as my principal men & myself have made & have a large amount of money to invest— Our intention was to buy up all the Magnetic iron ore mines in the state of Pennsylvania nearly[b] all of which are Contained in the only Azoic Rocks of the state, an area about 7 by 25 miles— While they have ~~no~~ but very little[c] value at present owing to the fact that the grade of ore in almost every case is too low to be used in a furnace or if not are to much mixed[d] with sulphur phosphorus or Titanium= yet with the new process which I have the grade of the ore is raised cheaply[e] & economically above that of any commercial ores in the world— Sulphur & Titanium are practically eliminated & ores much too high in phosphorous have[d] this element reduced far below the requirements of the Bessemer furnace—[b] These deposits are in the Center of the iron industry of the US. The freight rates average less than 50 cents to 180 blast furnaces—¾ of these furnaces are out of blast for want of local ore which renders it almost impossible to Compete with the Southern ore areas and also because most of the furnaces are of the old type[3] We have already errected a large mill at Bechellsville pennsylvania 300 feet long 40 high—Capable of Crushing[e] 200 tons daily. When I left we were only running on the outcrop of the vein carrying only 14 per cent of iron & were making money, and delivering to the blast furnace 65 per cent ore. when we reach the good part of the vein which carries 30 per cent and is 8 foot wide we shall make at least 150 percent on the investment. The quality of the pig iron produced from the furnace changed from No 3 and white to 75 per cent No 1 foundry iron on the addition of 25 per cent of our ore.[4d] The furnace master could not explain the reason for this.

All of my patents for Concentrating Iron and gold ores are owned by a Co in the US called the Edison Ore Milling Co which has been in existence about 8 years—during the whole of this period I have been experimenting on working low grade rebellious gold ores and iron ores and have expended a very large sum of money— This Co simply furnishes the money for conducting Experiments and does not engage in exploitation. the Capital is 2 million dollars—

A Local Co was formed some 6 months ago[5] on the Completion of my experiments with iron ore, which were conducted on quite a large scale at my Laboratory—ores from over 60 mines were tried and the machinery perfected so as to be able to cope with every kind of magnetic iron ore as well as many ores which were[f] not magnetic.[d] The Local[b] Co has the License for the states of Pennsylvania & New Jersey— The stockholders are soley myself and assistants. It is this Co which has built the mill.

After seeing the perfect working of the plant and its great capability of making money It occurred to me that If I could get possession of practically[b] all the magnetic ore deposits ~~in th~~ in the Center[e] of the Coal & iron district of Penna that with this ~~produce~~ process I would have a monopoly of one of the most valuable sources of natural wealth in the US. So we went to work and devised a process of Locating deposits by modern methods so perfect that we can discover and make an acurate magnetic survey of a mine heretofore unknown and not to be detected by the Old Magnetic needle used by the miners—[6g]

We can beforehand tell where to sink shafts or run tunnels ~~and~~ the extent width & length of the vein depth & give a close guess at the quality of the ore although in a wheatfield Mr

Kennelly and myself found three Valuable deposits in this way not two miles from our present mill and I bought outright for cash the mineral rights from the farmers on whose farms the deposits occurred The Costs of these rights are from $500. to $3000. according to the nature of the man and $150. for each acre spoiled by us[h] for farming purposes— I had Expected to use up about 180 to $200 000 in acquiring these rights which are for eternity—and would put up one mill additional of 1000 tons capacity daily Costing[d] about $85,000—and after running for a sufficient length of time to show the great value of the property sell out to a Company a portion so as to raise money to put up mills for[d] 6 or 8000 tons daily capacity and the Errection of several modern blast furnaces and the leasing of a number of those in the vicinity now out of blast— ~~I also am going to purchase a gold mine in Canada, when the stockholders can deliver a good title—~~[i]

The 2nd part of the Ore business is[d] working gold ores which are low grade & very rebellious Ore of this[d] kind occurs in the province of Ontairo Canada and in North Carolina a vast deposit of auriferous Mispickel ore[7] occurs in the Mammora district Canada[8] one Co spent over 500 000 trying to work[d] the ore but failed as no known process is applicable for two years I have been experimenting with it & can work it perfectly [this?][j] ore will average twelve dollars gold per ton The cost of working will not exceed 8 The investment in mill will not exceed for 100 tons [daily?][j] $80,000— The cost of mine is uncertain— I think if the owners can be made to agree the particular part[d] of the section I refer to could be bought for 50 000 or less— This ~~district~~ Co own if I remember right about [-000][e] feet in the vein— The vien has been traced 3 miles the balance could be secured on options. [~~Th~~--][k] these mines are in civilized communities cheap Labor & where men of talent will live which is not the case far west. The money made in mining depends not[e] so much on the [--- -----][j] richness of the ore as good management and plenty of ore even if it is of very low grade If these ores were free milling ores the lode would be worth ten million but being unworkable by known process they lie valueless The same occurs in North Carolina It has been said there is as much gold in North Carolina & Ga as in California but occurring in a rebellious form is worthless.[1]

The other scheme is that of Manufacturing. [Having?][d] sold out all my factories for 3,500,000. to Mr Villard & the Deutche Bank people:[9] These factories having cleared 525 000 cash during the year above all expenses—depreciation & writing off by Mr Villards own accountants & finding that for various reasons my men & myself[m] are abnormally fortunate in managing factories[d] I have started another manufacturing plant not however for Electric Lighting but in other branches of industry—for this purpose I have purchased our own 47 acress of ground 11 miles from New York and 2 miles from Newark one railroad running through the property,[10] another with 1500 feet, an electric street car in front of property with Macadamized road 7 miles long connecting three towns with Newark Canal[11] ~~3~~4000 feet away— there is a village all around[e] the property and Streets are all laid out near it. I am also trying to secure 30 more acres—The cost per acre averaged about 900 dollars. I have the plans finished and will commence on my return the errection at a central point on the property a steam plant for 800 horse power provided with triple expansion engines and every device for producing power cheaply— The whole of this power I turn into Electricity and then distribute the power to the various factories which I shall errect from time to time so that ultimately instead of ten of 15 different factories with as many different Engineers firemen etc. boilers uneconomical Engines I have but one Engineer & the most Economical steam plant known at one central point—from this point also I distribute live steam & have a fire system with water & telephones to all the factories & with tracks [-----][k] put all products directly [----][j] the cars— I have already two factories errected on the property which are in full blast. in one we make exclusively batteries for phonographs telephones & telegraphs— The other manufactures[e] from crude material The wax used in the phonograph, Insulating material for under ground electric wires, uninflammable[d] Varnish & other things which we have found from time to time in the Laboratory— These two factories are small but will earn about 25 to 30 per[d] cent on the investment.

The basis I am going to organize this factory Village is the same as that followed by me in the phonograph works which now covers 3 acres of ground Employs 400 hands turns out $2250 worth of goods daily Capital is $300 000. of which 50,000. is trust stock & gets nothing until 20 per cent is[d] paid when i~~n~~t comes in prorata for any excess. In[e] the sale of the phonograph I reserved all manufacturing rights. This I sold to the phonograph works on the following basis—

for every ~~doll~~ share paid for in cash I recd 4/10 of a share— As this would not give me control, a sufficient amount of trust stock was issued to me to control, but such trust stock gets no dividends in any year until the regular stock pays 20 per cent anything left over is divided prorata with the whole stock—

In other words I reserve manufacturing rights for my inventions wherever possible and I propose transferring these rights to the new mfg Co[12] on the basis of the issue to me of 4/10 of one share for every share subscribed & paid for in cash and [----][k] of 3/10 of a share[e] trust stock to give me control but not participating in div until 20 per cent is [~~secured~~?][k] paid on the regular stock. The 4/10 & cash stock being regular stock. I not only ~~giv~~ transfer the mfg rights to the mfg Co for 4/10 ~~of shares~~ of a share per share of cash stock but [~~I use m~~?][k] conduct and manage the works without Salary and give the facilities of Laboratory at cost to start each factory also the benefit without salary of my principal assistants, I reimbursing them from my share

The works which[d] I propose[d] errecting on the new property is ~~Co~~ 1st Copper refining by Electricity

2nd Large chemical works to manufacture several discoveries in industrial chemistry made at Laboratory.

3rd Large machine works for manufacturing Mining & Milling Machinery—Steam Engines[e]—Electric Rock drills—other heavy machinery

4th= Factory for Duplicating phonographic music, novels etc.

5th small tool shop to manufacture—Type writers, Telephones, & other specialties—

I expect to cover the property within six years and total investment will be in round numbers two million dollars—

Having described to you briefly what I am & propose doing I am at loss to make a proposition—as to obtaining money from yourself and friends for these schemes.

[I?][d] forgot to mention that the patent Co charge a royalty to the Local Cos of 15 cents for every saleable ton of ore. This is small considering that the Local Co makes $2 per ton= ~~only~~ on[b] gold ore it will charge a scaled royalty of about [--][k] 1/8th[b] ~~percent~~ of the profits=

The expenses of my Laboratory average about 130 000 annually of which Various Co pay about 60 000 leaving 90 000 to be paid by me. These expenses previous to my selling out [--][k] Mr Villard were bourne by my Various factories and Cos. Hence I am compelled to exact ~~from~~ the percentages named in the various enterprises as recompense for either exclusive rights & facilities of Laboratory together with my in

ADf, NjWOE, DF (*TAED* D8905AKJ). [a]"industrial undertakings" interlined above. [b]Interlined above. [c]"but very little" interlined above. [d]Obscured by ink smear. [e]Obscured overwritten text. [f]"which were" interlined above. [g]This paragraph written over an unrelated calculation, which is not transcribed. [h]"by us" interlined above. [i]Followed by "over" to indicate page turn. [j]Illegible. [k]Canceled. [l]Followed by dividing mark. [m]"& writing off…& myself" written in bottom margin of one page and top margin of the next.

1. Edison seems to have drafted this memorandum as a prospectus for a specific person or group, but the editors have not identified who he had in mind.

2. The editors' conjecture of this approximate date is based on comparisons with other sources. The organization of the New Jersey and Pennsylvania Concentrating Works (NJPCW), referred to below as having happened six months earlier, occurred in December 1888. Edison spent the second week of July in and around Bechtelsville, Pa., and afterwards would have been in a good position to write about his mining operations there. His descriptions accord with other accounts published in the middle of July. NJPCW minute book, 27 Dec. 1888, pp. 1–4, CR (*TAED* CJ074001); see Doc. 3381 regarding Edison's absence from Orange; "Edison's Machine for Preparing Ore," *New York Tribune,* 15 July 1889, 1; "Edison's Ore Plant," *St. Louis Republic,* 18 July 1889, 2; "Edison's Scheme a Success," *Pittsburgh Dispatch,* 18 July 1889, 5.

3. Blast furnace technology improved continuously throughout the late nineteenth century so it is hardly possible to make clear distinctions between old and new types of furnaces, even if Edison had specific ones in mind. The years 1888 and 1889 were notable for the number of new blast furnaces constructed, especially in the South generally and Alabama in particular. Twenty furnaces were built or underway in Alabama in 1888 and 1889 compared with just five in Pennsylvania. Generally speaking, newer furnaces were larger and fired with bituminous coal or coke instead of anthracite coal or charcoal. Pennsylvania was something of an exception in the northeast, having a number of furnaces burning bituminous coal or coke; other northeastern states used charcoal, anthracite, or a mixture of anthracite and coke. American Iron and Steel Association 1890, v–viii, 1–31; "Growth of the Iron and Steel Industries of the United States in 1890 and 1891," *Bulletin of the American Iron and Steel Association* 26 (24 Feb. 1892), 50.

4. See Doc. 3358 n. 33.

5. That is, the New Jersey and Pennsylvania Concentrating Works.

6. Edison's new locating "process" was a dipping needle consisting of a magnetized needle suspended on a thread. The needle would naturally align itself with the earth's magnetic field, and deviations measured against a background scale would indicate the presence of magnetic ores. Perhaps based in part on information Edison had gleaned about a similar "Tiborg Instrument," his dipping needle differed from others commonly in use in that the needle was not held in place by dual horizontal brass pivots connected to a circular case, which required the prospector to align the pivots with the earth's magnetic field. Kennelly Notebook #1:154, Lab. (*TAED* NM023154); R. Johnson 2004, 6–8.

7. Mispickel is “an arsenical sulphuret of iron.” Large veins of gold-bearing quartz had been discovered in Marmora, Ontario. Most of the gold reportedly was concentrated in bands and crystals of mispickel in the quartz. The mispickel at Marmora was about 55 percent iron, 25 percent arsenic, and 20 percent suphur. Rothwell 1881, 3.

8. Marmora, Ontario, a township about midway between Ottawa and Toronto on the Central Ontario Railway, was the site of both iron and gold mines by the late nineteenth century. Charlton et al., 1900, 22–28.

9. Edison apparently referred to the total price paid for all the stock shares of the three manufacturing shops by the Edison General Electric Co., not to the amount he personally received in the transaction. Edison General Electric Co. draft agreement with Sherburne Eaton, Apr. 1889, Miller (*TAED* HM89AAL).

10. That is, Silver Lake, N.J.

11. Edison probably meant the Morris Canal. A major freight artery, especially for anthracite coal, the canal connected Phillipsburg in eastern Pennsylvania to the Passaic River at Newark and ultimately the Hudson River at Jersey City, passing near the Bloomfield-Silver Lake region. Shaw 1884, 1:190–92.

12. That is, the Edison Manufacturing Co.; see Doc. 3439.

–3390–

From Robert Thurston

Paris Aug 1st ’89

My dear Mr. Edison:

The Grand Jury confirmed, as I suppose everyone expected it would, the award of the “Diplome d’ Honneur” to you, the “Grand Prix,” for your grand exhibit and inventions.

I do not suppose that there is the slightest probability of the “Superior Commission” disturbing this award.[1] Should any danger appear, I shall[a] stay—as I am a member of that body—and work with it until ~~a~~the awards of the lower juries are passed upon. But I do not think it will be necessary. Yours truly

R. H. Thurston

ALS, NjWOE, DF (*TAED* D8905AEV). [a]Obscured overwritten text.

1. Thurston was among the eighty members of the Exposition’s superior jury by virtue of being vice president of Group VI. The body adjudicated hundreds of questions and disputes about prizes but none, so far as the editors have learned, involving Edison. A grand prize, the highest of the Exposition, was given to about fifty exhibitors. Edison’s award was for his exhibit as a whole. U.S. Commissioners 1890, 1:83–90, 424–25.

–3391–

Orange, N.J. Aug. 1. 89[a]

Memorandum: Laboratory Projects

Clock phonograph[1b]
Smaller cheap doll phono.[b]
Electric Brake.[2]
Electric Rock Drill.=[3]
Electric Tricycle.[4]
Mailing phonograms.[b] <Finished>[5c]
Building for duplicating at Silver Lake[6]
[~~Four~~?][d] Tripod dipping needles for Magnetic Surveys[e] Six of these.[7f]
One Telephone induction balance[b] <gave John instructions>[8]
Dies for moulding new material which Aylsworth has when suitable either for mailing or musical cylinders[9]
Dipping machine for veneering musical cylinders[b]
Model glass blowing machine for Lamps bulbs[b]
" " " " for inside parts.[10]
Shultzberges[11] appartus for duplicating[12b]
Saphire making Machinery[13]
Model Cabinet for house phonographs:[14b]
Plans etc for Cabinet shop on Phonograph[g] grounds[15]
New Central power plant at Silver Lake:[16]
Rhigolene process for preserving meats fruit[g] etc.[17]
Non-inflammable insulation of the type made by Marshall and Type made by Fessenden.[18]
Contact Machine for large iron ore seperation[19b]
Water Seperating Iron Ore Machine.[20]
Two talking Machines for Dolls at Antwerp[21]
Moulds etc for Doll Rings—[22]
Design new Street car motor[23h] Batchelor Kruezi & Henderson[24] to decide it= Insull promised Draughtsman—[25] Model to be got out [Cellar?][j] & worked Batch & Ott with the Draughtsman to work up complete thing & then final~~ly~~ meeting with K[26] & H[27] & if ok bld one at Schenectdy—[28]

John Ott=[29]

New design for Cabinet House phono—[i]
Dipping Machine for Veneer cylinders[i]
Press & devices for mfg phonographic Crayons[30i]
Mailing Cylinder Model for ¼ size & full size[i]
Different sizes new battery as per catalogue[31i]
Water Motor for phono—[32b]
Toy phono & tools, starting manufactures[33b]
3 Machines for talking blanks for Europe[34]

Design for very small ~~ph~~ doll phono—cheaper—[35]
Help Dixon[36] on ~~ph~~ Kinetoscope[37]
Freight Brake[k] <Motor not more than 50 lbs>[38l]
Tricycle Motor & Battery[39k]

AD, NjWOE, DF (*TAED* D8968AAK). Letterhead of Edison laboratory. [a]"*Orange, N.J.*" preprinted. [b]Line of text preceded by "X." [c]Marginalia written by John Ott. [d]Canceled. [e]Enclosed by bracket; line preceded by "X." [f]"Six of these." interlined above with line drawn to bracket. [g]Obscured overwritten text. [h]"Design new Street Car motor" written by Charles Batchelor. [i]Line of text preceded by "X" and marked with a horizontal line, probably to indicate completion by John Ott. [j]Illegible. [k]Line of text preceded by line drawn on page. [l]Marginalia written by Batchelor.

1. It is unclear whether Edison referred to a phonograph for clocks or a clockwork phonograph. "Clock Phonograph" was listed as experiment #158 in N-87-11-24 (Lab. [*TAED* NL002AAA, image 8]) and appears in laboratory time sheets (NjWOE) as the primary work performed by machinist Julius Lux for the week ending 3 May 1888.

2. See Docs. 3358 and 3399.

3. On 14 April 1888, Charles Batchelor "made for Mr E. some experiments that he gave me in February in regard to a new electrical device for rock drilling." His journal entry included a drawing and description of the device. Arthur Kennelly subsequently conducted experiments with rock drill apparatus in mid-August 1889 and then with a modified design during February 1890. This latter design may be the one that pattern maker J. G. East worked on in the second week of September and draftsman William Burlingham worked on during the last two weeks of October. Although Edison General Electric began manufacturing and marketing two forms of electric rock drill in 1891, neither was based on Edison's designs. Cat. 1337:50 (item 548, 14 Apr. 1889), Batchelor (*TAED* MBJ004050A); Kennelly Notebook #2:26–27, 154, 158–9, 163, Lab. (*TAED* NM024023 [images 31–32], NM024154A, NM024156 [images 169–70], NM024163); Time Sheets, WOL; "The Electrical Transmission and Conversion of Energy for Mining Operations," *Power* (20 June 1891): 228–33.

4. Tricycles were among the first vehicles equipped with electric motors. Gustave Trouvé demonstrated the first electric tricycle in Paris in April 1881 using a small motor powered by Planté storage batteries. The next year, William Edward Ayrton and John Perry used Faure storage batteries to drive an electric tricycle in London. Edison may have been spurred to experiment in 1889 by reports of John Vaughan Sherrin's development of a motor and primary battery to power tricycles, which the Sherrin Electric Generator Co. in London began to manufacture the following year. Alfred Eugene Wiener, an employee of the Edison Machine Works in Schenectady, designed a "½ HP. Octopolar Motor. For Mr Edisons Tricycle" on 20 June. Arthur Kennelly conducted experiments in October on "the best arrangement of Lalande Battery to suit the motor designed by Wiener for Mr Edison's tricycle." Little else is known about Edison's experiments, but in 1896 the *New York Times* reported, "Some time ago Mr. Edison directed his attention to this

matter" and was "convinced that there is a great future in the tricycle propelled by electricity." Desmond 2015, 50–52; Nicholson 1982, 294, 305, 308; "Electric Tricycles," *Teleg. J. & Elec. Rev.* 11 (28 Oct. 1882): 339; "An Electric Tricycle," *Cassell's Family Magazine* (1883): 253; "English Trade Notes," *Wheel and Cycling Trade Review* 6 (24 Oct. 1890): 254; Kennelly Notebook #2:64–65, Lab. (*TAED* NM024064B, NM024065); "Planning an Electric Tricycle," *NYT,* 5 Jan. 1896, 26.

5. This entry may refer to the "Tools for Mailing Cylinders" on which work began in May 1889. Ledger #5:525 (*TAED* NL011A1 [image 185]); see also note 9 below.

6. See Doc. 3372 n. 10 regarding the Silver Lake factory buildings.

7. Account records for "Six Magnetic Dipping Compasses and Tripods" can be found in Journal #5:226 and Ledger #5:542, both WOL (*TAED* NL016A1 [image 115]; NL011A1 [image 194]); see Doc. 3389 n. 6 for a description of Edison's design.

8. The editors have not found Edison's instructions to John Ott, but Fred Ott worked during the second week of August on a magnetic induction balance that was subsequently charged to the Edison Ore Milling Co. A telephone induction balance, invented by David Hughes (whose priority was disputed by Edison), had famously been used by Alexander Graham Bell in 1882 in an unsuccessful effort to detect the assassin's bullet lodged in President James Garfield. In 1880, engineer James Munro had suggested using the instrument to detect ores, an idea later included in his book *Electricity and Its Uses*. Time Sheets, WOL; Ledger #5:543, WOL (*TAED* NL011A1 [image 194]); "Professor Hughes Induction Balance," *Sci. Am.* 40 (19 Apr. 1879): 244; "Prof. Edison's Induction Balance for Telephone Lines," ibid., 245; Bell 1882; "'Prospecting' Metal Veins by the Induction Balance," *Electrician* 4 (17 Jan. 1880): 103–5; J. Munro 1883, 101.

9. Having attended Purdue University for a year, Jonas Walter Aylsworth (1868–1916) started in Edison's new laboratory as a chemist in late 1887. He was associated with Edison for most of his working life ("Obituary—Jonas Walter Aylsworth," *Journal of Industrial and Engineering Chemistry* 8 [July 1916]: 659; App. 5). Sometime between mid-August and mid-September 1889, Aylsworth recorded in his notebook on wax cylinder experiments: "For mailing cylinder Mr. Edison desided to use hard rubber shell dipped in Reg wax. For veneer Music #   (of Substitute for hard rubber experiments) for base coated with #1047." The entry for 1047 noted that it was "an exact duplicate of Reg[ular wax] (1029) and is cheaper and easier to make." Wax 1029, he noted, "Talks even better than old Reg, and makes an excellent musical cylinder." Both 1047 and 1029 were "excepted [sic] by Mr Edison as regular." On 22 August, Edison cabled from Paris: "Send me several letters spoke on new mailing gram also Gouraud" (N-88-08-23:136–7, 144–45, 161, Lab. [*TAED* NB050129 (images 69, 73), NB050161]; TAE to [Samuel Insull?], 22 Aug. 1889, DF [*TAED* D8905AFI]).

10. Two laboratory projects may be related to these machines: no. 323 was a machine for sealing carbons in bulbs and 360 was one for blowing glass bulbs in molds. N-87-11-24, WOL (*TAED* NL002AAA).

11. Franz Schulze-Berge (1856–1894) received his Ph.D. under Hermann von Helmholtz and Gustav Kirchoff in 1880. He joined the

staff of Edison's West Orange laboratory in December 1887 and had charge of experiments on duplicating phonograph records until he left the laboratory in June 1891. Doc. 3109 n. 10; Time Sheets, WOL.

12. The best account of this apparatus is Charles Wurth's testimony in a patent interference between Edison and Frank Lambert, later entered as evidence in *National Phonograph Company v. Lambert Company* (pp. 256–57, Lit. [*TAED* QP009241, image 21]).

13. See Doc. 3349 n. 10.

14. The editors have found no information about this cabinet, but a later undated [1892?] North American Phonograph Co. circular shows a cabinet for "Domestic Phonograph Outfits for home use" (PPC [*TAED* CA027E]). Drawings from around this time show a cabinet with a typewriter table, most likely for office use (Unbound Notes and Drawings [c. 1889], Lab. [*TAED* NSUN12, images 22–23]). The North American Phonograph Co.'s catalog shows a form of cabinet sold by the company in 1889 (Illustrated Catalogue of Parts of the Phonograph, p. 26, PPC [*TAED* CA027B]).

15. The editors have not determined if plans were prepared, but descriptions of the Phonograph Works in 1893 do not mention such a building. Dickson and Dickson 1894a, 142–43; "The Edison Phonograph Works," *Electrical Age* 11 (18 Mar. 1893): 166.

16. Draftsmen William Burlingham and Eb. W. Thomas worked on the power plant for the Edison Manufacturing Co. in late September and early October. Time Sheets, WOL.

17. Brief experiments on beef preservation were made by chemist Alexander Brigham in July and then by Dr. Frank Deems from mid-August through the first week of November (Time Sheets, WOL; see also Ledger #5:536 (*TAED* NL011A1 [image 191]). Regarding the freezing qualities of rhigolene, see Doc. 3265 n. 8; for Edison's earlier efforts to preserve food using a vacuum, see Docs. 845, 2090, and 2096.

18. David Trumbull Marshall and Reginald Fessenden were working on insulation compounds involving a chlorine substitution method, for which Edison filed an application for a basic patent in May 1889. See Doc. 3342.

19. See Doc. 3375 n. 2.

20. See Doc. 3375 n. 3.

21. The editors have found no further reference to these devices but see Doc. 3354.

22. The "Rings" were the narrow cylinders on which the doll's message was recorded. Account records include entries for "Twelve Wax Moulds for Toy Phonograph" from August and September 1889 and for a "Press for Moulding Toy Phonograph Cylinders" from September 1889 to March 1890. Ledger #5:545, 549, WOL (*TAED* NL011A [images 195, 197]).

23. Edison probably had in mind not just the motor itself but the entire drive mechanism described in Doc. 3388. To aid in the design of the motor, Charles Batchelor asked attorneys Dyer & Seely to get copies of all U.S. patents on car motors and locomotion, and he asked John Henderson for "drawings of street car running gear to adapt to different plans that we have devised for running them by electricity." During September, Arthur Kennelly worked on a street car motor with a Gramme ring armature designed to supply seven horsepower. Batchelor

to Dyer & Seely, 21 Aug., 1889; Batchelor to Henderson, 4 Sept. 1889; Lbk. 32:125, 223 (*TAED* LB032125, LB032223); Henderson to Batchelor, 10 and 21 Sept. 1889; J. G. Brill Co. to Henry Iselin, 20 Sept. 1889; all DF (*TAED* D8938ABM, D8938ABN, D8938ABO); Kennelly Notebook #2:43, 47–48, 60, Lab. (*TAED* NM024043 [images 48–49, NM024058A [image 66]).

24. John Carlos Henderson (1844–1907) was a mechanical engineer who had worked with Henry Villard and the Edison Co. for Isolated Lighting. He succeeded William Marks as chief engineer of the Edison General Electric Co. by early September. Doc. 3016 n. 3; Charles Batchelor to Henderson, 4 Sept. 1889, Lbk. 32:223 (*TAED* LB032223).

25. Batchelor wrote to John Kruesi on 9 August regarding Insull's promise "when he was here that we should have a draughtsman from the Edison Machine Works to do some work that we are now getting up on motors &c &c." Perhaps in response, draftsman George Mayer began working at the laboratory on 2 September, where he spent much of his time on the street car motor between 16 and 29 September. Batchelor wrote to Insull's stenographer and confidential clerk William Gilmore on 24 September that he could use another draftsman. Gilmore replied the next day recommending William Burlingham, and Burlingham was working on the electric street car motor at the laboratory two days later. Batchelor to Kruesi, 9 Aug. 1889; Batchelor to Gilmore, 24 Sept. 1889, Lbk. 32:62, 403 (*TAED* LB032062, LB032403); Gilmore to Batchelor, 25 Sept. 1889, DF (*TAED* D8930ABI); Time Sheets, WOL.

26. Probably John Kruesi.

27. Probably John Henderson.

28. The editors have found no evidence of such a meeting or that this device was made in Schenectady. Motors for the Orange Crosstown and Bloomfield Railway were made at the laboratory (see Doc. 3457 n. 2).

29. Edison wrote this line and the remainder of this list on a separate sheet.

30. During the week ending 23 May 1889, Reginald Fessenden and machinists S. Wheelwright and John Spoerri worked on "Tools for Crayon Press." By August, the Edison Phonograph Works furnished "red crayons to mark where mistakes occur" in dictation. Time Sheets, WOL; "Inspector's Handbook of the Phonograph, made by the Edison Phonograph Works, Orange, N.J. August, 1889," p. 64, PPC (*TAED* CA025B); cf. Doc. 3353 n. 45.

31. In September and October, Charles Batchelor determined the cost of producing phonograph batteries and calculated their sale price; the Edison Manufacturing Co. subsequently published a price list for various battery sizes. Cat. 1337:72, 79–80 (items 583, 593–94; 12 Sept., 3 and 13 Oct. 1889), Batchelor (*TAED* MBJ004072A, MBJ004079B, MBJ004080A); N–89-08-15, Lab. (*TAED* NB074AAC [image 11]); Edison Manufacturing Co. 1889.

32. Such a motor would be run by the pressure of a municipal water system. Andem 1892, 9–10; Dickson and Dickson 1894a, 151.

33. See Doc. 3417.

34. The editors have found no information about these machines.

35. The editors have found nothing further about this small doll phonograph, but see Doc. 3360 n. 3.

36. That is, William Kennedy Laurie Dickson (1860–1935), who

joined Edison's work force in 1883 and was now an experimenter and photographer in the laboratory. Doc. 3109 n. 7.

37. This entry elides two crucial changes in motion picture devices being developed at the laboratory about this time. The first was in the kinetograph, where Edison abandoned the rotating cylinder used to record a series of tiny images (cf. Docs. 3307 and 3358). In place of the cylinder, Edison and William K. L. Dickson used strips of flexible film that could be advanced by stop-and-start motion and unwound and rewound on spools. In later testimony, Edison recalled that the film could be brought to a full stop more easily than a large cylinder and could remain at rest longer than it was in motion, which helped to produce clear images. It was also easier to create clear images on flat film than on a curved surface. A film of potentially great length further offered the chance to use larger images than those that could be squeezed onto a cylinder's limited surface (Edison's testimony, p. 3–10, *Edison Manufacturing Co. v. Kleine Optical Co.,* Lit. [*TAED* QM002001]). The celluloid film was developed by George Eastman for his new Kodak camera and was one of several types that the laboratory experimented with (see Doc. 3435; Spehr 2008, 138–39). In addition to its other advantages, it was more sensitive than the stock used in the earlier cylinder devices, and Edison acquired batches of it through Dickson's efforts over an indeterminate but significant period of time. The strips were ten to fifteen feet long and trimmed at the laboratory to less than ¾ of an inch wide. They were perforated on one side by a punching machine developed at the laboratory so the film could more readily be started and stopped. (A photograph of the punching machine was later entered into the record of a lawsuit.) Film was pulled past the shutter at thirty-five to forty images per second by a phonograph motor. The kinetograph's development was very much a part-time project, especially for Dickson, who was busy on ore milling, but the instrument was completed and "a number of views were taken of moving objects" before Edison left for Paris in early August (Dickson and Dickson 1894b, 208; Edison's testimony and complainant's exhibit, pp. 97, 421, *Edison v. American Mutoscope Co. & Keith*; Dickson's testimony, pp. 162–63, *Motion Picture Patents Co. v. Chicago Film Exchange*; Eastman's testimony, ibid., pp. 173–75; all Lit. (*TAED* QM001140, QM001 [image 243], QM003143, QM003172); Dickson time sheets, WOL).

The second big change came about soon after the switch to film, when Edison asked the laboratory to build a machine for viewing kinetograph films. Machinist Charles Brown (who assisted Dickson with motion picture experiments) testified years later that Edison gave the order just before leaving for Paris, and there was a burst of work by machinists and experimenters charged to the laboratory's motion picture accounts from the last days of July. The viewing device was known as the kinetoscope. The first design "was a rough box made of pine, with a hole in the top to look through, and these [strips of film] were run over wheels with a lamp underneath it." While Edison was away, the work on motion pictures, including the kinetoscope, was moved from Room 5 on the second floor of the main laboratory building to a new photograph building constructed nearby. The new building was put up on the order of Charles Batchelor because Dickson and Brown had to stop the elevator next to Room 5 "every time we wanted to take any pictures, because it would jar the room" (Brown's testimony, pp. 150, 157, and Complainant's Exhibits, pp. 360–61, *Edison v. American Mutoscope Co. & Keith,* Lit. [*TAED* QM001140, QM001 image 200]). The kinetoscope was completed before Edison's return in early October, when he was immediately shown several kinetograph films. Years later, Edison recalled those early results as "very satisfactory, the rate of re-presentation being about 40 to 45 per second, and the re-presentation of the motions of the men was perfection natural and true to life" (Edison's testimony, p. 2, *Edison Manufacturing Co. v. Kleine Optical Co.,* Lit. ([*TAED* QM002001]). Within a few days of that demonstration to Edison, Dickson had arranged to project the moving images on a screen. Looking back, Edison called this "the natural thing to do.… It simply involved putting a lamp behind the picture strip and substituting a projecting lens for the photographic lens." Edison described and illustrated the kinetoscope as it stood at the end of October, particularly the film-advancing mechanism, in Doc. 3435 (Edison's testimony, pp. 13–14, *Edison Manufacturing Co. v. Kleine Optical Co.,* Lit. [*TAED* QM002001]).

38. See Doc. 3399 n. 1.

39. See note 4 above.

EDISON'S EUROPEAN TRIP Docs. 3392, 3393, 3394, 3395, 3396, 3401, 3403, 3405, 3411, 3412, and 3413

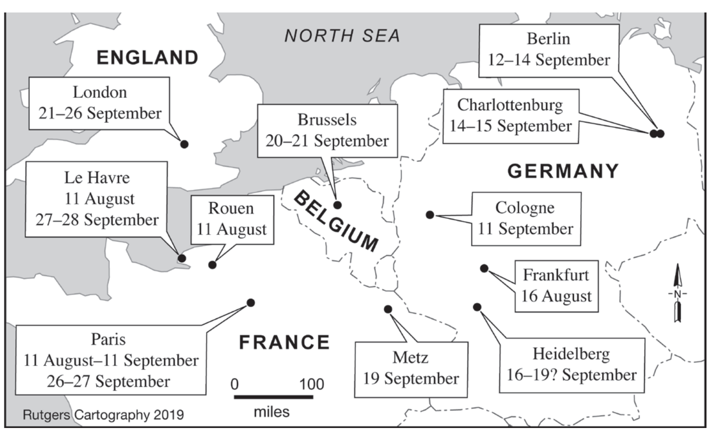
The highlight of 1889 for Edison, and arguably one of the most important events of his life, was his late summer trip to visit the Exposition Universelle, a world's fair in Paris celebrating the centenary of the French Revolution. This was the exposition for which Gustave Eiffel erected his famous tower that still dominates the skyline of the City of Light and has long since become an emblem of France itself. Edison was making his first trip there, and Paris and the French people welcomed him—an American symbol of republicanism—like a conquering hero. His stay in the capital had all the trappings of a state visit, with nightly banquets in his honor and receptions accorded him by everyone from the French president to the city's leading newspaper. Despite the importance of the trip for Edison's international reputation, he left very little evidence of his own impressions of the Exposition or his subsequent travels in France, Germany, and England. *Le Figaro,* the Paris-based daily newspaper, provided a near-daily record of his activities in France, but his own outgoing correspondence was either devoted largely to business or intended for public consumption, like his note to Gustave Eiffel in the Tower guest book (Doc. 3412) or comments to various newspapers (such as Doc. 3411). Letters written by those traveling with him offer more intimate perspectives; from these, the editors have selected two by Mina Edison (Docs. 3392—written before the Edisons' steamer had yet reached France—and 3394) and three by Margaret Upton, the new bride of longtime Edison associate Francis Upton (Docs. 3396, 3401, and 3403). Edison's own memories of his experiences abroad are included in Appendix 1; written years later, they made their way into the authorized biography by Thomas Martin and Frank Dyer. Alfred Tate, Edison's secretary, and British journalist Robert Sherard published their own recollections.[1]

Shunning publicity, Edison kept his departure as private as possible. He and Mina had traveled to Akron, Ohio, in July to entrust one-year-old Madeleine to the care of Mina's parents.[2] Then on the morning of 3 August, they boarded the steamer *La Bourgogne* in New York, sailing in company with honeymooners Margaret and Francis Upton.[3] As the *New York Times* reported, Edison had his name kept off of the passenger list and arrived at the dock at the last minute in a closed carriage in a pouring rain. The *Times* noted that Edison's health had "been poor recently" and that "his contemplated journey was not generally known." In spite of the rain and the news blackout, many friends were on hand to see the Edisons off. And as *Le Figaro* reported, a number of Edison's employees surprised him at the moment of departure with a phonograph and some cylinders on which they had recorded wishes for a good trip.[4] The voyage itself was uneventful and the Edisons enjoyed the ship's amenities, including dining at the captain's table. Edison was unaffected by seasickness and, evidently recovering his vitality, felt "perfectly well all the time." Mina, though, fretted over her separation from Madeleine, using the baby's photographs as bookmarks and longing to hold her. She also worried that she would find herself ill at ease in Paris amid the formal manners of the French (see Doc. 3392).

La Bourgogne arrived at Le Havre on Sunday morning, 11 August, in what *Le Figaro* described as "a bad storm." The Edisons were almost immediately greeted by associates along with French officials and journalists who came out to the ship aboard a tugboat.[5] Although Mrs. Upton seems to have recalled the event differently, *Le Figaro* noted that Edison "waved his handkerchief and smiled as his friends arrived." Among the dignitaries were: Charles Porgès, president of the Compagnie Continentale Edison; Amédée Vernes, director of works at the Champs de Mars exposition grounds; Alfred Tate, arrived from London the day before; William Hammer; Albert Dick; and author Émile Dürer, who published a short book on Edison soon after.[6] As reported in *Le Figaro,* "the party convened with Edison in the gaming room of *La Bourgogne*. Everything was said in English. Edison only knows two words in our language, 'bien' and 'merci.'"[7]

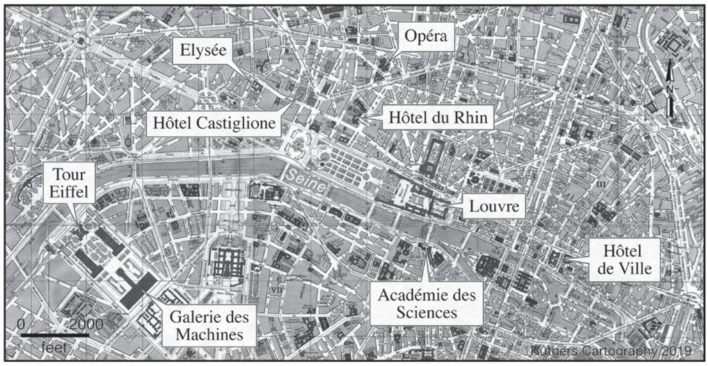
As *La Bourgogne* was brought into Le Havre, the passengers cheered "Vive Edison!" The inventor, in the meantime, was already peppering his associates with questions: Were foreigners numerous at the moment in Paris? Was M. Eiffel in town? Has the weather been good the last month? Was the Exposition as successful as reported? When the ship finally docked, it was greeted by "an impatient, colorful, tired crowd" that had gathered to gain a glimpse of the famous American. Edison now remarked that his visit was not a business trip. "I want to rest and relax," he told the French press; "It is in some fashion a pleasure trip, a honeymoon trip, I come like everyone else to see the Eiffel Tower."[8]

From Le Havre, the Edison party, including the Uptons, Tate, Edison's lawyer Eugene Lewis, and Porgès and his daughter, were ushered into a special private compartment on the train to Paris. After a twenty-minute stop in Rouen, where Edison was greeted by U.S. Consul Peter Williams, the train resumed its trip to the French capital and reached the Gare Saint Lazare. Here the Edisons were met by Mina's sisters Mary and Grace, financier Robert L. Cutting, prominent doctor Henri Nachtel, employees from Edison's French company, and other well-wishers. In a bid to avoid the crowds, Edison's party exited the station by a side door to four waiting carriages in livery, which conveyed them to the luxurious Hôtel du Rhin in the Place Vendôme.[9]



European itinerary, August–September 1889.

Edison in Paris, August–September 1889.



In spite of these precautions and his declaration that this was a honeymoon trip, Edison found himself beseiged. "Poor Mr. Edison has not had a moment that he could call his own since our arrival," Mina informed her mother a few days later. In an attempt to maintain some semblance of privacy, Alfred Tate was installed at the Hôtel Castiglione just around the corner from the Hôtel du Rhin. Anyone wishing to see Edison was told to apply to Tate, who reported that "they came in droves, mostly aspiring young inventors seeking advice or endorsement of their inventions."[10]

Edison and Mina, along with her sisters and young Marion Edison, the latter of whom came from Britain to join them, settled into a suite on the hotel's first floor. Although as Mina noted, she and Edison had "practiced French customs so much at home" that they now came naturally, she still seemed ill at ease, worrying even before she landed that her sisters, having arrived earlier, might have already adapted themselves to French social customs. Mina was also uncomfortable with all the attention her famous husband received. "I see almost nothing of Mr. Edison," she complained after only a few days in Paris. She was also unimpressed with French society. "The people are simply unbearable," she told her mother; "they are thoroughly immoral. I would not live here if they presented me with a palace all the days of my life to live in." Edison, though, seemed to enjoy himself despite having scarcely a moment to himself. "I hardly think he will want to leave when the time comes for us to go," Mina mused. In spite of the adulation, he remained, according to his wife at least, "the same as when we left home as far as vanity goes."[11] Amid the whirlwind of their stay in Paris and brief return in late September, the Edisons took time to shop at the Bon Marché and other establishments. Surviving receipts show they spent thousands of dollars. Many of the bills are not itemized but came from shops specializing in clothing, fabrics, and personal effects.[12]

Almost as soon as Edison was situated, Colonel George Gouraud arrived from London. *Le Figaro* reported, inaccurately as it turned out, that he brought a phonogram from Queen Victoria congratulating Edison on his "precious discoveries." The following afternoon, his assistants William Hammer and Adelbert Wangemann conducted him to the Exposition, after which he and Mina were reported to have gone for a stroll through the city.[13]

The Edison exhibit in the Palais des Machines, which would eventually win a grand prize for electrical appliances, encompassed nearly 9,000 square feet, or about one-third of the space allotted to American machinery. Edison entrusted electrical engineer William Hammer to organize the exhibit at Orange and to install and manage it in Paris. In spite of being "the largest and most important exhibit in the show," as Hammer put it, it was also the only one in the Palais des Machines to open on time. Edison phonographs were also exhibited to the public outside of the Edison exhibit itself—in the Special Phonograph Pavilion in the Industrial Section, in the Telephone Pavilion, and in the exhibit of the Compagnie Continentale.[14]

Assembled at a cost of $75,000 to $100,000, the Edison exhibit showcased some 493 of his inventions—old and new—divided into discrete departments. Included were virtually all of his innovations in telegraphy, telephones, lighting, underground tubing and wiring, batteries, lamp manufacture, ore milling, and meters. But it was the new "perfected" wax-cylinder phonograph that proved the hit of the show. According to Hammer, some 20,000 to 30,000 people listened to it each day during the Exposition—more than 4 million all told. Edison had made sure that his inventions were presented, as Hammer explained to the Paris edition of the *New York Herald,* not in "a commercial display, but a scientific one. We sell nothing, give no prices, solicit no trade." Still, it was clear that Edison and his business associates hoped the success of the exhibit would translate into future sales.[15]

Edison made a number of visits to the Exposition, but one of the most notable took place on 13 August, when Gustav Eiffel's son-in-law, the engineer Adolphe Salles, conducted him and Mina for the first time to the top of the great tower, where they were received by Eiffel's sister.[16] Here Edison was honored with a party in Eiffel's private apartment just below the beacon. Margaret and Francis Upton and Alfred Tate were among the guests, as were Russell Harrison (son of President Benjamin Harrison), the Count and Countess of Mareuil, and the Italian Count Giuseppe Primoli, who took photographs. Gustave Lyon, president of piano makers Pleyel Wolff & Company, organized a concert in the Eiffel apartment, which Adelbert Wangemann recorded on one of the new phonographs. After the party at the top, Edison descended to the second stage of the tower and visited the printing shop *Le Figaro* had set up there to publish a special edition during the Exposition. "Magnificent idea! Splendid idea!" he is reported to have said, plunging in to help the printers make plates and get out their next edition. While on the second stage, Edison also met a party of Native American members of Buffalo Bill's Wild West Show, which was performing just outside of Paris to take advantage of crowds bound for the Exposition. Chief Rocky Bear led the Sioux in a series of what were reported to be "war whoops" by way of greeting Edison, who seemed pleased to see them and asked what had become of their chief Sitting Bull, whom he had met years before. Afterward, Edison was the guest of honor at a luncheon for thirty at the Brébant restaurant, also on the second stage of the tower. That evening, he attended a dinner given by Whitelaw Reid, the U.S. Minister to France, in honor of Russell Harrison.[17]

Edison returned to the Exposition the next day to visit the Telephone Pavilion. Here he was met by Alfred Berthon, director of the Société Générale des Téléphones. Berthon introduced him to the théâtrophone, a public coin-operated telephone that allowed users to hear live performances from the Paris Opéra anywhere in the city. According to *Le Figaro,* "Edison found himself in communication with a concert, and he was so delighted that he engaged the inventors to establish a similar system of automatic communication in New York," though it never took root in the U.S.[18]

Edison learned soon after his arrival that Italy's King Umberto I had named him a grand officer of the Order of the Crown. On 16 August, the king's emissary, Cavaliere Enrico Copello, appeared at Edison's hotel with the insignia, which journalist Robert Sherard reported made Edison an Italian count and his wife a countess. To celebrate, Edison and Mina invited Copello, Sherarad, and Émile Dürer to lunch with them at the Brébant (see Doc. 3395).[19]

Louis Rau hosted a dinner that evening for the Edisons and Uptons at Bignons, one of the finest restaurants in Paris.

Afterward, the whole party attended the ballet *Excelsior,* an allegory of electrical progress, at the Eden-Théâtre. Edison and Upton left their wives in the midst of the performance to attend a scientific meeting at the residence of Prince Roland Bonaparte, returning later to the theater.[20]

The Edisons spent several additional evenings at the opera and the theater, where they quickly became the center of attention. On at least two occasions, Edison received ovations from the audience at the Paris Opéra while the orchestra honored him with "The Star-Spangled Banner." This happened on 17 August, after the first act of *Les Huguenots,* and again four days later between performances of the opera *Rigoletto* and the ballet *The Tempest* while the Edison party sat in the presidential box.[21]

On the morning of 19 August, Edison met privately for more than a half-hour with Sadi Carnot, the new president of the French Republic. In the afternoon, he was conducted by Gouraud and French astronomer Jules Janssen to the Académie des Science, where he promised to record for posterity the voices of all the academy members on the new phonograph; he received an ovation and toured the Académie building. In the evening, Edison attended a banquet of the Société Française de Photographie celebrating the fiftieth anniversary of the invention of photography. Janssen presided and Edison sat in the place of honor to his right. Also attending were Louis Pasteur and the scientist, inventor, and photographic pioneer Étienne-Jules Marey, with whom Edison would have individual encounters during his trip.[22]

Marey and Edison toured the Exposition together, at which time Marey showed off his Zoetrope, a rotating cylinder with viewing slits in the side and a series of coordinated still pictures or sculptures inside. When the viewer looked through the slits as the cylinder rotated, the subject of the pictures or sculptures appeared to move.[23] Some historians have held that Edison also visited Marey's Station Physiologique in the Bois de Boulogne, but so far no credible evidence has come to light to confirm this. Edison did visit Pasteur's Paris clinic and laboratory on 22 August. There he observed rabies victims being inoculated, including one "beautiful young boy" whom Pasteur said was beyond hope because he had come too late and been bitten too near the top of the spinal column.[24] Edison also took a trip outside of the city to Meudon to visit Janssen's observatory and laboratory. Here he saw the astronomer's gyroscope and perhaps also his photographic revolver, which took forty-eight photographs automatically in succession.[25]

Edison and Mina made an excursion by coach to Versailles on 24 August. Among the entourage were Grace Miller (and probably her sister Mary), Tate, the Uptons, Wangemann and his wife, Albert Dick, Eugene Lewis, Philip Dyer, and Émile Dürer. The party stopped for lunch at the famous Réservoirs hotel before going on to tour the museum and palace. They returned to Paris by 6 p.m.[26]

Edison was the guest of honor at a number of other notable events in late August and early September. These included an immense banquet at the Continental Hotel on 22 August, a 26 August reception by *Le Figaro,* a 9 September dinner at the Hôtel de Ville (city hall), and a banquet of the Society of Civil Engineers the next day. About three hundred persons reportedly attended the Continental Hotel affair, presided over by Charles Porgès. Among them were Gouraud, Upton, Hammer, Dick, and Tate, as well as Whitelaw Reid, William Preece, Adolphe Salles, Jules Janssen, Prime Minister Pierre-Emmanuel Tirard, Emile Chautemps (Municipal Council president), and representatives of the Parisian newspapers.[27]

One of the more spectacular events in Edison's honor was the reception given by *Le Figaro.* Among the attendees were: Reid, Dürer, Prince Roland Bonaparte, Buffalo Bill Cody, Emile Gautier, Princes Taïeb Bey and Mohamed Bey of Tunisia; Ramon Fernandez (minister of Mexico), General Nazare-Aga (minister of Persia), and General Tcheng-ki-Tong of the Chinese legation. Edison associates included Porgès, Dick, Wangemann, Cutting, and Dyer. The leading lights of the Paris stage provided entertainment, among them Berr and Bertiny from the Comédie-Française, Emma Eames from the Paris Opéra, cabaret singer Paulus, actress and singer Jeanne Granier, a group of Javanese dancers, and the comedian Coquelin cadet. Edison demonstrated the phonograph, played his recorded thanks, and stayed until 2 a.m. He also had Wangemann record all of the performers, either at the reception itself or over the next few days, so that cylinders could be distributed to them as souvenirs.[28]

The next day, Edison and his entourage, which included Marion, Mary and Grace Miller, Tate, Hammer, and Mrs. W. Preston Hix (wife of a longtime associate) and her daughter, attended Buffalo Bill's Wild West Show in the Paris suburb of Neuilly. Here Edison, who complained about the richness of French cuisine, was treated to an "American breakfast" of pork and beans, steak, hominy grits, apple pie, peanuts, cornbread, and biscuits, all served in one of Cody's enormous camp tents. After breakfast, the party attended the show where, according to Tate, Edison participated in a mock attack on the "Deadwood Coach." He and Mina sat inside the coach with New York lawyer Chauncey Depew and the wife of Nate Salisbury, the proprietor of Salisbury's Minstrels, while Alfred Tate took a position on the roof next to the rear guard. As the coach circled the enclosure, a Native American raiding party swooped in, firing blanks.[29]

About 120 persons fêted Edison at the dinner given by the City of Paris at the Hôtel de Ville. After dinner, Chautemps, who hosted, took Edison and most of the guests into the basement to inspect the Edison electric lighting plant installed in 1883. Then the Edisons attended the ballet *Coppélia,* in which Antonietta Dell'Era, who three years later would originate the role of the Sugar Plum Fairy in *The Nutcracker,* debuted.[30]

Edison returned to the Eiffel Tower on 10 September with his wife and daughter for a noon lunch given in his honor by the French Society of Civil Engineers and hosted by Gustave Eiffel at the Café Brébant. Eiffel, whom Edison had met three days earlier at a banquet given by Prime Minister Tirard, toasted Edison as "our dear and illustrious master." After the meal, Eiffel invited Edison's group to his apartment at the tower's top, where composer Charles Gounod played the piano and sang. On this occasion, Edison signed the guest book (Doc. 3412) and autographed a photo of himself and Salles that Primoli had taken on his prior visit.[31]

The following day, Edison and some of his party, which included Mina, Marion, his sister-in-law Mary, and William Hammer, left Paris by train for Berlin, traveling through Cologne where they may have stopped overnight. By way of thanking Parisians for their hospitality, he left 10,000 francs to the city to distribute among the poor. Edison arrived in Berlin on 12 September and took up residence at the Hotel de Russie near the Imperial Palace. That night he was honored with a dinner at the Union Club hosted by Werner von Siemens and Hermann von Helmholtz. The next day, Siemens conducted Edison on a tour of the German capital. They visited the Siemens & Halske establishment in the Markgrafenstrasse and also took in an accident-prevention exhibit. On Edison's instruction, Hammer and Wangemann conducted phonograph experiments at Siemens & Halske, including making recordings of the Franz Grenadiers' regimental band. Among the cylinders played was one Wangemann had made of the French cabaret singer Paulus a few days after his performance at the *Le Figaro* banquet.[32]

Edison spent the better part of 14 and 15 September in the Berlin suburb of Charlottenburg as the guest of Werner von Siemens (see Doc. 3393). He toured the Siemens & Halske factory on the morning of the 14th, returned to Berlin on his host's electric-powered boat *Electra,* then came back to the Siemens Charlottenburg villa in the evening for a dinner in his honor. During the banquet, Elizabeth Leisinger, a soprano of the Berlin Court Opera, performed selections from *Der Freischütz,* which were recorded on the phonograph.[33]

On the 16th of September, Edison traveled from Berlin through Frankfurt to Heidelberg to attend the first few days of the congress of the Association of German Naturalists and Physicians, scheduled to begin on the 17th. At Frankfurt, he and his party spent forty-five minutes in the station refreshing themselves—Mina and Marion on biscuits and grapes and Edison with a beer. He soon found himself besieged by the public and press and ended up speaking at length about the phonograph, the advantages of direct over alternating current, his impressions of Berlin's lighting systems, and other matters.[34]

Leaving the Heidelberg conference, Edison arrived in Metz on 19 September. He visited the iron forges at Ars-sur-Moselle in Lorraine before going on to Brussels, where he stayed overnight on the 20th at the Hotel Bellevue. The next day, he and his party departed for London by way of Calais.[35]

Edison's time in England was brief—just five days. He and Mina, along with her sister Mary, were guests at Cray's Foot, the country estate of Sir John Pender in Kent, just a short distance from London (see Doc. 3419). Reportedly suffering from a bad cold and sciatica, Edison curtailed his activities and remained out of the public eye his first two days in England. A reception Gouraud had planned at Little Menlo and a dinner with the Lord Mayor had to be canceled, though Edison did appear on 24 September for lunch with the Lord Mayor. That day, he also toured three of the electric power stations of the Metropolitan Electric Supply Company, built with Westinghouse alternating current machinery. The next day, he visited the construction site of the London Electric

Supply Company's massive Deptford Works before retiring to Cray's Foot for a dinner organized by the Penders (see Doc. 3419).[36]

The Edisons returned briefly to Paris on 26 September. Almost as soon as they arrived at the Hôtel du Rhin, Whitelaw Reid turned up to present Edison with the insignia of a commander of the French Legion of Honor.[37] The next day, Edison made a final short visit to the Exposition, visited the Elysée, and called at the residences of Reid and Eugène Spuller, the French Foreign Minister, to thank them for the Legion of Honor award. Then the Edisons boarded a special train for Le Havre at six o'clock. They embarked the next day (28 September) for New York aboard *La Champagne* of the Compagnie Générale Transatlantique, arriving home on 6 October.[38]

1. See esp. App. 1.B.38–48; Dyer and Martin 1910, 2:746–53; Tate 1938, chaps. 27–29; Sherard 1905, 172, 175–79.

2. Mary Valinda Miller to Mina Edison, 21 July 1889, MFP (*TAED* X018D1AR).

3. Margaret Upton to Edward and Helen Storm, 10 Aug. 1889, FRU Scraps., MS Group 988 (*TAED* X184B1).

4. "Edison Goes to Europe," *NYT,* 4 Aug. 1889, 13; "Edison en France," *Le Figaro,* 12 Aug. 1889, 2.

5. "Edison en France," *Le Figaro,* 12 Aug. 1889, 1.

6. Dürer 1889.

7. *Le Figaro* also mentioned "Mr. Dyt" (Philip Dyer), representing Anvers; Maj. Flood Page; reporter Mr. Vonhoven of the *Petit Journal*; a representative of *Le Figaro* (perhaps the reporter); former deputy Ferdinand Dreyfus, and Mrs. Porgès. "Edison en France," *Le Figaro,* 12 Aug. 1889, 1.

8. "Edison en France," *Le Figaro,* 12 Aug. 1889, 1.

9. Ibid.; see Doc. 3396.

10. See Doc. 3394; Tate 1938, 235.

11. See Doc. 3394; Mina Edison to Mary Valinda Miller, 14 Aug. 1889, EFP (*TAED* X018A703).

12. See Vouchers (Household), Box 2, esp. nos. 3442–69.

13. "À Travers Paris," *Le Figaro,* 13 Aug. 1889, 1; "The Queen to Mr. Edison," *Pall Mall Gazette,* 14 Aug. 1889, 6; "Mr. Edison Abroad," *NYT,* 14 Aug. 1889, 5. Sherard later reported that Gouraud asked him to debunk the story that Edison received "a phonographic message from the Queen." "With Mr. Edison on the Eiffel Tower," *Pall Mall Gazette,* 19 Aug. 1889, 1–2, reprinted in *Sci. Am.* 61 (14 Sept. 1889): 166.

14. Hammer [1889b?], cxxi, cxxiv–cxxvii, cxxxi, cxxxv–cxxxvii, cxxxix–cxli; Swift 2008, 103; "America at the Big Show," *NYT,* 10 June 1889, 2; "Paris Exhibition Awards," *NYT,* 30 Sept. 1889, 4; Hammer to Upton, 13 May 1889, DF (*TAED* D8946ABO); Jonnes 2009, 138.

15. Hammer [1889b?], cxxiv–cxxvii, cxxxi, cxxxv–cxxxvii, cxxxix–cxli; Jonnes 2009, 138.

16. Edison left his hotel with Russell Harrison at 9 a.m. to visit the

tower. "Edison's Pleasant Day," *New York Herald* (European edition), 14 Aug. 1889, 1.

17. Among Reid's guests were the marquis de La Fayette; Edward Bermudez, chief justice of the Louisiana Supreme Court; Perry Belmont, former ambassador to Spain; Gen. Rathbone; and the count of Turenne. "À Travers Paris," *Le Figaro,* 14 Aug. 1889, 1; "Edison's Pleasant Day," *New York Herald* (European edition), 14 Aug. 1889, 1; "Echos," *L'Écho de Paris,* 15 Aug. 1889, 1; Dyer and Martin 1910, 2:745; Jonnes 2009, 209–10.

18. "À Travers Paris," *Le Figaro,* 15 Aug. 1889, 1.

19. "À Travers Paris," *Le Figaro,* 14 Aug. 1889, 1; "À Travers Paris," *Le Figaro,* 17 Aug. 1889, 1; "Personal Paragraphs," *Western Electrician* 5 (14 Sept. 1889): 152; Sherard 1905, 175–89; Jonnes 2009, 240.

20. The Paris newspaper *Le Figaro* reported on 18 August that Edison attended *Excelsior* at the Eden-Théâtre the night before, occupying two boxes with family and friends. But because Edison was at the Paris Opéra the night of Saturday, 17 August, it seems likely that the newspaper erred and that Edison's party had been at the Eden-Théâtre one night earlier (Friday, 16 August), the same evening he attended the gathering at Roland Bonaparte's house. Doc. 3401 n. 5; Grace Miller Scrapbook, 16 Aug. 1889, MFP-N (*TAED* X466); "À Travers Paris," *Le Figaro,* 17 Aug. 1889, 1; "À Travers Paris," *Le Figaro,* 18 Aug. 1889, 1; "Courrier des Théâtres," ibid., 3.

21. Doc. 3401; "Courrier des Théâtres," *Le Figaro,* 22 Aug. 1889, 3; "Courrier des Spectacles," *Le Gaulois,* 19 Aug. 1889, 2; Grace Miller Scrapbook, 17 and 22 Aug. 1889, MFP-N (*TAED* X466); "Courrier des Théâtres," *Le Figaro,* 10 Sept. 1889, 4.

22. "À Travers Paris," *Le Figaro,* 20 Aug. 1889; *Bulletin de La Société Française de la Photographie* 5 (1889): 263, 268; Spehr 2008, 144–45.

23. Edison's witnessing of Marey's apparatus has subsequently been seen as a critical moment in the development of the kinetoscope, but the event is open to several interpretations. See, e.g., Spehr 2008, 144–47; Braun 1992, 28–30,189–90.

24. At the end of the year, Pasteur wrote Edison for a donation for the Société de Secours des Amis des Sciences, which aided aged and ill scientists, their widows, and children. Edison's contribution of fifty dollars gained him perpetual membership in the society. "Faits Divers," *Le Temps,* 24 Aug, 1889, 4; "À Travers Paris," *Le Figaro,* 23 Aug. 1889, 1; Pasteur to TAE, 1 Dec. 1889 and 15 Feb. 1890, both DF (*TAED* D8912ABL, D9011AAB); Tate to Pasteur, 23 Jan. 1890, Lbk. 36:272 (*TAED* LB036272).

25. See Doc. 3413.

26. See Doc. 3403; Grace Miller Scapbook, 24 Aug. 1889, MFP-N (*TAED* X466); "À Travers Paris," *Le Figaro,* 25 Aug. 1889, 1.

27. "À Travers Paris," *Le Figaro,* 23 Aug. 1889, 1; "Banquet to Edison," *NYT,* 23 Aug. 1889, 2; Grace Miller Scrapbook, 24 Aug. 1889, MFP-N (*TAED* X466).

28. "Edison au Figaro," *Le Figaro,* 27 Aug. 1889, 1; "Last echo from Last Night's Banquet," *Le Figaro,* 28 Aug. 1889, 1; "Last Echo from Our Banquet on Monday," *Le Figaro,* 30 Aug. 1889, 1. "'Sa Majeste Edison'," *New York Herald* (European Edition), 27 Aug. 1889, 1;

“Gossip Fresh from Paris,” *NYT,* 9 Sept. 1889, 2; Ernest Coquelin to TAE, 12 Sept. 1889, DF (*TAED* D8905AFZ).

29. Other guests included American actress Ada Rehan and playwright and director Augustus Daly. “Edison Out West,” *New York Herald* (European Edition), 28 Aug. 1889, 1; Tate 1938, 240–42; William Hammer, “Edison at Paris Expo. 1889” in manuscript “Mostly Notes about Edison” [n.d.], WJH (*TAED* X0980A, image 4).

30. “À Travers Paris,” *Le Figaro,* 10 Sept. 1889, 1; “Courrier des Théâtres,” ibid., 4; Tate 1938, 244; “The Paris Edison Company,” *Engineering* 48 (14 June 1889): 673.

31. *Le Figaro* reported that Edison also autographed the fan of Eiffel’s sister. Jonnes, 2009, 235–37; “À Travers Paris,” *Le Figaro,* 11 Sept. 1889, 1; “Mr. Edison’s Compliment to M. Eiffel,” *Pall Mall Gazette,* 12 Sept. 1889, 6.

32. Untitled, *Berliner Presse,* Sept. 1889; “Edison in Berlin,” *Freisinnig Zeitung,* 11 Sept. 1889; “Edison in Berlin,” *National Zeitung,* 17 Sept. 1889; “Mr. Edison in Berlin,” *London News,* 14 Sept. 1889; all Unbound Clippings (*TAED* SC89147B, SC89150A, SC89154A, SC89071A); “Mr. Edison’s Practical Acknowledgment,” *Pall Mall Gazette,* 13 Sept. 1889, 6; “À Travers Paris,” *Le Figaro,* 12 Sept. 1889, 1; “Edison’s Gift to the Paris Poor,” *NYT,* 13 Sept. 1889, 4; Fetridge 1884, 561; “Germany,” *Morning Post* (London), 14 Sept. 1889; “Mr. Edison’s Compliment to M. Eiffel,” *Pall Mall Gazette,* 12 Sept. 1889, 6; “Mr. Edison in Berlin,” *The Guardian* (London), 13 Sept. 1889, 8; “Edison at the German Capital, *Pittsburgh Dispatch,* 14 Sept. 1889, 7; “Interesting Phonograph Exhibits in Berlin,” *Pall Mall Gazette,* 14 Sept. 1889, 4.

33. “Mr. Edison in Berlin,” *Daily News* (London), 16 Sept. 1889, 6; “Mr. Edison in Berlin,” *The Guardian* (London), 16 Sept. 1889, 8; “Germany,” *The Standard* (London), 16 Sept. 1889, 5.

34. “Edison in Frankfurt,” *Frankfurter Zeitung,* 17 Sept., 1889, Unbound Clippings (*TAED* SC89157A). The editors have found little information about Edison’s time in Heidelberg.

35. “Nouvelles Diverses,” *Journal des Débats Politiques,* 21 Sept. 1889, 3; “Edison in Belgium,” *New York Herald,* 21 Sept. 1889, Unbound Clippings (*TAED* SC89166A); “À Travers Paris,” *Le Figaro,* 22 Sept. 1889, 1.

36. “The Court,” *Daily News* (London), 24 Sept. 1889, 5; “Mr. Edison in England,” *Pall Mall Gazette,* 24 Sept. 1889, 4; “Edison in London,” *Pall Mall Gazette,* 26 Sept. 1889, 1; “London, Wednesday, Sept. 25,” *Daily News* (London), 25 Sept. 1889, 4; “The Electric Lighting of London.—No. IV,” *Daily News* (London), 26 Sept. 1889, 5; Bowers 1991, 175; “The Electric Lighting of London,” *Electrical Engineer* 4 (27 Sept. 1889): 254.

37. Edison had been designated a chevalier of the Legion of Honor at the 1878 Paris exposition and an officer of that body in 1882. Chevalier was the Legion’s lowest honor, commander its highest. Docs. 1519 n. 1, 2205.

38. “Edison À Paris, “*Le Figaro,* 27 Sept. 1889, 1–2; “Further Honors to Edison,” *Philadelphia Times,* 28 Sept. 1889, 1; “The Legion of Honor for Mr. Edison,” *Pall Mall Gazette,* 27 Sept. 1889, 4; “À Travers Paris,” *Le Figaro,* 28 Sept. 1889, 1; see Doc. 3419 n. 6.

–3392–

Mina Edison to Mary Valinda Miller[1]

[Aboard La Bourgogne,[2] August 10, 1889][3]

My dearest Mamma & All.

We are just about in sight of land which we will see at five o'clock. I am not at all sorry although we have had a very pleasant voyage. Only one day did I feel any ill effects from the sea and that was when we started. It is just as rough today but I have become more of a sailor. Mr. Edison has been perfectly well all the time and enjoys it. I think however he too will be glad to place his foot on solid earth again. After seeing land we shall have tonight to travel yet reaching Havre about eleven o'clock tomorrow. I am hoping, yet fearing, that the girls will be there to meet us.[4] I shall be so delighted to see them. I hope I shall not have cold water thrown all over me by their formal manner. I shall feel my way a little at first and not show too much my inward feelings. The girls have probably acquired some French formalities that I shall not be aware of. I shall have them give me some lessons.

There are no little babies among the first class passengers so I console myself by going below where I can see third class passengers children. My darling baby[5] is hardly absent from my mind. Her papa and Mamma miss her very much. When the sun shines on her, Mamma, you may tell her the same sun her Papa & Mamma saw a few hours before and sent all the love and kisses it could hold which will be given to her by means of the sun beams. How glad I shall be to have her in my arms again. I use her photographs as book marks.

There are not so very many Americans[a] on board but of the few that are there are some very pleasant people. Mr. & Mrs. Colgate[6] are on board but I have not met Mr. Williamson[7] of whom Jennie will know about. There is a gentleman aboard wh~~ich~~om I imagine is he but he seems to be under a different name. He seems very attentive to a young lady with whom he is apparantly[a] just flirting. I have not a very high opinion of him but I may misjudge him.

I will write again after arriving in Paris[8] and hope that I shall have a letter soon from home.

Kiss all for me and my baby kiss over & over again. We could see Papa & the boys perfectly and I watched them until I could not distinguish any faces. It is a pretty sight to see that pier full of people all waving adieu. People going ~~at~~ on this line[9] always seem so happy. No tears but all for pleasure. Service is excellent and the ship is kept so perfectly clean. But how glad I shall be to[a] get on land and to have a word from those whom I so dearly love. I thank you for the telegram sent.[10] It gave me great cheer. I also hope Papa[a] and the boys arrived safely home and that they felt repaid for coming on. I have some of the fruit yet that dear Papa put in our stateroom. It has tasted very good. I have so many times wished that Papa was with us. I wish he had consented to come and bring the boys.

Well good bye for this time. Love to all. Your loving daughter

Mina.

Our address will be—Drexel, Harjes & Co., Bankers Paris.[11]

ALS, CEF, EFP (*TAED* X018A701). Letterhead of *La Bourgogne*. [a]Obscured overwritten text.

1. See headnote above.

2. *La Bourgogne* entered service between New York and Havre for the Compagnie Générale Transatlantique in 1886. Constructed under an agreement with the French government requiring it to be adaptable for military service, it was designed for speed but was capable of carrying guns. In regular revenue service, it could accommodate 225 first-class passengers in 85 staterooms, 72 second-class passengers, and 900 in steerage. "France Has An Ocean Flyer," *NYT,* 29 June 1886, 4; "Inspecting La Bourgogne," *NYT,* 2 July 1886, 8.

3. As indicated in the body of the letter, Mina Edison wrote the day before the ship's expected arrival at Havre on the morning of 11 August. See Doc. 3396.

4. That is, Mina's sisters Mary Emily and Grace Miller.

5. Madeleine Edison, Mina's first child, was about fourteen months old.

6. Richard M. Colgate (1854–1919) and Margaret Cabell Auchincloss Colgate (1861–1935) were Llewellyn Park neighbors of the Edisons. Richard graduated from Yale in 1877 and joined Colgate & Co., the Jersey City soap manufacturing firm started by his grandfather. He became president in 1897 and held that position until his death. Margaret was the daughter of Henry B. and Mary Cabell Auchincloss, also Llewellyn Park residents, and married in 1885. "Richard M. Colgate Dead," *NYT,* 18 Sept. 1919, 11; "Mrs. R. M. Colgate Dies in New Jersey," *NYT,* 23 Aug. 1935, 15; U.S. Census Bureau 1970 (1880), roll T9_781, p. 258B (enumeration district 113, West Orange, Essex, N.J.); baptismal record for Margaret Auchincloss, 9 Mar. 1862, *Presbyterian Church Records (U.S.) 1701–1970,* online database accessed through Ancestry.com, 6 June 2018.

7. Not identified.

8. See Doc. 3394.

9. The Compagnie Générale Transatlantique was created in 1862 and operated with major subsidies from the French government, both as to domestic ship construction and contracts to carry the French mails across the Atlantic. Its ships enjoyed a reputation for luxurious accommodations and excellent food and service. Fry 1896, chap. 20.

10. The undated message, directed to the steamer from Akron, read: "baby sends greeting is happy." It was signed simply "Miller." Mary

Valinda Miller (?) to Mina Edison, n.d. [Aug. 1889], MME-CD (*TAED* X401BD).

11. Before he left New York, Edison also provided this contact information to Samuel Ritchie, an Akron mining investor about to embark for London. Ritchie to TAE (with TAE marginalia), 31 July 1889, DF (*TAED* D8952ABT).

–3393–

From Werner von Siemens[1]

Berlin, August 12th 1889.

Dear Sir,

With very great pleasure I hear from Mr. Villard, that you departed for Europe the 3rd of August and are probably now at Paris, and that you have the kind intention of accepting my invitation to visit me here at Berlin.[2]

I hope you will do me the honor of being my guest and of making your residence at my home in Charlottenburg[3] during your stay here.

Having previously arranged of joining my family at a German watering-place[4] and intending to return together with my family the 10th of September, it would be most agreeable to me, if I could expect your kind visit on or after that date. If however this would not be convenient to you, I am ready to come back at an earlier day. You would do me therefore a great favor,[a] if you would kindly write few lines to me stating the proposed day of your arrival in Berlin. I am, dear Sir Yours very sincerely

Dr Wr Siemens

As Mr. Villard writes to me that you would like to make the acquaintance of Prof. du Bois-Raymond[5] and of others of our scientific men, and as September is a bad time for meeting any body at Berlin, and further because there will be a convention of the society of natural science[6] at Heidelberg from 17th to 23rd of Sept.; I make you still another proposal which you may find perhaps convenient: Either you may go first to Heidelberg where I should meet you about 17th of September, and from[b] there we go afterwards to Berlin; or you may come at first here about the time proposed above, and we visit together Heidelberg during said convention.[7] [Yours?][c] Dr Wr S

LS, NjWOE, DF (*TAED* D8905AFB). Letterhead of Siemens & Halske. [a]Repeated at bottom of one page and top of the next. [b]Interlined above. [c]Illegible.

1. The autograph draft (in German) by Siemens of the body of this letter is in the archives of the Siemens Historical Institute in Berlin. The final version was addressed to Edison in care of the Compagnie Continentale Edison in Paris. Siemens to TAE, 12 Aug. 1889, copybook SAA Z 223, SHI.

2. The next day, Siemens expressed to Villard his pleasure at Edison's acceptance of his invitation. Edison evidently did so in a letter that reached Berlin the third week of August and was forwarded to Siemens by his son, but the editors have not found it. As late as 10 September, however, there seems to have been some uncertainty about Edison's specific plans for the visit. Siemens to Villard, 23 Aug. 1889, copybook SAA Z 223, SHI; Wilhelm Siemens to TAE, 28 Aug. 1889; Adelbert Wangemann to TAE, 10 Sept. 1889; both DF (*TAED* D8905AFM, D8905AFW).

3. Now part of Berlin, Charlottenburg (founded 1705) was at this time a sister city to the German capital. In 1861, Siemens bought a house and property in Charlottenburg at Berliner Strasse 36, which he remodeled and expanded to include electric lighting, a ballroom, and offices. This "villa," as he called it, was a summer house until it became his primary residence in 1882. It was destroyed in World War II. In 1883, Siemens moved the Siemens & Halske cable and dynamo manufacturing plants to Charlottenburg. Geppert 1839, 227; Hoffman 2009, 91; W. Siemens 2008 [1892], 462; Feldenkirchen 1999, 45.

4. Siemens planned to visit Sylt, a German resort island in the North Sea near the Danish border. Siemens to Villard, 23 Aug. 1889, copybook SAA Z 223, SHI; *WGD,* s.v. "Sylt."

5. Swiss-born Emil Heinrich du Bois-Reymond (1818–1896), educated at the universities of Berlin and Bonn, was a professor of physiology at the University of Berlin. He experimented extensively on the electrical stimulation of nerves and muscles and is regarded as the founder of the modern science of electrophysiology. Du Bois-Reymond was the permanent secretary of the Prussian Academy of Sciences from 1876 until his death. He was a personal friend of Siemens and Hermann von Helmholtz and became acquainted with Charles Batchelor in Paris in 1881. *CDSB,* s.v. "Dubois-Reymond, Emil Heinrich"; *Ency. Brit. Online,* s.v. "Du Bois-Reymond, Emil Heinrich"; W. Siemens 2008, 443; *Electrical Trades' Directory and Handbook* 1896, xxvi–xxvii; Doc. 2155.

6. The Gesellschaft Deutscher Naturforscher und Ärzte (the Association of German Naturalists and Physicians) was founded in 1822 in Leipzig to advance interactions among practitioners of the medical and natural sciences. Schelhaas and Hönsch 2001, 12; "Foreign Correspondence," *Medical Times & Gazette* 13 (25 Oct. 1856): 428.

7. Edison went with his wife, daughter, sister-in-law Mary, and William Hammer on 12 September (via Cologne) to Berlin, where Siemens and Hermann von Helmholtz hosted a dinner for him at the Union Club upon his arrival. The next day, Edison toured the city with Siemens. Hammer later recalled they also toured the Gesellschaft Urania, a public observatory and science center headed by Siemens. Edison was a guest at the Siemens home in Charlottenburg home from 14 to 16 September and was again honored at a dinner given by his host and the directors of Allgemeine Elektrizitäts Gesellschaft. He then

traveled with Siemens and Helmholtz to Heidelberg for the meeting of the Association of German Naturalists and Physicians on 17 September. Hammer [n.d.]; Hammer 1892, 106; Werner von Siemens to Friedrich Siemens, 8 Aug., 10 and 11 Sept. 1889, all copybook SAA Z 223, SHI; "Mr. Edison in Berlin," *Guardian* (London), 16 Sept 1889, 8; "Edison at the German Capital," *Pittsburgh Dispatch,* 13 Sept. 1889, 7; "Interesting Phonograph Experiments in Berlin," *Pall Mall Gazette,* 14 Sept. 1889, 4; Wolfschmidt 2011, 187; Wasmansdorff and Heinemann to TAE, 9 Oct. 1889, DF (*TAED* D8905AGW); App. 1.B.48.

–3394–

Mina Edison to Mary Valinda Miller

[Paris, August 12, 1889?][1]

My dear Mamma—

We have at last arrived in Paris where the girls, Mary & Grace, met us. ~~a~~Also a whole host of men so we really could not tell what to do. One this way and one that. I did not enjoy it very much. We are very nicely situated here, in the Hotel du Rhin,[2] as you will see from the heading. The apartments are very nice indeed and Marion and the girls are with us in the same suite of rooms. Poor Mr. Edison has not had a moment that he could call his own since our arrival but he seems to enjoy it all very much. I hardly think he will want to leave when the time comes for us to go. I was not feeling very well yesterday and so did not go out and today the girls & I am going to do a little running about while Mr. Edison is taken to the exposition by his numerous friends. I am really tired of having so many men claim him but we are going to assert our rights tomorrow. He is going with us to the ~~e~~Exposition but to tell the truth Mamma I dont think he will remain with us long. Marion came from England last night and has been writing letters all morning. When I opened my trunk yesterday I discovered to my dismay that my ~~c~~Cologne bottle had been broken and the ~~c~~Cologne had simply ruined my hats so this morning the first thing I had to see about others. Fortunately my dresses escaped. Mame and Grace are charming they seem just the same sweet girls but a little more independent. Both are very well and perfectly happy. Grace was homesick when she saw baby's[3] last pictures and thought of you having her almost all to yourself there at home. She seems quite satisfied to go home in Sept. as I think she entertains hopes of coming over again sometime. Mame wants to see Italy very much so may remain longer than we do. She is perfectly well now and looks so pretty.[4] I have not seen Grace yet this morning as she went out early.

I am wondering this morning how baby is, little darling. A reporter made a most humble supplication for baby's picture yesterday as I did not care to give it to him. He almost got unto his knees before me. I think he is three quarters crazy any way. He says he knows twelve languages so there is no surprise at his actions. I have several letters to answer or write so I must not take too much time for one,[a] the girls will be in soon and there I must go. Mr. Edison and I have practised French customs so much at home with the exception of having our coffee that it comes quite natural to us. We breakfasted at eleven this morning and had five or six calls before we were up. Kiss babe over & over for me and tell her, her Mamma longs to see her. With a great deal of love to you, Mamma dear, and all from all, I am your loving daughter,

Mina.

I am going to write to Papa very soon. I shall write my next letter to him.

ALS, CEF, EFP (*TAED* X018A702). Letterhead of Hôtel du Rhin. [a]Obscured overwritten text.

1. The contents of this letter strongly suggest it was written the day after the Edisons' arrival in Paris on 11 August. See Doc 3392 (headnote).

2. The Charles Dickens guide to Paris placed the Hôtel du Rhin among "the first rank" of establishments frequented more by "Princes and ambassadors, or men holding high official position" than by tourists. It was located at 4 Place de Vendôme near the Tuileries Garden, roughly two miles from the Exposition site (Dickens, Jr. 1883, 117; *Galignani's* 1889, 293). It had been the Paris residence of Napoleon III prior to his election (1848) as president of France. In 1871, during the Commune, troops from Versailles filtered through the hotel to attack the insurgents from the rear (Edwards 1893, 1:158).

3. That is, Madeleine Edison.

4. According to an Ohio newspaper interview with William Pitt Edison, the Miller family received a telegram about an unspecified but "serious" illness of Mary Emily Miller just as Mina and Edison were embarking for Paris. On a doctor's orders, Mary had gone to Spa, Belgium, a town famed for its mineral waters, at the start of June and stayed for at least several weeks. She noted then, amid ongoing conflict with Marion Edison as a traveling companion, that "trouble makes me ill." "Wm. Pitt Edison," *Canton Repository,* 12 Aug. 1889, Clippings (*TAED* SC89107); Mary Miller to Mina Edison, n.d. [c. 12 June 1889], FR (*TAED* FP001A).

–3395–

To Robert Sherard

[Paris, c. August 13, 1889][1]

Friend Sherard[2]

All right. Friday about 11 in mng.[3] Ill be sane by that time My intellect is now making 275 revolutions a minute Yours

Edison

ALS (facsimile), Sherard 1905, 177, PM (*TAED* PM890813). Letterhead of Hôtel du Rhin.

1. Edison likely wrote this note within a few days of reaching Paris on 11 August (Sunday), answering an inquiry from Robert Sherard that the editors have not found. Alfred Tate insulated Edison from incoming messages until midday Monday (see Doc. 3396). Sherard recalled writing immediately after learning of Edison's arrival at the Hôtel de Rhin and receiving a prompt reply. Edison had lunch with Sherard (and others) on the Eiffel Tower on Friday, 16 August. Sherard 1905, 175–76; "À Travers Paris," *Le Figaro* (Paris), 17 Aug. 1889, 1; see note 3.

2. Journalist and author Robert Harborough Sherard Kennedy (1861–1943), born in Melton, Mowbray, England, was the son of the Rev. Bennet Sherard Kennedy and the great-grandson on his mother's side of William Wordsworth. He dropped the surname Kennedy after an argument with his father over finances that forced him to withdraw from New College, Oxford. Sherard also studied at Queen Elizabeth College, Guernsey, and later at the University of Bonn. He lived frequently in Paris, writing for such New York papers as the *Herald,* the *World,* and the *Times,* and London papers such as the *World* and *Daily Graphic.* Sherard had completed two novels and a book of poems by this time; over the course of his life he wrote thirty-four books, including fourteen novels and several biographical works, one of them about his close friend Oscar Wilde. In later years, he wrote important exposés on the plight of Britain's poor and working classes, notably *The White Slaves of England* in 1897. Keating 1976, 174; *Who's Who* 1907, s.v. "Sherard, Robert Harborough"; O'Brien 1985, 1–9.

3. When Sherard arrived at the Hôtel du Rhin, Edison was in the process of receiving from Cavaliere Enrico Copello the insignia making him a Grand Officer of the Crown of Italy. Mina Edison, George Gouraud, and the writer Émile Dürer were also present. In his press account of the event, Sherard reported that this honor made Edison a count and Mrs. Edison a countess and that Edison laughed when the announcement was "made to him by the little Cavaliere." (The Edisons were later embarrassed when the story about the titles followed them back to the U.S., and Edison blamed it on a French reporter.) Mina invited the whole party to a celebratory lunch at the Brébant restaurant on the Eiffel Tower. Sherard said he afterward often saw Edison in Paris and interviewed him again at the Hôtel du Rhin just before Edison left for Germany. Sherard's account of his interaction with Edison and Gouraud appeared in the 19 August issue of the London-based *Pall Mall Gazette* and later became the basis for a chapter in his memoirs. Sherard found the 43-year-old Edison to be "a big boy, full of fun and humour, simple, unaffected, and kind-hearted." During the lunch at the Brébant, someone remarked disparagingly that the Eiffel Tower

was merely "the work of a bridge builder." But Edison, according to Sherard, retorted, "no; It is a great idea. The glory of Eiffel is in the magnitude of the conception and the nerve in the execution. That admitted, and the money found, the rest is, if you like, mere bridge-building." Sherard, relating the incident later to Eiffel, prefaced it by saying that Edison was "delighted" with the tower. "I'm glad to hear it," Eiffel responded, "for when Edison lunched with me in my room at the top…he hardly spoke, and I must say I should have liked to hear his opinion." "With Mr. Edison on the Eiffel Tower," *Pall Mall Gazette,* 19 Aug. 1889, 1–2; Sherard 1905, 172, 175–79.

–3396–

Margaret Upton to Helen Storm

Paris, France. [August 14, 1889][1]

My dear Mother:—[2]

By this time you have received my steamer letter[3] and know what a delightful voyage we had. When we reached the harbor of Havre Sunday morning about nine o'clock, one of the small steam Yachts belonging to the French line, came out to meet Edison, having on board a number of the Edison people. Among them[a] the president of the Companie Generale—Edison—of France,[4] Mr. Dyer[5] Mr. Tate, and Mr. Hammer, and several Frenchmen whose names I cant remember.[6] No one was expecting them, so none of us were on deck to receive them, and were not conscious of their presence until they appeared in the dining saloon.[7] They gave Edison a most cordial greeting and we came in for our share of it too. We had a special compartment on the train from Havre to Paris— In it were Mr & Mrs Edison—Mr. Tate, his secretary—Mr. Lewis[8], one of his lawyers—Mr. Porgeous the President of the French Company and his daughter[9], Frank[10] and myself. Nothing of special interest occurred until we stopped for twenty minutes at Rouen. There the Consul General of America[11] was waiting to greet Edison, and offer him the City's hospitality and his own services. It was most gracefully done—but in twenty minutes we were spinning away to Paris—where we arrived at three-thirty. At the station waiting for us were Mr. Robert L. Cutting of New York—and Mrs Edisons two sisters,[12] and a lot more of the Edison people. Two fine carriages all in livery had been provided for our party and we drove over to the Hotel[13] in fine style. Frank had written for one room for us—so you can imagine our surprise, on being shown into a gorgeous suite of apartments—right next the Edisons. Our apartment consists of a gorgeous Salon—all done in red velvet and gold—and mirrors on all sides—three bed-rooms—a dining room—and little private hall. The most superb gold candelabra, and crystal chandeliers adorn the Salon—and we are simply in clover up to our necks. Every morning we have a dainty little déjeuner, by ourselves—beautifully served—and are waited on to absolute perfection. We found superb flowers in our rooms—from Mrs Edison's sisters—Mr. Dyer—and some one filled a beautiful jardinier with white chrysanthemums and hydrangeas—but I havent yet discovered who. Our windows look out on the Place Vendome and are directly opposite where the Prince of Wales[14] stays when he is in Paris. The Edisons of course have a finer apartment than ours—as fine as any in Paris—but we have access to it and them at any hour. The day we arrived, Mr. Tate left word for no cards to be sent up till the next day, so we were undisturbed till Monday noon. We have had a number of calls, but not of course as many as the Edisons. Monday noon Mr. Hammer came for us and we took the Edisons cards and our own and left them at the American Minister's Mr. Reid.[15] Yesterday he returned the call in person—but we were all out. We drove on Monday out to the[b] Exhibition[c] buildings, and Mr. Hammer went with us to get [a] birds-eye view of it— Returning at four o clock, and we gave our first dinner party that night. Frank invited four gentlemen to dine with him, making a party of six, and I the only lady. We had it served in our own little dining room. The guests were Maj. Page[16]—an English gentleman the head of the Edison Comp. in England—a typical Londoner—and very charming—Mr. Lieb[17]—the head of the Edison Comp. in Italy—living at Milano—Mr. Hammer and Mr. Dyer. It seemed to me, one could seldom find five more elegant and agreeable men together, than these with Frank, made. Being our first dinner party—I felt some anxiety about it, but Frank has expressed himself as very much pleased with everything about it. We had a fine dish of fowl in the centre of the Table, and bon bons & fancy cakes to orniment with besides—[boutonnieres?][d] for the men. The dinner was faultlessly served—by two men—and as faultlessly cooked. We had claret and seltzer, and Champagne frappe—with the dinner. The coffee was daintily served in the Salon—and the Licquers with it afterwards—Cognac & Chartreuse. I wore my wedding dress—and of course the men their dress suits. After they all left, about ten o'clock Frank and I took a fly, and drove for nearly an hour, along the Boulevard—to see the city illuminated. Yesterday we had a most memorable day. We were invited to visit the Eiffel Tower—which is pronounced F.-L. M. Eiffel[18] is in

Vienna—so he deputized his son-in-law—M. Salles[19]—and M. Lyon[20] the Chief of Engineers—to give Mr. Edison and his party a reception at the Tower. We left here before nine o'clock—and were received at the foot of the Tower by the gentlemen named. An elevator was reserved for us and soon we were on the highest landing stage. Here Mr. Eiffels Sister,[21] a maiden lady introduced herself—a typical, aristocratic, French woman of fifty or more years. She was accompanied by an attendant in livery—with immense silver buttons with the Eiffel monogram on. We were invited after gazing a long time at the magnificent view, into M. Eiffels private salon up there—and after the very daintiest luncheon you ever saw, of chicken & trouffle sandwiches not an eighth of an inch think—cakes & bon-bons, and the finest of wines which Madamoiselle Eiffel herself passed to the guests—we listened to some lovely music by three of the finest musicians in Paris—a flutist, violinist, and singer.[22] A phonograph had been carried up there—and these musicians performed in front of it—the sound was registered—and then all the guests had the pleasure of hearing it repeated as often as they chose.[23] As[c] there were numerous tubes attached to the instrument—several could listen at once. It was a most delightful affair. There were thirty in the party, among them Comte Primoli,[24] & Comte & Comtesse de Mareuil[25]—Russell Harrison,[26] and six or seven men members of the Legion of Honor of France. Every one pays homage[c] to Edison. The day he arrived the papers all had long articles calling him, His Majesty Edison—Edison the Great—Vive l'Edison After the musicale was over—we descended by slow degrees, stopping at every landing stage. [-----][e] in the view, and when we reached the 2d stage, M. Salles and M. Lyon invited us to a very fine déjeuner. I was given the seat of honor next Edison—his daughter[27] sitting on the other side. Frank was given the seat of honor next Mrs Edison—Russell Harrison sitting on the other side. Toasts of all kinds were given and a most delightful affair it was. At the end each lady was presented with a beautiful rose. I forgot to mention that on top the Tower, just before leaving Madamoiselle Eiffel presented each lady with a gold bronze medal of the Tower, in a little leather case—as a souvenir of the occasion. Do you not think we are greatly favored to have all these beautiful things fall to us? It is very cool here. I am obliged to wear my jacket all the time. Yesterday after the Eiffel Tower reception was over Frank and I went to see some of the pictures, and staid out there for dinner, at a little restaurant where a splendid band of Hungarian women[28] furnished music that is enchanting. After dinner we got seats for the illumination of the fountains, which I wont attempt to describe. It is absolutely super-human—and super-natural. It does'nt seem as if it could be a reality—but must be an illusion of the mind so exquisitely beautiful is it. We got home at 9:30—awfully tired. Mr. Edison wanted Frank to go with him to day "without any of the women" he said. So they have gone, and I am to meet Mr. Dyer at two o'clock at the Edison department—and Frank will join us at five. Mr. Dyer is to dine with us to night at the Exhibition. Four weeks ago to day was my nuptial day. It does'nt seem possible—that a month has passed. We are both very well. Wont you send this letter to Mattie[29] and Annie[30]—after you finish it. Tell them I would write personally to them but think one letter like this must be more satisfactory to you all. Tell Mattie how much I enjoyed her sweet letter. Did you remember to send the list of presents to Mrs Perry[31]? Will close as it is time for me to go to the Exposition. With very much love to you and father,[32] in which Frank would join me if he were here—and kind remembrance to any friends who may be good enough to ask for me! Ever your loving daughter—

Margaret A. Upton.[33]

ALS, NjHi, FRU Scraps., MS Group 988 (*TAED* X184B2). [a]Interlined above. [b]Word obscured by tape. [c]Obscured overwritten text. [d]Illegible. [e]Word obscured.

1. The Edisons and Uptons ascended the Eiffel Tower on 13 August, referred to below as "Yesterday." "Edison à la Tour Eiffel," *Le Constitutionel,* 15 Aug. 1889, 2; see Doc. 3392 (headnote).

2. Helen Storm (1833–1909), née Wilkinson, was the daughter of George Wilkinson, the mayor of Poughkeepsie, N.Y. She married Edward Storm, a local manufacturer. I. Wilkinson 1869, 564; "Mrs. Edward Storm Dead," *Poughkeepsie Eagle-News,* 17 May 1909, 5; "Edward Storm Dead," *Poughkeepsie Eagle-News,* 16 Oct. 1906, 5.

3. Margaret Upton enthusiastically described her voyage in a letter dated 10 August, the day before the ship's expected landing. Upton to Helen and Edward Storm, 10 Aug. 1889, FRU Scraps. (*TAED* X184B1).

4. Financier Charles Porgès (1836–1906) was president of the Compagnie Continentale Edison. The firm was created as a holding company to license Edison's patents in France, its colonies, and much of continental Europe but had recently obtained limited rights to manufacture and sell equipment itself (Docs. 2553 n. 3, 2806 n. 1, 3013, esp. n. 3; "Nécrologie," *L'Univers* [Paris], 3 Apr. 1906, 3). Porgès had offered to put his house, servants, and carriages at Edison's disposal in Paris (Alfred Tate to Samuel Insull, 29 July 1889, DF [*TAED* D8905AEU]).

5. Philip Dyer was based in Antwerp, but Edison sent him to Paris at the end of July to book rooms for him in a "very quiet hotel." The French newspapers gave his name as "M. Dyt," an error repeated in some American reports. Dyer to TAE, 24 July 1889, DF (*TAED* D8905AES); Doc. 2435 n. 4; "Edison en France," *Le Figaro* (Paris), 12 Aug. 1889, 1; "Edison en France," *Le Petit Journal* (Paris), 13 Aug. 1889, 1.

6. As reported by *Le Figaro,* the party included Ferdinand Dreyfus (a son-in-law of Porgès and formerly a deputy to the National Assembly), the writer Émile Dürer, and an unnamed representative of *Le Figaro.* A "M. Vonhoven" from the Paris newspaper *Le Petit Journal,* possibly Ludwig von Beethoven's grand nephew Louis Vonhoven, was also on hand. "Edison en France," *Le Figaro,* 12 Aug. 1889, 1; "Edison en France," *Le Petit Journal,* 13 Aug. 1889, 2; "Renseignements Utiles," *Le Gaulois* (Paris), 28 Nov. 1881, 4; Marriage record for Ferdinand Dreyfus, *Paris, France & Vicinity Marriage Banns, 1860–1902,* online database accessed through Ancestry.com, 13 Sept. 2017; Nettl 1957, 263.

7. *Le Figaro* gave a different account; see Doc. 3392 (headnote).

8. Eugene Lewis.

9. The editors have not been able to determine which of Porgès's two unmarried daughters was present, Virginie or Clarisse. "Edison en France," *Le Figaro,* 12 Aug. 1889, 1; "Edison en France," *Le Petit Journal,* 13 Aug. 1889, 2; Marriage records for Virginie Hélène Porgès, 18 Oct. 1891, and Clarisse Julie Porgès, 28 Apr. 1901, *Paris, France & Vicinity Marriage Banns, 1860–1902,* online database accessed through Ancestry.com, 14 Sept. 2017.

10. That is, Francis Upton.

11. Charles Platt Williams (1829–1901) was the U.S. consul in Rouen from 1882 to 1896. Williams was born in Boonville, N.Y., graduated from Union University in 1849, and began his career as a stone merchant in New York City. Prior to receiving his appointment at Rouen, he was U.S. consul in Bermuda. Raymond 1907, 3:127; *England & Wales, Civil Registration Death Index, 1837–1915,* online database accessed through Ancestry.com, 25 Sept. 2017; U.S. Census Bureau 1965 (1870), roll M593_995, p. 102A (New York City Ward 16, N.Y., N.Y.); Carpenter 1942, 334.

12. Grace and Mary Emily Miller had been traveling in Europe since August 1888. Mary Miller to Mina Edison, 26 Aug. 1888, MFP (*TAED* X018C9AI).

13. The Hôtel du Rhin.

14. Albert Edward (1841–1910), second child of Queen Victoria and Prince Albert, had been the Prince of Wales since infancy. He became King Edward VII in 1901. *Oxford DNB,* s.v. "Edward VII."

15. Whitelaw Reid (1837–1913), acquainted with Edison for a decade, had taken up his new duties as U.S. ambassador to France in May. Reid had previously been editor of the *New York Tribune,* having succeeded Horace Greeley in 1872. Born in Ohio, Reid made his reputation as a correspondent for the *Cincinnati Gazette* during the Civil War and joined the *Tribune* in 1868. He had been active in Republican Party politics since 1856 and served as a de facto campaign manager for Greeley's presidential run. In 1892, he returned from France to run for

vice president on the Republican ticket; after his defeat, he again edited the *Tribune. ANB,* s.v. "Reid, Whitelaw"; *DAB,* s.v. "Reid, Whitelaw"; Reid to TAE, 26 June 1878 (*TAED* D7805ZBR1); Cortissoz 1921, 2:125.

16. Samuel Flood-Page (1833–1915), a native of the Isle of Man, was the son of a Lancashire curate. He was educated at Christ's Hospital and the Rossall School before entering the British army as a cadet. He served in India and Burma, eventually rising to the rank of major. Flood-Page was the secretary and manager of the Crystal Palace, for which he organized the Electrical Exhibition of 1882. He was general manager of the Edison Indian and Colonial Electrical Co. from 1882 to 1883, helping to introduce incandescent lighting and power to Australia. He next took on the roles of secretary and manager (and later director) of the Edison and Swan United Electric Lighting Co. In 1899, he became managing director of the Marconi Wireless Telegraph Co., Ltd., and helped to promote wireless in Great Britain. Doc. 2572 n. 7; "Marriages," *Gentleman's Magazine and Historical Review* 17 (Sept. 1864): 377; "Notes of the Month," *Wireless World* 3 (May 1915): 98–99.

17. John Lieb.

18. Alexandre Gustave Eiffel (1832–1923) designed and built the great tower for the Paris Exhibition with his assistant Maurice Koechlin. Eiffel earned a diploma in chemical engineering from the École Centrale des Arts et Manufactures in 1855, after which he briefly apprenticed at the foundry of his brother-in-law, where he received much of his training in the iron business. Eiffel then entered railroad construction and learned bridge building from renowned engineer Eugène Flachet, who had built the first sheet-iron bridge to use rivets instead of bolts. He received his first major commission in 1856 to construct a 1,640-foot iron railway bridge over the Garonne River in Bordeaux. He later formed his own engineering and construction company based near Paris and by the mid-1870s had designed or constructed numerous iron bridges and buildings on a grand scale, among them structures for French expositions in 1867 and 1878. Eiffel had recently been involved with designing hydraulic locks for the ill-fated French attempt to build a canal across Panama. *OAO,* s.v. "Eiffel, Gustave"; Harvie 2004, 2, 10, 19, 31, 36–37, 48–50, 160, 175–78.

19. Mining engineer Jean Adolphe Salles (1858–1923) married Gustav Eiffel's daughter Claire in 1885. Salles was born in Marseilles and studied at the École Polytechnique and École Nationale des Mines. He became chief engineer of the Compagnie des Mines, Forges et Fonderies d'Alais in 1884. Two years later, he joined Eiffel's company and collaborated on both the Exposition tower and the Panama Canal locks. Barral 1892, 380–81; "Nécrologie," *Le Temps* (Paris), 1 Jan. 1924, 3; Marriage banns for Jean Adolphe Salles and Claire Marie Françoise Alexandrine Eiffel, 1 Feb. 1885, *Paris, France & Vicinity Marriage Banns, 1860–1902,* online database accessed through Ancestry.com, 27 Sept. 2017.

20. Educated at the École Polytechnique as a mining engineer, Gustave-Frantz Lyon (1857–1936) now headed the Parisian piano manufacturing firm of Pleyel Wolff. He organized the concert in the Eiffel apartment and hosted the luncheon at the Brébant afterward. Electoral roll for Gustave Frantz Lyon, 1891, *Paris & Vicinity, France*

Electoral Rolls, 1891, online database accessed through Ancestry.com, 27 Sept. 2017; France 1889, 38:1532; "À Travers Paris," *Le Figaro,* 14 Aug. 1889, 1; "Aujourd'hui," *Le Figaro,* 15 Jan. 1936, 2.

21. Marie Hénocque (1834–1901), née Boenickhausen-Eiffel, was at this time married to physician Albert Hénocque. She was previously married to Armand Hussonmorel (d. 1871), a flour miller who took part in the Eiffel construction business. Harvie 2004, 2, 8, 34, 42; Death notice for Dame Hénocque, 10 May 1901, *Paris & Vicinity Death Notices,* online database accessed through Ancestry.com, 25 Sept. 2017.

22. The performers were Paul Taffanel, flute; Pierre-Albert Brun, violin; and Rachel-Pascaline Leroux-Ribeyre, voice. There were also two piano accompanists, Auguste Charles Léonard François Vianesi, chief conductor of the Paris Opéra, and Xavier Leroux, composer and husband of Leroux-Ribeyre ("À Travers Paris," *Le Figaro,* 14 Aug. 1889, 1; "Chronique de l'Exposition," *Journal des Débats Politiques et Littéraires* (Paris), 14 Aug. 1889, 2; Blakeman 2005, 137; Holoman 2004, 60; Pierre 1900, 840; Chabrier and Bodin 1994, 353 n. 1; *GMO,* s.vv. "Vianesi, Auguste Charles Léonard François" and "Leroux, Xavier [Henry Napoléon]"). "Today I lunched at the Eiffel Tower," Taffanel wrote his seven-year-old daughter about this event, "and I went right to the top, into Monsieur Eiffel's little room. There was a gentleman with us called Monsieur Edison, who invented the little electric lights which you saw when you visited the Exhibition at night" (quoted in Blakeman 2005, 137).

23. The phonograph was supplied by Adelbert Wangemann. "À Travers Paris," *Le Figaro,* 14 Aug. 1889, 1.

24. Count Guiseppe-Napoleonne Primoli (1851–1927), an Italian nobleman and photographer, was the great-grandson of Joseph Bonaparte, the king of Spain during the Napoleonic Wars. In addition to photographing Edison on the Eiffel Tower, Primoli took pictures of Buffalo Bill and Annie Oakley during the Exposition. He noted in a journal entry dated August 1889: "To the Eiffel Tower with Edison, whom I photographed on the fifth platform. *Le Figaro* and the correspondents of the American papers asked me for my little snapshots." Richardson 1987, xi–xii, 159; Hannavy 2008, 1:756; "À Travers Paris," *Le Figaro,* 14 Aug. 1889, 1.

25. Jean-Joseph Durant (1813–1897), count of Mareuil, was an officer of the French Legion of Honor, chargé d'affairs of France, and councilor-general of the Marne. His Brazilian wife, Carlota Maria (d. 1893), née Garcia d'Almeida, was the daughter of a Brazilian Supreme Court judge. They were married in Brazil in 1847, when Durant was minister plenipotentiary in Rio de Janeiro. Révérend 1902, 2:493; Pontavice 1903, 120; Niess 2012, 206; "Nécrologie," *Le Gaulois,* 23 July 1893, 2.

26. Russell Benjamin Harrison (1854–1936), the son of President Benjamin Harrison, was born in Oxford, Ohio, and earned a degree in mining and engineering from Lafayette College. After a brief stint in the gas and lighting business in Indiana, he received an appointment as assistant assayer of the U.S. Mint in New Orleans. Quinn and Kanter 1995, 139.

27. Marion Edison.

28. That is, the Tacianu Sisters, whom Wangemann recorded on 29 August. Their performance that day of a "Russian Melody" is available on the website of the Thomas Edison National Historical Park. Puille [2012?].

29. Not identified.

30. Possibly Annie Moore (b. 1849?), a seamstress who lived with the Storm family in the 1870s. New York State Census 1875, online database accessed through Ancestry.com, 16 Mar. 2018.

31. Possibly Elizabeth Fenno Perry (1832–1896), née Curtis, the mother of Francis Upton's late first wife and grandmother to his three young children. See Doc. 3401 n. 10; Find A Grave memorial no. 39652186, online database accessed through Findagrave.com, 6 Oct. 2017; Marriage record for Elizabeth Fenno Perry, 16 Feb. 1879, *Massachusetts, Town and Vital Records, 1620–1988,* online database accessed through Ancestry.com, 14 Sept. 2017.

32. Edward Storm (1832–1906) was a prominent manufacturer in Poughkeepsie, N.Y. He headed the Edward Storm Spring Co., which made carriage springs (under his patents), elevator equipment, and other hardware. Storm was highly visible in Poughkeepsie as president of the city water board, an incorporator of the Poughkeepsie Bridge Co., and a director of the City Railroad, but he underwent bankruptcy late in life and lost most of his property. Ryerson 1916, 286; *Empire State* 1888, 232; "Edward Storm Dead," *Poughkeepsie Eagle-News,* 16 Oct. 1906, 5; "Financial Trouble," *Poughkeepsie Eagle-News,* 16 Apr. 1902, 5; "Edward Storm's Bankruptcy," *Poughkeepsie Eagle-News,* 2 May 1902, 5; "Mrs. Edward Storm Dead," *Poughkeepsie Eagle-News,* 17 May 1909, 5.

33. Margaret Adriance (née Storm) Upton (1858–1929) married Francis Upton in Poughkeepsie, N.Y., on 17 August. Before marrying, she had been a student at Vassar College in Poughkeepsie. Storm passport application, 27 Aug. 1887, U.S. Department of State [n.d.], *Emergency Passport Applications*; *Episcopal Diocese of Newark (N.J.) Church Records, 1800–1970,* online database accessed through Ancestry.com, 7 Sept. 2017; Edison Pioneers questionnaire of Eleanor Stuart Upton (n.d.); "Personals," *The Vassar Miscellany* 19 (Oct. 1889): 33.

–3397–

To Charles Batchelor

Paris, AUG 16 1889[1a]

Ship quick Hammer hundred Clarinet piano long announcement by native Frenchmen German and Italian also barrel Blancs turned down little more than regular[2]

Edison

L (telegram), NjWOE, DF (*TAED* D8946ABU). Telegraph form of Compagnie Française du Télégraphe de Paris à New York. [a]Date from Compagnie Française handstamp.

1. The "1" in the "16" of the date was apparently added by hand. The context of related correspondence makes clear that this message was not from 6 August.

2. Walter Miller swiftly telegraphed to Henry Giesmann, a New York pianist and possibly a talent manager whom the laboratory had called upon to make other recordings, to come to Orange the next day to "make clarinet & Piano cylinders for Paris with French, German & Italian announcement. Bring man that can do such" (Miller to Giesmann, 16 Aug. 1889, DF [*TAED* D8955ACU]; Thomas Maguire to Giesmann, 7 Aug. 1889; Alfred Tate to Giesmann, 10 Aug. 1889; Lbk. 32:36, 68 [*TAED* LB032036, LB032068]; "At the Home for Incurables," *Masonic Standard* 8 [2 May 1903]: 2). A barrel of blank cylinders was shipped on 17 August. They were followed a week later by eight recordings of an unidentified band and 92 of music for piano and clarinet introduced in French, German, and Italian. Possibly the latter group included the performances by Giesmann (piano) and a Mr. A. Belucci (clarinet) of a dozen songs recorded on sixty-six cylinders on 21 August; Belucci recorded another dozen numbers on seventy-cylinders two days later (Batchelor to TAE, 20 Aug. 1889, DF [*TAED* D8946ABV]; Maguire to TAE, 26 Aug. 1889, Lbk. 32:153 [*TAED* LB032153]; Musical Cylinder Account Book, E-2531:65–66, NjWOE, transcribed in Koenigsberg 1969, 117–18). These performers seem to have been among a large number who recorded at the laboratory by invitation or their own request in August (Tate to Will Loomis, 7 Aug. 1889; Maguire to Fred Voss, 14 Aug. 1889; Lbk. 32:37, 85 [*TAED* LB032037, LB032085]). The editors have not learned why Edison wished the cylinders to be "turned down" more than usual.

–3398–

Alfred Tate to Samuel Insull[1]

Paris, August 16, 1889.

First interview yesterday between Gouraud, T. A. Edison and Seligman's agents.[2] Discussed bringing out Company for joint interests. Could not agree on division of amount to be paid Vendors. T. A. Edison suggests proportions sixty and forty, our favor. Seligman's men said could only submit to their principal's proposition for equal division. Gouraud and Edison refused and interview ended.[3]

Tate.

TL (decoded telegram), NjWOE, DF (*TAED* D8959ADF).

1. The editors have inferred the recipient of this message based on its contents and authorship; see Doc. 3377 n. 1.

2. That is, Stephen Moriarty and Theodore Seligman.

3. After the London meetings ended unceremoniously, Moriarty and Seligman headed to Paris by 23 July. Moriarty later recalled that while in Paris, Edison tentatively consented to a union of the phonograph and graphophone interests. At the end of August, Moriarty and Seligman jointly gained the European rights of the New York-based International Graphophone Co. Tate to Insull, 23 July 1889; Moriarty to Thomas Platt, 4 Mar. 1896 (pp. 1–3); both DF (*TAED* D8959ACT, D9623AAS); Moriarty and Seligman agreement with International Graphophone Co., 30 Aug. 1889, Misc. Legal (*TAED* HX89052A).

In a letter that Tate might have received in the last day or two, Insull disagreed with the suggestion to "leave him [George Gouraud] alone and allow things to drift until January." Insull feared the graphophone interests might by then have formed their own company and become less interested in paying a hefty price for phonograph rights. He made this argument in the context of recent events in New York:

> The Graphophone people to-day are undoubtedly scared since we broke off connection with the Seligmans. They have sent several people to us, notably Mr. Haynes…and I am confident that within the next few days this gentleman will again turn up, and will, in all probability, bring with him a Mr. Dos Pasos, who is, I believe, the Attorney for the Seligmans in connection with this matter. Probably by the time you receive this letter I shall be again cabling you on this subject. Do not imagine when I do so that I am negotiating with the Seligmans. I shall do absolutely nothing unless they come to me. [Insull to Tate, 7 Aug. 1889, DF (*TAED* D8959ADD)]

"Mr. Haynes" was likely John P. Haines of the New York Phonograph Co., who had endeavored to see Edison in mid-July, or perhaps his brother, Richard Townley Haines, also with the New York firm. "Mr. Dos Pasos" was corporate legal expert John R. Dos Passos, who sailed for France on 24 August on phonograph business (Edison Laboratory to John Haines, 8 July 1889; TAE to John Haines, 16 July 1889; both Lbk. 31:207, 302 [*TAED* LB031207, LB031302]; Insull to Tate, 31 Aug. 1889, DF [*TAED* D8959ADI]; Landsberg 1964).

–3399–

From Charles Batchelor

[Orange,] Aug. 19. 89.

My dear Edison:

CAR BRAKE. I have designed one of these and we are now making it. The part[a] for winding up and unwinding without stopping the armature is a little complicated at present, but I shall certainly simplify it before we get through.[1]

HORSE CAR MOTOR. I enclose you a clipping from the "Electrical World" of last November, which shows that someone else has been working on the principle of our Car Motor. This article is dated November 1888 and was apparently new at that time.[2] As we made our Motor in April 1888, I presume we are far ahead of him and am therefore going ahead designing just as if he had not done anything.[3]

BATTERIES. Gladstone is now turning out all the Batteries that are wanted by the Phonograph Works. He has been turning out sufficient zincs and oxide plates to make 40 batteries a day but he does not complete that many. We have found it much cheaper to run the furnace right along, night and day, for the oxide plates. I then let up again until the press has got another lot ready, by this means we can keep the coal bill down to a reasonable amount. I sent Gladstone to Trenton to see if he could not get battery tops cheaper and we have arranged with a firm to get them of a much better material at 50¢ a dozen, in place of $1.80 per dozen always charged us by Bergmann. The small batteries for telephone have been on test now for over 100 hours and show up very satisfactorily indeed.

I have asked Kennelly to make me a little report on it and I enclose it.[4] Just as soon as we see our way clear I shall go and see the telephone people in regard to this battery. We are also getting the figures for talking this battery against the Stock Quotation Printer batteries in use by the Western Union Co. I [---][b] found[c] out that sometime ago Mr. Logue tried one of these batteries on one of your phonoplex circuits in Altoona, Pa. and it was apparently a failure. I have discussed the matter with him and I think I know where his trouble is and have therefore instructed him to get everything that he wants from Gladstone for a new trial, and I have no doubt that we shall make it go to their satisfaction.[5]

PHONOGRAPH WORKS. The 200 thread screw and new Recorder and Reproducer work like a charm, in fact I think if anything better than the old one.[6] There seems to be less scratch. English is putting on a few of the machines a device which you have frequently spoken of for turning off the cylinder by means of the Return Screw. He has got a very simple arrangement of the lever on the opposite side nut arm from the return screw nut; it works perfectly.

Everything necessary for the sapphire business is coming along. I had an idea of asking you to look up the matter of sapphires whilst you were in Europe, but I do not now think that this is necessary as Mr. Wills[7] will furnish us the slips for making the Recording needles at [4¢?][b] each, and each slip would [average 5?][b] Recording [points?]. This is, in my opinion, very cheap, as [these would undoubtedly give us the best and hardest][b] sapphires suitable for our purpose.

WAX CYLINDERS. . . . We are now making the wax cylinders in the new building of the Phonograph Works. We have caught up to our orders and are beginning to get a few ahead. This is quite necessary as you know the cylinders should stand for some weeks before being turned off. English[8] feels sure that by the 25th. of this month he can be making 1500 good cylinders per day.[9]

TOY. Bliss' men[10] are still finishing the dies and also making some that we found were necessary, although they were not included in the original order. I do not know why they were left out as they are quite essential. We have no order at present to go ahead nor do I want any until these details are fixed. ~~Keiser~~[11] Heize[12c] is now at the Phonograph Works teaching another man so that in case you want to send him to Antwerp we shall have a man who can attend to that part of the business.

In regard to the Reproducer needle on the Toy, we have found that it is not necessary to make a small ball point, we simply punch out a small punching of brass of[d] this shape  ~~after~~ and[c] burnishing the end, which is done in a few minutes, there is sufficient of a circle when the brass is of the right thickness to make a recorder point equal to the other, in fact we have made one of this style for the regular Phonograph and it works apparently as well as the other. Certainly it will be much cheaper to make them this way for the toy and equally as good. Very truly yours[e]

"Batch"

TLS (letterpress copy), NjWOE, DF (*TAED* D8968AAM). [a]Written by Batchelor. [b]Illegible copy. [c]Interlined above by Batchelor. [d]"brass of" written by Batchelor. [e]Closing written by Batchelor.

1. Charles Batchelor made drawings on 15 August based on the electric freight car brake shown in Edison's 20 May caveat draft (Doc. 3358). A few days later, he asked attorneys Dyer & Seely to obtain copies of all U.S. patents on car brakes. By 21 September, Arthur Kennelly was testing a "Brake Car motor on the quadpolar plan," which appears to be the same motor shown in Batchelor's journal entry of 19 October. By the end of October, however, Edison and Batchelor were working on alternatives to the dynamo and motor in the electric brake, and such designs were included in a November caveat (Doc. 3435). Unbound Notes and Drawings (1889); N-88-01-03.2; N-89-08-15; Kennelly Notebook #2:22; all Lab. (*TAED* NS89ACT, NS89ACX, NA021AAC, NB074AAA, NM024022); Cat. 1337:84, 87 (items 599, 601; 19 and 26 Oct. 1889), both Batchelor (*TAED* MBJ004084, MBJ004087); Batchelor to Dyer & Seely, 21 Aug. 1889, Lbk. 32:125 (*TAED* LB032125).

2. The editors have not found Batchelor's enclosure, but it may have been "The Baxter Electric Street Car Motor" from the 23 November 1888 issue of *Electrical World* (14:337). The illustrated article described a compact direct-drive motor designed by William Baxter, Jr., a successful inventor and electrical manufacturer in Baltimore. Despite its small size and relatively low weight, the motor developed a strong magnetic field that enabled it to operate efficiently at the low speeds typical of street railroads.

3. See Doc. 3391 n. 23.

4. Not found.

5. The battery failed prematurely in early August on a circuit between Altoona and Pittsburgh. Batchelor apparently adopted James Gladstone's view that the cause was the crystallization of electrolyte fluid on the zinc electrode. William Taylor to Alfred Tate, 14 and 22 Aug. 1889; William Logue to Tate, n.d. [21 Aug. 1889]; all DF (*TAED*

D8966ACA, D8966ACB3, D8966ACB); Tate to Taylor, 20 Aug. 1889, Lbk. 32:117 (*TAED* LB032117).

6. Batchelor likely meant the "Half size Phonograph" that laboratory machinist Hugo Kayser worked on in late 1888 and early 1889 and took up again full-time from late June through October (under a new project number). On 9 August, Batchelor told Edison he had been trying "the 200 thread screw machine, and find it works perfectly. The recording and reproducing points, of course, half size." The machine itself was not necessarily small and could accommodate "one of our ordinary cylinders" on which Batchelor recorded 1500 words at a "very leisurely" pace. Batchelor planned to make the necessary screw-cutting tools for the factory. Kayser time sheets, WOL; projects 217 and 301, laboratory project list, N-87-11-24, Lab. (*TAED* NL002AAA); Batchelor to TAE, 9 Aug. 1889, Lbk. 32:65 (*TAED* LB032065).

7. William Russell Wills (1837–1910) was the long-time head of the jewel department at the American Waltham Watch Co. near Boston. He was credited with recently inventing a process for cutting and shaping gemstones in a fraction of the time required by conventional methods. Wills was apparently not acquainted with Edison until he visited the laboratory in late July, after which Edison sent him a phonograph. Wills subsequently provided sapphires and the tools for working them. H. Abbott 1888, 32; "Rock Crystal Watches," *Sci. Am.* 59 (28 July 1888): 49; Massachusetts State Census, 1865, online database accessed through Ancestry.com, 8 Aug. 2018; *Massachusetts Death Records, 1841–1915 [Braintree],* online database accessed through Ancestry.com, 8 Aug. 2018; Batchelor to John English, 31 July 1889; Batchelor to Wills, 1 Aug. 1889, Lbk. 31:471, 468 (*TAED* LB031471, LB031468); Wills to Batchelor, 7 Oct. 1889; Wills to TAE, 22 Oct. 1889; both DF (*TAED* D8968AAP, D8905AHO).

8. Edison had appointed John English manager of the Phonograph Works two months earlier. Batchelor to English, 21 June 1889, Lbk. 30:477 (*TAED* LB030477).

9. What Batchelor means by the "new building" is unclear. According to Jonas Aylsworth's later recollection, the "room in which the wax was manufactured in the Phonograph Works was situated next to the nickel-plating room" in the main assembly building erected a year earlier (see Doc. 3241 n. 3). At this time, Aylsworth was looking for ways to cheapen the manufacturing process by substituting less expensive materials and by developing a process to recover waste wax. He began experimenting on 14 August with carbonate of soda in place of the more expensive caustic soda. Compound No. 1059, with cheap carbonate of soda crystals, was soon manufactured on a large scale; subsequent experiments with compounds based on it proved its worth, and 1059 was adopted as the new standard in October. Aylsworth also searched for "a cheap substitute for the more expensive ceresin" but was not successful. However, he had better results with efforts

> to recover the stearic acid from scrap wax, a considerable quantity of which had accumulated at this time, consisting of turnings from phonographs, broken records, sweepings from the floor of the wax room, and broken records which were returned to the works from

users of the cylinders. We paid, as I recollect, about six cents a pound for such scrap wax when procured from the North American Phonograph Company.

After Aylsworth developed this recovery process, a "plant for this purpose was installed and all of our waste material was worked up." Wax manufacture using composition No. 1059 continued at the Phonograph Works until it was transferred to building No. 2 at Silver Lake in late 1889 or early 1890 and "the wax manufactured there was shipped to Orange for molding into cylinders." N-88-08-23:154–57, 163–65, 169; Lab. (*TAED* NB050155, NB050163, NB050165; Aylworth's testimony, pp. 51–60, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046).

10. The E. W. Bliss Co. of Brooklyn, founded by Eliphalet Williams Bliss (1836–1903) was a major manufacturer of printing presses and machine tools. Edison had done business with the firm for at least two years and had recently gotten price quotations on presses and dies for the Phonograph Works. On 14 August, the laboratory sent a model of the talking doll's torso to the Brooklyn factory as a template for designing punches for manufacturing it. *DAB,* s.v. "Bliss, Eliphalet Williams"; E. W. Bliss Co. to TAE, 23 Aug. 1887; E. W. Bliss Co. to Orange Laboratory, 22 Apr. 1889; both DF (*TAED* D8756AAY, D8970ABH); Thomas Maguire to E. W. Bliss Co., 14 Aug. 1889, Lbk. 32:84 (*TAED* LB032084).

11. Charles Hugo Kayser (b. 1857?), a German native, became a U.S. citizen around 1885. At about that time, he seems to have co-founded the Kayser Electrical Co. in New York to sell lamps and make electrical instruments. He began working at the Edison laboratory in March 1888, mostly on the phonograph; his time sheets there identified him as a machinist. State Census of New Jersey, 1915, reference number L-12, film number 25, online database accessed through Ancestry.com 7 Aug. 2018; U.S. Census Bureau 1982 (1910), roll T624_884, p. 7A (enumeration district 0228, West Orange Ward 5, Essex, N.J.); U.S. Dept. of State n.d., roll 301, Kayser passport issued 8 Apr. 1916; *Electrical Review* 6 (20 June 1885): 9; Kayser time sheets, WOL.

12. William Heise (b. 1847?) arrived from Germany in 1869. He was employed by Edison as a machinist since at least January 1888; he had been working almost exclusively on the toy phonograph since March of that year and was still doing so at the end of 1889. In the latter part of 1890, he began collaborating closely with William K. L. Dickson on the kinetoscope and related technologies. U.S. Census Bureau 1982? (1900), roll T623, p. 21 (enumeration district 0185, West Orange, Essex, N.J.); State Census of New Jersey, 1905, reference number L-10, film number 16, online database accessed through Ancestry.com 8 Aug. 2018; Spehr 2008, 201; Heise time sheets, WOL.

–3400–

From Sherburne Eaton

New York City, August 2~~2~~0th, 1889.

My dear Sir:

Perhaps you do not care to be troubled with business matters, but I will venture to give you some of the latest news as follows:—

Re Boston Toy Phono. Co. At last the four Boston contracts[1] have all been executed and your 14,000 shares of stock have been delivered to us. No changes were made since you saw the documents the night before you sailed, but I found it hard work to get the Boston lawyer to approve. Altogether it has been a hard job, but ends quite to my satisfaction. Mr. Briggs wants me to help the Boston Company get from Lippincott a license for the U.S. for toy figures worked by a nickle. Insull and I see no objection to my helping them get this, provided Mr. L. approves and you get the manufacturing. The Boston people are quite alarmed about Berliner.[2] He wants to sell them a controlling interest for $40,000. When they get to the point of seriously considering it they will ask for your approval. I do not think they will buy unless you say so.

Your Personal Taxes: I have succeeded in getting the proceedings to collect your old personal taxes in this city and your taxes as administrator, adjourned till October, 16th. It rather looks to me as if these matters have not been carefully attended to at the time the taxes were levied. The first I ever heard of them was recently when the papers announcing the commencement of proceedings against you, were sent to me from Orange. Your tax for 1886, $557.06. The tax against you as administrator of Mary A. Edison[3] is $687.

Re Edison Machine Works: I visited these works with Mr. Insull a week ago. They are crowded for room there. Workmen seem to be standing in each others way. They are just laying the foundations for the new factory. They are very busy.

Re Drive with Insull: He and I drove your new pair of big gray horses about 150 miles in four days.[4] They are a fine team. The last day we drove 45 miles. They stood it well, and took us along at a steady jog which covered distance rapidly. They will make you a fine span. I am sure that you and Mrs Edison will be well satisfied.

Re Winnipeg Company. Mr Villard gave me today an amusing account of the trouble he is having at Winnipeg. He says he first asked Prof. Marks to make an estimate for Winnipeg. Marks did not know that the machinery had to be made in Canada and made his estimate on U.S. prices. It was sent to Winnipeg but had to be withdrawn to be increased on account of Canadian prices. That was mistake No. 1. The local Winnipeg Company then started to go ahead, but it was discovered that Winnipeg belonged to the Canadian agency. This required a second re-adjustment. The Winnipeg Company then went ahead again and called in ten per cent subscriptions on their stock. Villard now discovers that the Winnipeg Company must pay a license of 30% of the stock to us here. That will require readjustment No. 3. Villard says the Winnipeg people will probably blame him severely for these repeated blunders.

Re Broad Street Building. Mr Herrick[5] has received from the architect a design for the fronts of the proposed seven storey building for the General Company. It will be a handsome structure. The neighbor claims an easement, touching light for his side windows, which I am looking up today.

Re Penna Mining Lands: The title to the lands which you and Livor bought is difficult to straighten. The local Justice of the Peace who drew the deeds for you made about as many blunders as possible. Besides that, there is no chain of title on record for many years back, but with the aid of Mr. Hodgkins[6] I am gradually straightening the whole thing out.

Re N.Y. Ill. Co. Mr Skehan[7] tells me that the 26th Street Station earned a net profit of $1,900 in July, the 39th Street Station earned $100. There have been two conferences between all the companies furnishing incandescent light in this city with a view to keep up prices. The Brush Company[8] are going into incandescent lighting. Skehan says Brush has the best dynamo for alternating current. The companies participating in the conference are the Edison, Brush, Manhattan,[9] East River[10] and the Safety Company which is a consolidation of the Westinghouse and the United States Company.[11] The Safety Company is erecting a station on Washington Street near Courtlandt Street. They are putting up four dynamos, alternating current, for 2,500 incandescent lights, each. They will invade our down town territory being underground. There are conduits in several of our most important down town streets.

E. H. Johnston and the Sprague Company. Johnston complains to me about his Attorney, Mr. Wise.[12] He says he gave Wise a big block of stock out of his own pocket, to induce him to come here from Richmond and contracted to pay him a salary of $6,000 a year for three years. Sprague also gave him stock. Johnston says Wise does not give him satisfaction, and wants me to help him out. I do not see how I can do it, except so far as it relates to the interests of the General Company in the Sprague Company.

A New Phonograph: Mr. Lippincott showed me today three patents which were issued on the 13th inst. to Gianini Bettini,[13] an Italian residing in New York. I shall get copies and send them by mail to you. Mr. Lippincott will ask Mr. Witter[14] to give him an opinion on these patents. Mr. L. thinks they infringe your fundamental patent. The applications were all filed in April this year. Mr. L. thinks that the Gilliland crowd is behind these patents. He says that Tomlinson's brother[15] is the Attorney of Mr. O. Lugo,[16] who is one of the witnesses to the applications to the patents.

Re Canadian Lamp Decision. Hastings tells me that the Minister of Agriculture has asked the Attorney General to write the opinion, and that the last named official has asked the Minister of State to write it and that he has asked a certain other party to write it. Our friends tell us that the case will not be decided until next month.[17] Billsby[18] has been to Ottowa "with loads of money," and is said to have bought the Deputy Minister of Agriculture.

Re Siemens and Halske Contract: Coster has sent Villard a letter criticising the contract in detail.[19] Villard has just turned the said letter over to me for my opinion on it. I do not relish the job of taking a hand in this fight.

Edison Phonograph Company: In order that the license to the Boston Company might be executed by the President of this Company as required by the by-laws, Mr. Insull was elected President of the new Board and Mr. Randolph, Secretary and Treasurer. Of course this was only for temporary purposes as aforesaid.

Mr. Villard's suit against Judge Davis:[20] This matter has become public. All the papers discuss, and I send enclosed two samples.[21] Mr. Villard told me today that his lawyer Mr. Artemus Holmes,[22] had acted for him in this matter, and that Davis had made admissions to Holmes which the latter reduced to writing and now holds, convicting Davis. Mr. Villard says that ever since his return from Berlin both he and his wife have on every occasion both public and private, declined to recognise Judge Davis and have always cut him dead. He further states that he and his wife have resigned from Committees because Davis has been a member and that they have taken every opportunity to pointedly to show the Judge their feeling against him. It appears that Mr. Pullmann[23] has had the same experience with Judge Davis that Mr. Villard has, having put out money for him and lost everything, without any repayment.

Prof. Marks: The exec. com. of the Gen. Co. passed a resolution today requiring Marks to resign. Marcus[24] is to send it to him. They passed a further resolution dismissing him if he declines to resign. They refuse to pay the $5,000. As soon as I knew of these resolutions I took pains to have Marks given an opportunity to resign before the resolution asking for his resignation was presented. Being a professional man myself, I hoped to save Marks from the disgrace of being kicked out by resolution. I know that it is none of my business, still I would like to save a brother professional man from apparent disgrace. The best thing he can do is to resign and I hope he will.[25]

Re Siemens and Halske again: Since writing the above mem. on this subject I have gone over Coster's letter with Villard. I thought perhaps he would let me draw a new contract, meeting Coster views if possible, but Villard decides to let the matter rest until you come back and then force it through by a vote of the Board. He thinks that Coster, Wright, Johnson and Smithers[26] would be against him. You and Schurz[27] being away, that would make a tie vote of four against four, if the matter were forced to a vote now.

Prices of Stock: Gen. Co. is quoted at 80. Gen Co's trust certificates at 30 to 32. N.Y. Ill. Co. at 92.

Personal Congratulations: Our papers have all spoken very handsomely of the honor conferred on you from Italy.[28] Mr. Lippincott has given me an editorial from a Pittsburg paper to send to you. I enclose it.[29] I shall write Mrs. Edison a personal letter of congratulation.

Hoping you will excuse the length of this letter, and with compliments and best wishes to Mrs Edison and Marion, Believe me to remain, Sincerely yours,

S. B. Eaton

TLS, NjWOE, DF (*TAED* D8905AFH).

1. These interrelated agreements, each dated 6 August, governed the transfer of manufacturing and sales rights—domestic and foreign—from Edison and the North American Phonograph Co. to the Edison Phonograph Toy Mfg. Co. (which, though incorporated in Maine, was aligned with William Jacques of Boston). One agreement dealt specifically with patents that Edison might receive in the next five years, and another licensed to Edison patents taken out by Jacques (TAE agreements with Edison Phonograph Toy Mfg. Co.; Edison Phonograph Co. agreement with Edison Phonograph Toy Mfg. Co.; North American Phonograph Co. agreement with Edison Phonograph Toy Mfg. Co.; all

6 Aug. 1889; all Misc. Legal [*TAED* HX89047, HX89048, HX89049, HX89050]). These matters had been under discussion at least since May, and some sort of agreement in principle seems to have been reached in June. As a prerequisite to these agreements, the company agreed in early July to increase its capital stock (Jacques to Alfred Tate, 7 June 1889; Edison Phonograph Toy Manufacturing Co. circular, 1 Oct. 1889; both DF [*TAED* D8964ABD, D8964ACR]; Tate to Jacques, 11 June 1889; Tate to Eaton, 13 June 1889; Lbk. 30:304, 342 [*TAED* LB030304, LB030342]; "Edison Phonograph Toy Company," *Electrical Review* 14 [6 July 1889]: 1).

2. Emile Berliner (1851–1929) was born in Germany to a Talmudic scholar and immigrated to the United States in 1870, where he at some point added the "e" to his given name. After studying electricity and acoustics on his own in New York, Berliner came to Washington, D.C., and set up a laboratory, where he invented a carbon telephone transmitter. After selling the patent on that device to the Bell company in 1878, he turned his attention to recorded sound. He invented a machine in 1887 he called the gramophone that recorded laterally on a flat disc, overcoming many difficulties of the prevailing vertical recording techniques. Berliner successfully demonstrated it before the Franklin Institute in Philadelphia in May 1888. He also developed a small toy gramophone, which he demonstrated in Germany and was trying to bring to the European market about this time in 1889. By the mid-1890s, Berliner was commercially producing machines and recordings in the United States through a series of gramophone companies. *ERSUS,* s.v. "Emile Berliner"; Wile 1926, chaps. 19–22.

3. Mary Stilwell Edison (1855–1884) was Edison's first wife. Docs. 218 n. 5, 2683 (headnote).

4. Eaton and Samuel Insull planned to vacation together from the 7th or 8th to the 12th of August, after which Insull planned to attend a meeting of the Association of Edison Illuminating Companies at Niagara Falls on 13 and 14 August. Insull to Alfred Tate, 7 and 8 Aug. 1889; John Beggs to TAE, 30 July 1889; all DF (*TAED* D8959ADD, D8930ABE, D8936AAQ).

5. Jacob Hobart Herrick (1833–1903), a New York businessman and commodities broker, was made a vice president of Edison General Electric in the spring or early summer of 1889, apparently at the request of Henry Villard. He was also president of the United Edison Mfg. Co. "Jacob H. Herrick Dies After a Fall," *New York Herald,* 12 Mar. 1903, 14; Villard to Eaton, 22 Apr. 1889; William Marks to TAE, 15 July 1889; Herrick to TAE, 1 Nov. 1889; all DF (*TAED* D8938AAL, D8938AAW, D8943AAE).

6. Arthur P. Hodgkins (1861?–1897) was born in Massachusetts and received a law degree from Harvard University in 1882. It is not clear how and when he became professionally associated with Eaton in New York, but he was working for Eaton & Lewis in 1891 and later became a named partner with them. U.S. Census Bureau 1970 (1880), roll T9_562, p. 404A (enumeration district 793, Chelsea, Suffolk, Mass.); Harvard Club [1914], 251, "Recent Deaths," *American Lawyer* 5 (Nov. 1897): 550; Eaton to Tate, 22 Apr. 1891, CR (*TAED* CE91091); *NCAB* 7:130.

7. James B. Skehan (1865?–1895), a stockbroker associated with Spencer Trask & Co., was secretary and treasurer of the Edison Electric Illuminating Co. of New York. Skehan to TAE, 16 Mar. 1889, DF (*TAED* D8936AAJ); "Skehan Kills Himself," *NYT,* 27 Nov. 1895, 8.

8. Eaton meant the Brush Electric Illuminating Co., a New York affiliate of the Brush Electric Co., a leading firm in arc lighting. The New York company had about 2,500 arc lights in commercial use and several hundred others for street lighting. *Whipple's* 1890, 372; Doc. 2148 n. 7.

9. The Manhattan Electric Light Co. operated one station in New York with (as of 1890) 700 arc and 35,000 incandescent lamps. *Whipple's* 1890, 372.

10. The East River Electric Light Co. operated (as of 1890) 200 commercial arc and 1,200 incandescent lamps in New York. *Whipple's* 1890, 373.

11. The Safety Electric Light and Power Co. was incorporated in February 1887 by, among others, Herman Westinghouse, brother of George Westinghouse. Its name changed in November or December 1889 to the United Electric Light and Power Co. "New Incorporations," *Elec. and Elec. Eng.* 6 (Mar. 1887): 128; *Whipple's* 1890, 510; Arent 1969 [1919], 23, 137.

12. John Sergeant Wise (1846–1913), formerly a lieutenant in the Confederate Army, served briefly as a U.S. district attorney in Virginia and then a single term in the U.S. House as a member of the Readjuster Party but did not seek reelection. After failing to be elected governor of Virginia as a Republican in 1885, Wise practiced law in Richmond, where he represented the Sprague Electric Railway & Motor Co. against the Bell Telephone Co. in a dispute about overhead wires. He moved to New York in September 1888 and continued as counsel for the Sprague firm and subsequently the Edison Electric Light Co. *ANB,* s.v. "Wise, John Sergeant"; *BDUSC,* s.v. "Wise, John Sergeant."

13. Gianni Bettini (1860–1938), a former Italian army officer, came to the United States in the mid-1880s and began experimenting with sound recording. Trying to improve the Edison phonograph, he devised a means of transferring vibrations from the diaphragm to the stylus (or vice versa) at several points. He received three U.S. patents on this mechanism in August 1889. Although Arthur Kennelly gave an unfavorable evaluation in 1893 of Bettini's latest variation on his device, Edison purchased the 1889 patents in 1902. *ERSUS,* s.v. "Bettini, Gianni"; U.S. Pats. 409,003; 409,004; 409,005; Kennelly to Tate, 16 Feb. 1893, Kennelly Letterbook LM-7:203, WOL (*TAED* LM117203).

14. William Ciitus Witter (1842–1914) was a prominent patent attorney practicing in New York City. Witter was a veteran of the Union army and a graduate of Yale University (1865) and Columbia Law School (1867). "William C. Witter Dead," *NYT,* 29 Mar. 1914, C5.

15. The 1880 Federal census identified the brothers of John Tomlinson who, like their father and younger brother, were New York lawyers: David (b. 1848?) and Theodore (b. 1850?). U.S. Census Bureau 1970 (1880), roll T9_898, p. 589C (enumeration district 640, Manhattan, New York, N.Y.).

16. Orazio Lugo (1829–1907), born to a Venetian countess, possessed Austrian citizenship that facilitated a peripatetic and colorful life. He

reportedly fought with Garibaldi, came to the United States and was inserted as a naval spy in Richmond during the Civil War (for which he was arrested and condemned but eventually released), and somehow ended up in England, where he apparently became an assistant to William Thomson. Lugo also claimed some connection with Joseph Henry of the Smithsonian Institution. By the late 1870s, he was working in a laboratory at University of the City of New York (now New York University). In the ensuing decade, Lugo claimed several inventions in telegraphy and electric lighting. "Once Famous, Dies Neglected," *Los Angeles Times,* 19 Aug. 1907, 1; Stuart 1982; Doc. 2024 n. 2.

17. Eaton referred to the appeal of a decision by Canada's deputy commissioner of patents in February 1889 to invalidate the basic Edison lamp filament patent in Canada on the ground that lamps (or parts of them) covered by the patent had been impermissibly imported from the United States. The verdict applied directly only to a single patent but could have had vastly wider consequences. Because the U.S. Supreme Court had left a key issue unresolved in its recent decision of *Bate Refrigerating Co. v. Hammond,* the possibility remained that the invalidation of the Canadian patent could end the life of the corresponding U.S. patent (see Doc. 3313 n. 2). However, questions were raised about the deputy commissioner's authority to decide the matter, and the case was re-heard by John Carling (the Minister of Agriculture) with the Minister of Justice (John S. D. Thompson). Carling ruled in December 1889 to overturn the first verdict and reinstate the patent, and Thompson wrote a detailed report on the evidence presented ("Electrical Companies," *Teleg. J. and Elec. Rev.* 25 [27 Dec. 1889]: 712; "Edison Lamp Patent Sustained in Canada," *Western Electrician* 5 [7 Dec. 1889]: 297–99). The pending case in the meantime generated speculation that Edison and attorney Eugene Lewis would use their visit to London to try to neutralize the threat by lobbying Queen Victoria to bring Canada into an existing compact between the U.S. and Great Britain governing patent relations ("The Edison Filament Patent in Canada," *Electrical World* 14 [21 Sept. 1889]: 200). Sometime after the decision, the Edison Electric Light Co. used it in a pamphlet lampooning George Westinghouse, having "Westringhouse" confess to using the episode to sell inflated stock in his company (Edison Electric Light Co. [1889], 6–7).

18. Henry Marison Byllesby (1859–1924) was a draftsman who played a key role in designing Edison's Pearl St. central station in New York and later supervised the installation of Edison isolated and exhibition plants. Byllesby left the Edison lighting business in 1885 and went to Westinghouse Electric as vice president and general manager. Docs. 2243 n. 3 and 3002 (headnote, esp. n. 12); Obituary, *Pittsburgh Daily Post,* 3 May 1924, 7; *NCAB* 15:310–11.

19. See Doc. 3378 regarding this proposed contract. The editors have not found Coster's letter, but one dated 15 August 1889 was the subject of a lengthy summary in Villard's files. Among Coster's numerous objections to the latest draft was that the contract should be made with the Edison Machine Works rather than Edison General Electric, and that it should distinguish the flexible Siemens & Halske cable from the rigid tubes used in the Edison underground system. The next definitive

step occurred in September. Memorandum on Coster letter of 15 Aug. 1889, n.d., Box 78, Folder 551, Villard; see Doc. 3418.

20. Noah Davis (1821–1902) was born in New Hampshire and grew up in Buffalo, N.Y. He was elected to the U.S. House of Representatives from New York as a Republican in 1868 but resigned before completing his term to become a U.S. attorney. He left that office at the end of 1872 after winning a seat on the Supreme Court of the State of New York. He sat on the bench until 1887, gaining wide recognition for conducting the corruption trials of William "Boss" Tweed. Davis was recently a member of the Edison Electric Light Co.'s board of directors. Villard sued him in August 1889 for repayment of $125,000, the dispute apparently having originated years earlier in the collapse of Villard's Oregon Transcontinental Co. *BDUSC,* s.v. "Davis, Noah"; "Noah Davis Dead," *NYT,* 20 Mar. 1902, 2; "Villard Sues Noah Davis, *NYT,* 21 Aug. 1889, 5; "Edison's Quarter Million," *New York Herald,* 19 Jan. 1889, Cat. 1160:7, Scraps. (*TAED* SB019007b).

21. Enclosures not found.

22. Artemus H. Holmes (1849–1917), a prominent New York attorney, had represented Villard for at least a decade. Born in Illinois, Holmes attended Washington University in St. Louis and Harvard University. "Artemus H. Holmes Very Ill," *NYT,* 7 Mar. 1908, 7; "Died," *NYT,* 21 Aug. 1917, 9; U.S. Congress. Senate, 1888.

23. Chicago industrialist George Mortimer Pullman (1831–1897), who built his sleeping car business into a railroad empire, hosted Noah Davis at his home and sponsored an 1882 banquet in his honor, but the editors have not learned more about the business relations between the two men. *ANB,* s.v. "Pullman, George Mortimer"; "Suburban," *Chicago Daily Tribune,* 18 June 1882, 7.

24. Arnold Marcus (b. 1838) was a native of Hamburg, Germany, and a New York stockbroker. At this time he was secretary of the Edison General Electric Co. and the United Edison Mfg. Co. U.S. Census Bureau. 1970 (1880), roll T9_ 880, p. 349A (enumeration district 293, Manhattan, New York, N.Y.); U.S. Census Bureau 1982? (1900), p. 9 (enumeration district 11, Englewood Ward 2, Bergen, N.J.); Tate to Marcus, 8 Oct. 1889, Lbk. 33:14 (*TAED* LB033014); Marcus to TAE, 5 Sept. 1889, DF (*TAED* D8943AAB).

25. William Marks believed he had taken the job as chief engineer of the Edison General Electric Co. on condition that he answer only to Edison and Villard, and he chafed at reporting to vice president Jacob Herrick or anyone else. Amid a chain of correspondence in July, Marks broached the subject of resigning but did not quite offer to do so. Before Edison left for Europe, he had Samuel Insull give Villard his opinion that Marks "is a very valuable man as an Engineer but his peculiarities reduce his value very much and under the circumstances I think we would do better to get another man." One way or another, Marks returned in the fall to managing the central station in Philadelphia. Marks to Herrick, 15 July 1889; Marks to TAE, 16, 22, and 23 July 1889; TAE to Marks, 20 July 1889; Marks to Villard, 22 and 30 July 1889; Insull to Villard (quoted), 23 July 1889; all DF (*TAED* D8938AAX, D8938AAY, D8938ABF, D8938ABG, D8938AAZ, D8938ABB, D8938ABJ, D8938ABH).

26. Francis Sydney Smithers (1839–1919), son of a Montreal bank president, moved to New York in 1865 and began his own career in gold exchange and banking. He was a director of the Edison General Electric Co. (and a member of its law committee) and a trustee of the Edison Electric Illuminating Co. of New York. "F. S. Smithers, Banker, Dies at 70," *Brooklyn Daily Eagle,* 29 Nov. 1919, 22; Edison General Electric Light Co., circular letter, n.d. [22 May 1889], UHP (*TAED* X154A8CI); "Edison's Quarter Million," *New York Herald,* 19 Jan. 1889, Cat. 1160:7, Scraps. (*TAED* SB019007b); Edison Electric Illuminating Co. of New York, certificate of capital stock increase, 12 Feb. 1890, NNNCC-Ar (*TAED* X119JH).

27. Statesman and journalist Carl Schurz (1829–1906) came to the United States in 1852 as an exiled German revolutionary. Drawn to the abolitionist cause, he entered politics in the new Republican Party and served as an officer in the Civil War. After the war he became first a U.S. senator (from Missouri), then secretary of the Interior Department (under Rutherford Hayes), before focusing his energies on journalism as co-editor of the *New York Evening Post* and *The Nation* until 1883. Schurz was a director of the Edison General Electric Co. by January 1890. *ANB,* s.v. Schurz, Carl; "The Edison General Electric Company's Annual Meeting," *Electrical Engineer* 9 (Feb. 1890): 73.

28. See Doc. 3392 (headnote).

29. Enclosure not found.

–3401–

Margaret Upton to Helen Storm

Paris, France— Aug. 20, 1889

My dear Mother:—

After writing you last Wednesday[1] I went out to the Exposition and met Mr. Dyer, and we wandered thro various departments, among them the Russian, which ended in my buying two of the handsomest side board covers you ever saw, of Russian embroidery on white linnen. At five o'clock Frank met me, and after dining we spent the entire evening in the wonderful Cairo St.[2] which is one of the features of the exposition. We went into the dance houses and saw in one an Egyptian[a] dance just as given in Egypt. In another a Moorish dance, the most weird barbaric affairs you can imagine. Thursday we spent at the Exposition and remained all the evening there. Friday I went out for an hour with Mrs Edisons sisters, to their dressmaker, thinking I would order a gown, as Frank suggested I should, but I was'nt much pleased, ~~and~~ I[b] did'nt do it—as it takes so much time from sight-seeing, the moment one begins on clothes. In the afternoon we went to the Exposition and at seven o'clock to an elegant dinner, given by Mr. Eugene Lewis of New York to Mr. Edison. The diner was at the Bignon,[3] which is the Delmonico's[4] of Paris. Mr. Lewis came for me in his carriages. The party consisted of

Mr & Mrs Edison—Frank and myself, Miss Miller and Mr. Lewis. The table had superb flowers on, and the diner was magnificent, as only the French can produce. After dinner we went to the theatre,[5] where Mr. Lewis had taken two boxes and had the partitions removed so we were all together. Each lady was given a superb bouquet as we left the dinner table. Mr. Lewis invited a few more of the Edison people to come to boxes, and we had an elegant time. At ten o'clock Mr. Edison and Frank had to leave us, as both were invited to a soireé[a] at Prince Roland Bonaparte's.[6] It was a gorgeous affair Frank says, and he enjoyed it very much indeed. We think it a great compliment that Prince Roland invited him. Only men were present, and they the most distinquished in Paris. He and Mr. Edison returned to the theatre for us, and we all came home together. Every where Edison goes the people stand in groups[a] to stare at him, and we have some funny experiences. Saturday, we went to Notre Dame, the Salon Carré of the Louvre,[7] and drove thro' the old part of Paris. In the evening our party all attended the Grand Opera,[8] on the invitation of Mr Raul,[9] one of the Edison Company of Paris. He had the three boxes directly opposite the stage made into one, and festooned with a garland of Laurel leaves intertwined with roses, running all round the box inside. At the back of the box, were the American and French flags, draped together, and on the sides, Lovely flowers, ferns and palms, in pots, and incandescent lamps all thro' them to illuminate them A beautiful buffet of Champagne lemonade, bon-bons and ices was in the back of the box, and two waiters to serve it, all the evening. After each lady removed her wrap, she was presented with a lovely bouquet of pink roses tied with lavender ribbon. We went in a little late, and at the end of the first act, the grand orchestra played the Star Spangled Banner, and every one in the house rose, and turned round to face our box. Edison rose first and bowed in acknowledgement, then we all rose and bowed. Then every body turned their glasses on us and stared to their hearts content. After that the Opera went on. The manager came to the box and offered Edison the use of his own box at any time. Between the next acts, we were all taken out and shown the Grand Staircase and Foyer—a staring crowd following. It was however a most gorgeous and beautiful affair. Sunday we were lazy till noon. Then we again went to the Exposition, and at night found Curtis Perry[10] and dined him, spending the evening at home. Yesterday it poured, but in the morning we accepted an invitation to go all over the Grand Opera house and were taken where visitors are never allowed. We saw the ballet lessons going on, the dress-making department, the private rooms of the performers, all the machinery of the place, and went on top of the roof where we had a superb view of Paris. Then we spent the remainder of the day at the Exposition. Curtis Perry and Dr. [Swazey?][11c] dined with us at our rooms. We had a delicious dinner and delightful visit. Your letter[12] came and were so glad to get it. I hope you will save any thing the news-papers may have [in?],[c] about our party or us,. And let [Irving?][c] and Susie[13] hear about our good time. We received a cable from Henry [Rich?][14c] last night, saying another boy had arrived safely. I must not write more as I have lots of things to do. Give my dearest love to father, and accept a great deal for yourself, from us both. Lovingly your daughter,

Margaret A. Upton.

ALS, NjHi, FRU Scraps., MS Group 988 (*TAED* X184B3). [a]Obscured overwritten text. [b]Interlined above. [c]Illegible.

1. Doc. 3396.

2. Cairo Street, or la rue du Caire, was intended to represent a street in the Egyptian capital. It was (as it had been in the 1878 Exposition) one of a number of such constructs in a section devoted to the colonial empires of European powers. Designed by French architect Delort de Gléon, the street included shops, bazaars, entertainment venues, and two mosques. It was staffed by artisans and entertainers from North Africa, including belly dancers, who were considered risqué in 1889 Paris. Findling and Pelle 2008, 104; "At the Paris World's Fair," *NYT,* 23 June 1889, 16; Gléon 1889.

3. Likely the renowned restaurant Chez Bignon (also known as Maison Bignon) at 38 Boulevard des Italiens. It was the former Café Foy, opened in 1749 and famous as the place where Camille Desmoulins made a rousing speech on 12 July 1789 that precipitated the attack on the Bastille. In 1889, it was owned by Jules Bignon, whose brother Louis was the proprietor of Café Riche, 16 Boulevard des Italiens, another famous Paris eatery, sometimes also called Bignon's. "Dining in Paris," *Frank Leslie's Popular Monthly,* 6 (Sept. 1878): 351; Baedeker 1878, 15; Grafe and Bollerey 2007, 76.

4. Delmonico's opened at 25 William St. in lower Manhattan in 1831 and for decades enjoyed a reputation as New York's finest restaurant, featuring French and American fare. By this time, Demonico's had three locations in the city and had only just closed a fourth at 112–114 Broadway. The branch that Edison and his associates seem to have frequented was at Fifth Ave. and Twenty-Sixth St., a six-story establishment overseen by renowned chef Charles Ranhofer. Thomas 1967, 12, 157, 159, 165–66; Tate 1938, 78.

5. The group saw the ballet *Excelsior,* an allegory of electrical progress. Edison had provided special lighting for the dancers and some

of the scenery for a New York production in 1883. Postlewait 1999, 2:127–30; Docs. 2502 n. 2 and 3392 (headnote).

6. Prince Roland Bonaparte (1858–1924), an explorer, geographer, anthropologist, botanist, zoologist, and ethnologist, hosted a meeting of the Congress of Criminal Anthropologists at his Paris house. Bonaparte was a grand-nephew of Napoleon I and the son of Prince Pierre Bonaparte and his mistress, Justine Ruffin, the daughter of a Paris plumber. His parents eventually married but Roland grew up in straitened circumstances after his father was disowned by the Bonaparte family and later arrested for killing a journalist. The French government eventually provided a stipend for Justine and her two children, enabling Roland to attend the Lycée Saint-Louis and the Saint-Cyr Military School and begin his career as a sub-lieutenant in the French army. Roland's financial position dramatically improved with his marriage to Marie Felix Blanc, whose father owned the Monte Carlo Casino. The match brought him a large dowry, a palace on the Mediterranean, and after her death in 1882, an inherited fortune. "Prince Roland Bonaparte," *Nature* 113 (24 May 1924): 755; "Prince Roland Bonaparte Dies; Kinsman of Napoleon," *NYT,* 15 Apr. 1924, 21; "Prince Roland Bonaparte Passes: Was a Prince of Science," *NYT,* 20 Apr. 1924, xx13; Atteridge 1909, 566–67.

7. The Salon Carré, what historian Thomas Crow called "the vast box of a room," was the exhibition space in the Louvre Palace where the Paris Salon art exhibitions of the Académie de Peinture took place. Royal architect Louis Le Vau redesigned the room after a 1661 fire, and in 1725 it became an exhibition space for the Royal Académie. Crow 1985, 1; Oliver 2007, 7–8; Babelon 1998, 275.

8. The Opéra staged *Les Huguenots* by Giacomo Meyerbeer; see Doc. 3392 (headnote) regarding the Edisons' theater outings in Paris.

9. That is, Louis Rau (1841–1923), managing director of the Paris-based Compagnie Continentale Edison. Rau was born in Germany but was a naturalized French citizen. The Compagnie Continentale was one of four French firms contracted to provide electric light and power for the Exposition. Docs. 2581 n. 3, 2819 n. 2; Rau agreement with Paris Universal Exhibition, et al., 1 June 1889, Misc. Legal (*TAED* HX88018B4).

10. Possibly Curtis Appleton Perry (1854–1931), the brother of Francis Upton's first wife, Elizabeth Fenno Perry. A member of the Bowdoin College class of 1877, Perry was an artist who later cofounded a socialistic art community near Portland, Maine, where American painter Marsden Hartley, among others, found solidarity around the turn of the century. Perry birth record, *Massachusetts Birth Records, 1840–1915,* online database accessed through Ancestry.com, 16 Mar. 2018; Find A Grave memorial no. 39652151, online database accessed through Ancestry.com, 16 Mar. 2018; U.S. Census Bureau 1970 (1880), roll 477, p. 91C (enumeration district 25, Brunswick, Cumberland, Me.); U.S. Dept. of State n.d., roll 226, Perry passport application, 2 Nov. 1914; Bowdoin College 1889, 82; Luddington 1992, 26, 28, 40.

11. Likely Dr. James Atwood Swasey (1833–1896), a Chicago dentist and president of the Chicago Dental Society in 1889. Swasey attended the International Dental Congress, held in Paris from 1 to 8 September at the Trocadéro Palace. Swasey birth record, *Vermont Vital Records,*

1720–1908, online database accessed through Ancestry.com, 23 Mar. 2018; "Dr. J. A. Swasey," *Chicago Daily Tribune,* 27 Dec. 1896, 2: "James A. Swasey," *The Dental Cosmos* 39 (Apr. 1897): 345; "Chicago Dental Society," *International Dental Journal* 10 (May 1889): 318; Koch 1909, 2:1174; *Passenger Lists* 1958, microfilm M237_539, line 5, list number 1308.

12. Not found.
13. Not identified.
14. Not identified.

–3402–

Alfred Tate to Samuel Insull

Paris.[1] Aug 23/89

My dear Insull:

I confirm my cablegram to you of yesterday as follows:[2]

"Stevens entirely unauthorized unprepared do anything.[3] Unless immediate action taken in Boston to place foreign business in competent hands one year will be entirely lost. Want you to try initiate negotiations with Dick who can act quickly when arrangement made" Edison[a]

Mr Edison is very much disappointed that Mr Stevens came wholly unprepared to start active operations over here. We all thought that when he arrived decided steps would be taken to secure the coming Christmas trade.[4] If you can do anything towards inaugurating a more active policy in Boston Mr Edison wants you to take the matter up and get them to make some arrangement with Dick, who is not only well posted on the foreign business but who is the only available medium through which the trade of this year can be secured.[5]

My cablegrams have kept you acquainted with the situation here. I have not written you much lately, first because you are thoroughly posted and secondly because I have been rushed at a tremendous pace since Mr Edison's arrival. In addition to the numerous Engagements I have to keep with him, I have to tackle a correspondence involving nearly one hundred letters per day, and nearly all of which require to be replied to. Add to this the fact that they are written in French (I have a French Stenographer) and that it takes twice as long as correspondence in English, and you can size up the situation.

People here say that nothing has ever Equalled the reception which has been given Mr Edison by representative bodies of the French nation. On the 4th Septr the Minister of Commerce &c Mons. Tirard,[6] gives him a dinner, and on the

9th he is to be Entertained in the same way by the city of Paris (Hotel de Ville)[7]

I think it quite possible that Mr Edison will go to England but will advise you more definitely later on.

Either today or tomorrow I will address you another letter on the subject of the Phonograph.[8] I have seen nothing of the Seligman party lately and that affair rests as explained in my last cablegram—[9] They stated they were unauthorized to negotiate for anything other that the purchase outright of the Phono interests. Gouraud and Edison declined.

I hope you Enjoyed your drive with ~~Edis~~ Eaton.[10] You must have needed a rest. Truly yours

A O Tate

I will see that you get those confirmations from Gouraud re Mexico[11]

ALS, NjWOE, DF (*TAED* D8905AFJ). [a]Followed by dividing mark.

1. Tate addressed this letter from the Hôtel Castiglione.

2. Tate quoted the full text of his 22 August cable to Insull. DF (*TAED* D8964ACO).

3. Tate had cabled Insull in mid-July about the intentions of Benjamin Stevens: "Wire status toyphono. Will Stevens be prepared deal with foreign business on arrival and when." Insull replied, in part: "Toy doll practically closed. Stevens expects negotiate." Insull said nothing about the European negotiations in a subsequent letter to Stevens, nor did Stevens discuss specific plans in a letter just before Edison's departure. He planned only a brief stay in Paris but promised to find Edison there before leaving in time to reach New York on 9 September. Tate to Insull, 18 July 1889; Insull to Tate, 19 July 1889; Stevens to TAE, 31 July 1889; all DF (*TAED* D8964ACJ, D8964ACK, D8964ACM); Insull to Stevens, 20 July 1889, Lbk. 31:355 (*TAED* LB031355); *Passenger Lists* 1958, microfilm M237_538, line 54, list number 1246.

4. There were also warning signs about the prospective domestic market for the talking doll. In July, an associate of Stevens interviewed several prominent retailers about Christmas sales in New York, and the results were not encouraging. His contacts, including Frederick August Otto Schwarz of the city's largest toy store, described a very limited market for expensive dolls (in the $15 range). They seemed inclined to think of the Edison toy as an old idea that had never amounted to much, an impression formed, at least in part, by unkept promises of having dolls ready for last Christmas. William Ratcliffe, Jr., to Stevens, 11 and 12 July 1889; Stevens to TAE, 16 July 1889, all DF (*TAED* D8964ACH, D8964ACI, D8964ACG); "Fractional Currency," *The Chronicle*: *A Weekly Insurance Journal* 56 (25 July 1895): 44.

5. Tate again cabled on 30 August: "Stevens did not desire negotiate have all toyphono contracts been executed." After Insull requested instructions in the matter, Edison advised that an agency contract should be arranged with Albert Dick for "one year on basis

fifty per cent royalty to boston company added to cost of phonograph part delivered antwerp dick to keep agency for the second year and thereafter if sales amount eighty thousand yearly go to Boston and put this through otherwise phonograph boom will die out here business will be killed and our factory investment lost." Tate to Insull, 30 Aug. 1889; Insull to Tate, 4 Sept. 1889; TAE to Insull, 5 Sept. 1889; all DF (*TAED* D8905AFQ, D8964ACP, D8964ACQ).

6. A stalwart republican, Pierre-Emmanuel Tirard (1827–1893) became prime minister of France for the second time in February 1889. Concurrently acting as Minister of Commerce, Industry and the Colonies, Tirard presided over the opening of the Exposition. His dinner in Edison's honor was planned for two hundred guests. According to Robert Sherard, an autographed photograph of Tirard was among several on display in Edison's hotel rooms. *Encyc. Brit.* 11, s.v. "Tirard, Pierre Emanuel"; Bell et al. 1990, s.v. "Tirard, Paul-Emmanuel;" *Appletons' Annual Cyclopedia* 1894, s.v. "Obituary"; *Appletons' Annual Cyclopaedia* 1887, s.v. "France"; "A Travers Paris," *Le Figaro* (Paris), 5 Sept. 1889, 1; Sherard 1905, 191.

7. Hôtel de Ville, the city hall of Paris, was destroyed by fire in 1871 during the Commune and was reopened in 1882. Edison's memory of this dinner years later included the Edison lighting plant there. The installation had been proposed as early as 1886 but completed recently and used only for special events. *Galignani's* 1889, 146; Dyer and Martin 1910, 2:748; "Notes," *Electrician* 17 (20 Aug. 1886): 292; "Electric Lighting in Paris," *Teleg. J. and Elec. Rev*. 27 (14 Nov. 1890): 588; "The Cost of Municipal Electric Lighting in Paris," *Electrical Review* 26 (28 Feb. 1890): 229.

8. The editors have not found a letter within that narrow time frame, but see Doc. 3409.

9. Tate probably referred to his 19 August message to Insull: "Seligman's agents state are authorized negotiate only for outright purchase. Gouraud and Edison refuse this basis." DF (*TAED* D8959ADH).

10. See Doc. 3400.

11. Tate referred to written confirmations of Gouraud's assent to Thomas Connery's requests to alter the terms of his Mexican phonograph concession. He reported ten days later that Gouraud had "overlooked" putting anything in writing but would do so. In mid-September, however, Tate was forced to remind Gouraud again by summarizing his correspondence with him on the subject. Gouraud finally signed an agreement with the amended terms in early October. Tate to Insull, 2 Sept. 1889; Tate to Gouraud, 13 Sept. 1889; both DF (*TAED* D8905AFR, D8961AAN1); TAE agreement with Gouraud and Connery, 5 Oct. 1889, Misc. Legal (*TAED* HX89053).

–3403–

Margaret Upton to Edward Storm

Paris—France Aug 26th[–]30, 1889[1]

My dear Father:—

Mothers letter[2] came this morning, and I was so glad to hear from you all. I was so surprised to hear you had given up No. 7, yet I know I was about the only member of the family who used it.[3] I am quite anxious to know what you did with all the things, and hope you will want me to store the Dutch table for you at Orange—of course subject to your orders at any time. We are having such a beautiful time— Wednesday[a] night we were dined by M. Berton,[4] one of the wealthy Parisians—in behalf of the Telephone Companies of France—[5] The dinner a most superb affair was at the Exposition[a] grounds, in the restaurant Kuhn[6]— the room in which it was served was lined all round with palms and ferns, and blooming plants, so the effect was as in a great conservatory—all thro' these plants were hundreds of little incandescent lamps— It was a regular fairy-land scene— About one hundred and fifty sat down at[a] three tables— I had a most honored seat opposite Mrs Edison. On my left was Mr. Bartholdi[7]—who made the great Statue of Liberty in New York harbor— He speaks good English and was perfectly charming to me. On my right sat Mr. Preece[8] of London the most eminent Electical Engineer in England, next him Mr. Berger,[9] the French Exposition Commissioner, next him Edison—and then M. Mascart[10] the most eminent scientist in France. After dinner we listened thro the Telephone to the Grand Opera[11] being performed five miles away. It was like a chapter from Looking Backwards.[12a] Saturday Mr. Dick and Mr. Dyer had a four-in-hand coach and drove eleven of us to Versailles. It was a beautiful day, and we had an elegant time—with a fine déjeuner there—in a private room— When we returned we attended an elegant dinner at the Grand Hotel,[13] given by Mr. Hammer for Mr. & Mrs Edison, after which we all went to see the Spanish Dancer[14]—one of the sights of Paris this summer— Sunday [we?][b] with the Edisons breakfasted with Mr & Mrs Harjes[15]—at their elegant house in Paris— Mrs. Harjes came up from the country and opened her house for this occasion— Tuesday night we attended a very swell reception for Mr. E. by the British Scientists in Paris[a] in Convention[16]— Sir William Thompson and a number of celebrated people were there. Mr. Courtlandt Parker[17] of Newark went with us— Wednesday we came over to London and are at the Metropole[18]— We are alone—and having a glorious time— Last evening in the parlor—just before we went out to dinner I met Mrs Nicholls[19] of New York, a great friend of Mrs Thompsons—[20] We were dined &[a] taken to the theatre last night by Franks friend, Mr. [----- -----],[b] and to night a Mr. Thomas[21] honors us the same way— Next Tuesday and Wednesday we dine at two different country places with Franks friends and shall have an opportunity to see some thing of English Country life— We sail Thursday on the Saale—North-German Lloyd[22]—and ought to be in New York the 12th. I hope all goes well with you dear father— With much love to you and mother in which Frank joins— Ever your loving daughter

Margaret A. Upton—

Frank has gained six and I seven pounds—

ALS, NjHi, FRU Scraps., MS Group 988 (*TAED* X184B4). [a]Obscured overwritten text. [b]Illegible.

1. Margaret Upton dated the start of this letter "Aug 26th" at the Hôtel du Rhin in Paris. She closed it at London's Hotel Metropole on "Aug. 30, 1889."

2. Not found.

3. The editors have not identified "No. 7" but presume it was a family residence, perhaps a summer or vacation home.

4. Louis Alfred Berthon (b. 1838), a French civil engineer and inventor, was an initial investor in the first Edison telephone company in France, the Société du Téléphone Edison, and became chief engineer and managing director of its successor, the Société Générale des Téléphones. Berthon electoral record 1891, *Paris and Vicinity, France Electoral Rolls, 1891,* online database accessed through Ancestry.com, 28 Mar. 2018; Doc. 1449 n. 1.

5. The French telephone company Société Générale des Téléphones was created in December 1880 by the merger of the Société du Téléphone Edison with two rivals operating under the Gower and Blake transmitter patents. The combined company controlled telephone networks throughout France. Docs. 1826 n. 4, 1983 esp. n. 1; Préfecture de la Seine 1884, 432–33.

6. Restaurant Kuhn was an ostensibly Austrian-themed establishment at the Exposition, though a reporter for the *New York Herald* European edition wrote that only the name and the beer evoked Austria. Jonnes 2009, 158.

7. Sculptor Frédéric Auguste Bartholdi (1834–1904) is best known as the creator of the Statue of Liberty in New York Harbor, dedicated in 1886. Before he studied sculpture and painting, the young Bartholdi trained as an architect. *Ency. Brit. Online,* s.v. "Bartholdi, Frédéric Auguste."

8. William Henry Preece (1834–1913), the assistant chief engineer for the British postal telegraph system and a member of the Royal Society, was vice president of the electrical jury at the Exposition. His long acquaintance with Edison had been marked by a bitter feud in the late 1870s, but their recent relations had been cordial, even warm. Docs. 2600, 2756 n. 3, 2865 n. 10; Hering 1893, 17–18.

9. Paul-Louis-Georges Berger (1834–1910) was the commissioner general of the 1889 Paris Exposition. Trained as an engineer, Berger was educated at the Collège Charlemagne and the École Supérieure des Mines and afterward took a position with the Compagnie des chemins de fer du Nord. He was involved with organizing the Paris expositions of 1867 and 1878. Berger was also a professor of art history at the École des Beaux-Arts and later was elected to the Académie des Beaux-Arts. He was made an officer of the Légion d'honneur in 1878 and was elevated to a grand-officer two days prior to the opening of the 1889 Exposition Universelle. He was elected a deputy to the National Assembly in 1889 and reelected every four years until his death. "Nécrologie," *Art et Décoration* (Supplément) 28 (Aug. 1910): 4; "L'Élection à l'Académie des Beaux-Arts, *Art et Décoration* (Supplément) 14 (Dec. 1903): 2; *DNC,* s.v. "Berger, Paul-Louis-Georges."

10. Éleuthère Élie Nicolas Mascart (1837–1908), professor of physics at the Collège de France and director of the Bureau Central Météorologique in Paris, was renowned for his experimental and theoretical work in a number of fields, including optics, magnetism, and meteorology, but chiefly in electricity. He had been president of the general assembly of the International Society of Electricians at the time of its meeting in Paris in 1887. He was president of the Exposition jury on electricity and a principal organizer of the related meeting of the International Congress of Electricians. *CDSB,* s.v. "Mascart, Éleuthère Élie Nicolas"; Hering 1893, 17–18; U.S. Commissioners 1890–91, 4:18.

11. The Théâtrophone was a coin-operated machine that allowed patrons to hear five minutes of live opera by telephone for the cost of fifty centimes. Edison experienced the device during his 14 August visit to the Exposition's Telephone Pavilion. The Paris newspaper *Le Figaro* reported that he "was so delighted that he engaged the inventors to establish a similar system of automatic communication in New York." By 1890, the Compagnie du Théâtrophone had begun installing the devices in Parisian hotels, bars, and other public establishments; subscribers could also have it in private residences. The system continued in use until 1932. Fauser 2005, 297; "À Travers Paris," *Le Figaro,* 15 Aug. 1889, 1.

12. Edward Bellamy's popular socialist utopian novel *Looking Backward: 2000–1887* was published in 1888. In it, Bellamy foresees each house in his futurist city connected by telephone to "a number of music rooms" so residents could listen to live performances from the comfort of their own homes. Bellamy 1888, 156.

13. The names of any number of Paris establishments started with the phrase "Grand Hôtel," but the one called simply The Grand Hôtel, at 12 Boulevard des Capucines overlooking the Paris Opéra, was among the city's largest and finest. Designed in the Second Empire Style, it opened in 1862. The Café de la Paix on the ground floor served as its restaurant since the beginning. Baedeker 1878, 5; Great Eastern Railway 1877, 123; Intercontinental Paris Le Grand 2017, 3–4, 7.

14. While claiming training in classical ballet, Carmen Dausset (1868–1910) gained international fame at the 1889 Exposition for her performances as an Andalusian dancer. She performed in New York later in the year and toured the United States in 1890, when she took the stage name "Carmencita." In New York, she met the painter John

Singer Sargent, who arranged to make a full-length portrait of her at the studio of William Merritt Chase (who also painted her portrait). In 1894, William K. L. Dickson made a film of her dancing at Edison's Black Maria studio at the laboratory (four sequences of eight still frames each are published in Dickson and Dickson 1894a, p. 310). Scholars consider it the first film of a woman made by an Edison motion picture camera. Bennahum 2000, 51–53, 209 n. 12; Musser 1995, 18; Cogeval et al. 2009, 74.

15. The financier John Henry Harjes (1836–1914) was born in Bremen and immigrated to Baltimore, from where he moved to Philadelphia and began a banking career in 1853 as a member of Harjes Bros. In partnership with Philadelphia banker Anthony Drexel, he established Drexel, Harjes & Co. in Paris as a branch of Drexel & Co. in 1868. From that time Harjes remained largely in France, making Drexel, Harjes & Co. into a major broker of American stocks in France. He married Amelia Hassenbruch (1841–1934) of Philadelphia in 1868. Amelia Harjes became socially prominent among Americans living in Paris. Doc. 1846 n. 3; *NCAB* 19:262; U.S. Dept. of State n.d., roll 309, Amelia H. Harjes passport issued 5 June 1916; marriage record for Amelia Hessenbruch, 1868, *Pennsylvania and New Jersey, Church and Town Records, 1669–2013,* online database accessed through Ancestry.com, 7 May 2018; "Mrs. John H. Harjes," *NYT,* 10 July 1934, 21.

16. The International Congress of Electricians, meeting in Paris from 24 to 31 August in conjunction with the Exposition, held a reception for Edison at the British Pavilion. In addition to William Thomson (who presided), attendees included William Preece, James Dredge, and William Hammer. Published accounts ascribed the event to Wednesday evening, which fell on 28 August. "Paris Exposition," *Western Electrician* 5 (28 Sept. 1889): 166; "The Fêting of Mr. Edison in Paris," *Teleg. J. and Elec. Rev.* 25 (30 Aug. 1889): 242; U.S. Commissioners 1890–91, 4:18.

17. Cortlandt Parker (1818–1907) was a prominent Newark attorney. A native of Perth Amboy, N.J., he was valedictorian of his graduating class at Rutgers College in 1836. Parker read law with Theodore Frelinghuysen and was admitted to the bar in 1839. He became active in politics with the presidential campaign of 1844 and later helped organize the Republican Party in New Jersey. President Grant sent him to Louisiana to oversee the counting of ballots in the disputed 1876 presidential election. Parker declined ambassadorships offered by Presidents Rutherford B. Hayes and Chester Arthur. "Cortlandt Parker Dead," *NYT,* July 31, 1907, 7; "Start for Europe To-Day," *NYT,* 31 July 1889, 2; *A History of the City of Newark* 1913, 3:223.

18. Built for Frederick Gordon's hotel company, the luxury Metropole Hotel, located on Northumberland Ave. in London, opened in 1885. Denby 1998, 143.

19. Possibly Ida Preston Nichols (1853–1928), the wife of Cornell University physics professor Edward Leamington Nichols. After some time at Vassar College in Poughkeepsie (not far from her hometown of South Dover, N.Y.), she attended Cornell from 1872 to 1875 and earned a licentiate in botany and floriculture. She and Nichols met as students at Cornell and married in 1881. She later wrote and illustrated children's fairy tales. U.S. Dept. of State n.d., roll 1472, Edward L.

Nichols passport application, 24 Feb. 1921; Cornell University 1878, 39, 104; death record for Ida Preston Nichols, *Florida Death Index, 1877–1998,* online database accessed through Ancestry.com, 30 Apr. 2018; Merritt 1940, 346; "Fairy Stories," *Book News* 10 (Oct. 1891): 70; "Books for Children," *The Bookseller, Newsdealer and Stationer* 23 (15 Nov. 1905): 487.

20. Frances Anna Thomson (d. 1916), the daughter of Charles Blandy, an English wine producer on the island of Madeira, was the second wife of distinguished physicist William Thomson. They met when he visited the island in 1873 aboard the *Hooper,* which was laying 2,500 miles of telegraph cable between Lisbon and Brazil. They married the next year when Thomson made a return trip to Madeira on his own yacht. Collins et al. 2016, 19–20; "Obituary," *Times* (London), 17 Mar 1916, 27.

21. Not identified.

22. The North German Lloyd Co., based in Bremen, was founded in 1857 and began service to New York the following year. It significantly expanded its express passenger operations in the 1880s and by this time was one of the principal transatlantic steamship operators. The luxury liner *Saale* was built in Scotland and entered the company's expanded fleet in 1886 on the Bremen-Southampton-New York route. Over 400 feet in length, the *Saale* had a single screw, four masts, and could carry 1,240 passengers. It was one of several ships caught in a conflagration on the docks of Hoboken, N.J., in June 1900 that left 109 of her passengers dead. Fry 1896, 226–30; "A New German Steamer," *NYT,* 29 Aug. 1886, 3; "Over 200 Perish in Burning Liners," *NYT,* 1 July 1900, 1.

–3404–

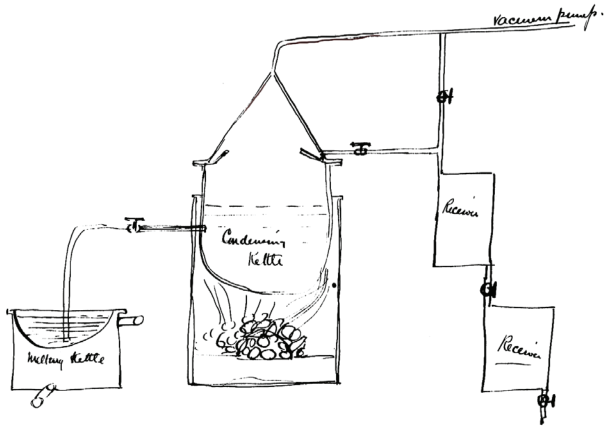
From Charles Batchelor

Orange, N.J. August 27, 89.[a]

My Dear Edison,—

WASTE WAX. I have had Aylesworth make an experiment in regard to recovering the stearic acid from the old wax, and he finds that he can recover very easily about ninety-two per cent of the stearic acid and cerasine. His process is decomposition of the wax by ~~the~~ an[b] acid, and purifying and separating the parts by distillation in vacuum. He says that steam distillation would answer, but considering the danger, trouble and care, and also the expense of having to boil a considerable quantity of water off afterwards, distillation by vacuum is preferable. The vacuum is about 26 inches, and is got by an ordinary water pump.[1] I am, therefore, making him a kettle about 36 inches diameter, with a copper top suitable both for getting the vacuum and also for running the distilaets over into suitable chambers cheaply. Immediately this is done, I think we shall be able to give them a price for the old wax.

Wax recoverer.[2c]



ORE MILLING. The Mallory single magnet has been done now for a few days, and is already painted up to go away. The other one will be finished in a couple of days, when they will both be shipped together[3]

We have just made an extended test of the single magnet. We found that it would be necessary to crush a little ~~smooth~~ smaller[b] before putting it on that machine, and have, therefore, substituted brass bars ¾ of an inch high on the outside of the drum instead of wooden ones, which were on when you were here. I noticed that the ore was fast ~~going~~ cutting[b] into the brass cylinder, so that it would soon have worn it away. We have remedied this by shellacing strips of canvass on, which after our extended test of twelve hours run, with ore continually running on it, did not show the slightest sign of being cut up. The heat inside the cylinder reached 205, but I do not consider this as anything, as it cannot be exceeded, this being the hottest season of the year. It has been a very slow job with the other magnet, as I have had to reorganize the bottom shop,[4] discharge a lot of the men, and get others who will attend to the business in better shape.

I send you cutting about Wilbur.[5] This is a sorry ending for such brilliant talent. Your very truly,

"Batch"

TLS, NjWOE, DF (*TAED* D8968AAN). Letterhead of Edison laboratory. [a]"*Orange, N.J.*" preprinted. [b]Interlined above by Batchelor. [c]"Wax recoverer." written by Batchelor on separate sheet with drawing.

1. That is, a common laboratory instrument for evacuating a closed vessel. Like the Sprengel mercury air pump so familiar to Edison and Batchelor from their electric light research, it worked by having liquid

drops fall through a tube and entrain the air around them. *KAMD,* s.vv. "air-pump," "aspirator"; cf. Doc. 1816.

2. Batchelor made this drawing on a separate sheet. Figure labels are (at top) "vacuum pump," and (from left) "Melting Kettle," "Condensing Kettle," "Receiver," and "Receiver." He made a similar drawing and a brief description (like that above) in his journal several weeks later. Cat. 1337:72 (item 584, 12 Sept. 1889), Batchelor (*TAED* MBJ004072B); see also Ayslworth's testimony, pp. 53–55, 57–58, *American Graphophone Co. v. National Phonograph Co.,* Lit. (*TAED* QP003046 [images 109–12]) and N-88-08-23:165, Lab. (*TAED* NB050165).

3. Cf. Doc. 3375.

4. Not identified.

5. The enclosed clipping, titled "Tried Hard to Save Him," was apparently from the *New York World.* It reported the death of Zenas Fisk Wilber (1839–1889), a former chief examiner at the Patent Office who handled the competing telephone application of Alexander Graham Bell and caveat of Elisha Gray in 1875. Though he enjoyed political connections through his cousin, Rutherford B. Hayes, Wilber was an acknowledged alcoholic and had been heavily indebted to one of Bell's attorneys, and he later confessed to acting corruptly in the Bell-Gray matter. (Wilber also solicited small loans from Edison on a least two occasions.) After leaving the Patent Office, he served as one of Edison's principal patent attorneys and worked for the Edison Electric Light Co. until 1882, when it was discovered that he had been embezzling funds and not filing applications entrusted to him. Despite his checkered history, Wilber was the federal government's key witness in its suit against the Bell telephone monopoly. He was sent to Denver in the care of a Secret Service agent in hopes of keeping him away from alcohol, but his death there on 22 August was attributed to drinking. Find A Grave memorial no. 79071466, accessed through Ancestry.com, 8 Aug. 2018; Docs. 1284, 1828 nn. 1 and 3, 2120 n. 5, and 2323; "Grog Killed Him," *Los Angeles Herald,* 23 Aug. 1889, 4; "Affidavit Wilber Dies in Denver," *Electrical World* 14 (7 Sept. 1889): 175; Evenson 2000, 43–46, chap. 14; Shulman 2008, 104–9, 140–51.

–3405–

To Gaston Tissandier[1]

[Paris,] Aug 30 1889

Friend Tissandier

Many thanks for the two books and the Copies of La Nature.[2] I hope you will come to our exhibition in 1892.[3] Bring a practical Aerial Ship[4] with you— I am sure it can be done, but everyone seems to be on the wrong track.[5] Yours

Thos A Edison

ALS (facsimile), NjWOE, Clippings (*TAED* SC89149A1). Letterhead of Hôtel du Rhin.

1. A facsimile of this letter was reproduced (and translated into French) in *La Nature* as part of a short article about it and the journal's hope to see a very lightweight Edison motor power a dirigible. "Une

lettre autographe de M. Edison," *La Nature* 17 (2): no. 542 Boite aux lettres [letterbox] of 14 Sept. 1889.

2. Tissandier likely sent copies of the biographical article about Edison he wrote for the 31 August 1889 edition of *La Nature* (Tissandier 1889). The two books may have been his *Histoire des Mes Ascensions: Récit de Quarante Voyages Aériens* (1887) and his brother Albert's *Six Mois aux États Unis: Voyage d'un Touriste dans L'Amerique du Nord, Suivi d'une Excursion à Panama* (1886), both of which are in Edison's library at the Orange laboratory (G. Tissandier [1887], acc. no. 203975; A. Tissandier [1886], acc. no. 207231; both NjWOE).

3. Preliminary planning had begun for a celebratory Columbian Exposition in 1892, but the site was yet to be selected by Congress. New York and Chicago were presumed to be frontrunners among a pack of aspiring cities. Parmet 1972.

4. See Doc. 3370 n. 3.

5. Tissandier thanked Edison (in French) for his letter and expressed the hope that he had left Paris with agreeable memories. Tissandier to TAE, 21 Sept. 1889, DF (*TAED* D8905AGG).

–3406–

To George Gouraud

Paris, 3rd September 1889.

Copy Letter.

My Dear Sir,

I beg to acknowledge receipt of your letter 26th inst:[1] asking me to inform you as to the maximum prices at which we will bill Phonographs and supplies to you pending the determination of definite prices later on, and have to say in reply that we can make with you an arrangement similar to that which we have carried into effect with the North American Phonograph Co.

Without prejudice to the prices which are to be based upon actual costs incurred in the manufacture of three thousand machines, and for the purpose of facilitating business, we have made an invoice price for the different types of Phonographs the details of which I give you below.—

Motor Phonograph.------- Invoice Price $~~42~~.5[a] —/45/—[b]

This price, forty five dollars includes one cell of old battery. As we do not use this battery now, the above price will be reduced by about three dollars. ($3).

Motor Phonograph For Electric Light Circuit. Invoice Price $50.

Treadle Phonograph.[2]----- Invoice Price $45.[b]

Battery.-------Four Cells.-- List Price----- $18.

Net Price---- $15

In a short time we expect to be able to reduce the price of this Battery.

All these prices are for machines and batteries <u>in the factory</u> at Orange N.J. and do not include charges for packing.

<u>Royalty</u>.

The quotations of invoice prices made herein do not include the percentage which I am entitled to receive from you as royalty under agreement with yourself.[3] These percentages will be added to the prices named when goods are being billed to you.

I am unable at distance to quote prices on parts; all such details you must obtain from America.

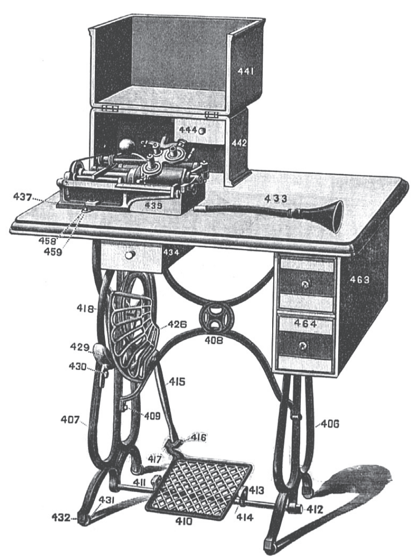
I do not understand your reference to an order for fifty Phonographs.[4] I know of only one order that has been received from you which was for a thousand machines, and the Edison Phonographs Works is expecting you from day to day to arrange the details of this order so that they may commence its fulfillment. Yours truly,

(Signed) Thos. A. Edison

L (typed copy), NjWOE, DF (*TAED* D8959ADK). [a]Correction made by hand. [b]"—/45/—" written by hand; line followed by typed dividing mark. [c]Line followed by typed dividing mark.

1. The editors have not found this letter. Gouraud later asked Alfred Tate to quickly wire a price for phonograms, in anticipation of placing "a large order." Gouraud to Tate, 14 Sept. 1889, DF (*TAED* D8959AEN).

2. The treadle machine now in production was probably like that shown in the 1889 catalog of the North American Phonograph Co. "Illustrated Catalogue of Parts of the Phonograph," 1889, PPC (*TAED* CA027B).



The commercial treadle phonograph in 1889.

3. The October 1887 agreement that licensed Gouraud to use Edison's patents as worldwide agent for the phonograph obligated him to add a manufacturing profit of twenty percent to the actual cost of each instrument. To that subtotal was then to be added a fifteen percent royalty to Edison personally as a licensing fee. TAE agreement with Gouraud, 14 Oct. 1887, Misc. Legal (*TAED* HX87010); see also Doc. 3099 n. 1.

4. This order, discussed in Doc. 3387, evidently remained a source of confusion well into September. On the seventeenth, Samuel Insull wired Tate that Gouraud's cabled order for fifty machines conflicted with instructions wired by Edison. Tate responded that Insull had misunderstood Gouraud's instructions, which were supposed to cover an order for "fifteen battery machines and five machines for electric light in addition to treadles." He directed Insull to "Ship as Gouraud directs so we can hold his order." In any event, Gouraud was soon invoiced for fifteen "style M" (battery-powered) machines at $45 each, five "style E" (light circuit) machines at $55 each, and thirty "style T" (presumably treadle) machines at $45 apiece (Insull to Tate, 17 Sept. 1889; Tate to Insull, 18 Sept. 1889; TAE to Gouraud, 26 Sept. 1889; all DF [*TAED* D8959AEK, D8959AEL, D8959AEU]). This confusion notwithstanding, Gouraud responded that Edison's statement of terms in this letter was "in the main satisfactory" and that he would overlook the lack of a firm price for a while longer (Gouraud to TAE, 7 Sept. 1889, DF [*TAED* D8959ADW]; see also Doc. 3409).

–3407–

From Sherburne Eaton

New York City, September 3rd 1889.

My dear Sir:

Re Light Co. Patent Litigation: The Committee[1] has passed a resolution this week directing Dyer to turn over to me all the cases in litigation. At my suggestion, he is continued as attorney of record in applications at Washington. Dyer prefers to work by the day, $50 per diem, beginning last May. He prefers that to a salary of $10,000. He is to be allowed to take other business not conflicting with ours. He and I are on the best of terms.

Patent Experts. We have retained Mr. Quimby[2] for $1,000 a year. On top of that we are to pay him $50 a day in New York and $75 and expenses a day away from here. I find that these expenses for experts are very heavy. We have to pay for their time while they learn our business.

Charles L. Clarke:[3] He is now employed by the Gibson Storage Battery Co.[4] in which Lowry[5] is interested. I do not think they pay him much. Would it not pay us to employ Clarke by the year at a low salary to act as an expert touching our patent matters? If he developed no particular ability, he would be worth his salary to us, to post more expensive experts, thereby saving their heavy per diem charge to some extent. What do you think of our trying Clarke for one year? Both Dyer and I think rather favorably of it. I wish very much that you would cable me, on receipt of this, your views. The Clarke question is likely to come up in the next week or two. I hear, indirectly, that Clarke thinks of leaving his present position this autumn, to go into the expert business. I have not seen him yet, my information comes principally through Dyer. If we make an arrangement with Clarke I would like to do it before our business for the Autumn begins. Please cable me.[6]

Pooling Patents: When you come back, you may be asked to pool some patents. One of our Directors suggests that patents relating to one particular subject be pooled by all the principal light companies on a value to be fixed by arbitration touching the patents of each, that each company be licensed for all of the said patents on like royalty, and that the proceeds be divided among the pooling parties according to the approved value of their respective pool patents.

Re Convertors: The enemy are making effort, notably Westinghouse to get patents to control all convertor systems. When you come back, I shall ask you to determine what our attitude is to be. We must have a policy about convertors. Shall we fight on our own line alone?

Re Beer Keg Case: Judge Wallace[7] has decided the beer keg case against us.[8] It was thought that he would have the courage and conviction to decide in our favor touching foreign patents. But he says the decision of the Supreme Court compels him to decide against us. Thus our only hope now is the re hearing at Ottawa. Hastings tells me he thinks the result will be all right there. No decision yet. Also no news from Judge Bradley.

Dyer and Other Companies: Dyer tells me that the Thomson-Houston people wish to retain him to help them fight certain patent suits on the lamp which the Westinghouse people are bringing. He asks me if there is any objection. I shall try to put this off until you return, to get your instructions. To speak correctly I believe the suits in which he can be retained are brought against Bernstein & Schaffer companies.[9] It is said that the Thomson-Houston people control those companies.

Re Mining Lands. Livor tells me that the ore is so lean that he is running two tunnels so as to get good ore and on a level. He says he is about paying expenses now, and will make money when he gets better ore, which he hopes to do by means of these tunnels. Both will be done in about two weeks. I am having trouble with the title to the mining lands which you bought. It seems there was a mortgage on the property, and you got no title as against the mortgagee. Livor is trying to fix it up under our direction.

Mr Curtis,[10] the Westinghouse patent lawyer sails for Europe tomorrow. Possibly he is going over on some question relating to foreign patents affecting us, though he denies it. Possibly also he is going over to investigate and purchase, if of any value, the Mordey alternating current motor which has just been announced as operating successfully in England.[11] It is said that his people want a good alternating current motor. It is further possible that Curtis is going over in connection with Byllesby, as explained in the following newspaper cutting—[12] By the way, one of their local officials was killed by the alternating current yesterday. See following from "Herald" of this morning:—[13]

Re Yourself: Not a day passes but what the newspapers have editorials or cable comments on what you do abroad. Never was anyone better treated by the press. I hope you will look on all this from a commercial standpoint as well as otherwise, to the end that you may get a better price for everything connected with your name, including particularly the foreign phonograph patents.

Will you please present my compliments and best wishes to Mrs Edison and Marion and believe me to remain, with best wishes for yourself, Sincerely yours

S. B. Eaton

TLS, NjWOE, DF (*TAED* D8905AFS).

1. Presumably the Patent Litigation Committee of the Edison General Electric Light Co.

2. Edward Everett Quimby (1831–1902) was a highly regarded patent expert. Born in Bangor, Maine, he came to New York as a boy and eventually went into manufacturing. An inventor in his own right, his specifications were used as exemplars by the Patent Office, and he frequently helped friends draw up their own applications. His success in writing patents—despite a lack of formal training or college education—led him to be sought as an expert in legal disputes, and he was brought into several important cases, including the telephone litigation between Western Union and Bell. "Death of Edward E. Quimby," *Hartford Courant,* 19 Feb. 1902, 1; "Death List of A Day," *NYT,* 19 Feb. 1902, 9; "Personal," *Western Electrician* 30 (1 Mar. 1902): 153.

3. Charles Lorenzo Clarke (1853–1941), a draftsman and civil engineer, joined the Menlo Park laboratory staff in 1880 and played key roles in designing the Edison electric light system. He left the business

in early 1884 as chief engineer of the Edison Electric Light Co. and began to work as an independent patent expert and consulting engineer. Clarke later became involved with managing a Westinghouse-General Electric patent pool and spent nearly two decades in the GE research laboratory. Docs. 2482 n. 1, 2585; "Clarke, Charles L.," Pioneers Bio.

4. The Gibson Storage Battery Co. (or Gibson Electric Co.) of New York City made and sold lead batteries based on the patents of Charles D. P. Gibson, also of New York. Its products were used to operate lights in a variety of places, including tiny dental instruments, private yachts, and streetcars. "Notes. The Gibson Storage Battery," *Electrician* 21 (1 June 1888): 103; "The New Gibson Storage Battery," *Electrical World* 11 (31 Mar. 1888): 162; "The Gibson Storage Battery," *Electrical World* 12 (7 July 1888): 7; "Gibson Storage Batteries," *Electrical World* 12 (15 Dec. 1888): 318; "Gibson Storage Battery," *Western Electrician* 2 (21 Apr. 1888): 193; "Storage Batteries for Yachts," *Electrical Review* 14 (11 May 1889): 3; see, e.g., U.S. Pats. 382,968 and 383,640; cf. Schallenberg 1982, 85, 122.

5. Grosvenor Porter Lowrey (1831–1893) had been a patent attorney for Edison in the 1870s and a pivotal figure in the formation of the Edison Electric Light Co. Now a principal in the New York firm of Lowrey, Stone & Auerbach, he had recently helped defend the basic Edison lamp patent at issue in the *McKeesport* case in Pittsburgh. Doc. 2493 n. 4.

6. The editors have not found evidence of a reply from Edison, but in 1890, Clarke appears to have been acting as a patent expert for Edison General Electric.

7. William James Wallace (1837–1917), originally from Syracuse, N.Y., received an undergraduate degree from Hamilton College in 1857 and a law degree in 1876. One year into serving as mayor of Syracuse, he was appointed to the U.S. district court. He remained on the district bench until 1882, when he was named to the federal circuit court in New York. *NCAB* 17:316; "Judge William J. Wallace," *New York Tribune,* 13 Mar. 1917, 9.

8. Wallace issued his opinion in *Pohl et al. v. Anchor Brewing Co.* on 7 August, a case in which Grosvenor Lowrey was among the plaintiffs' attorneys. Like the *Bate Refrigerating Co. v. Hammond* matter decided by the Supreme Court in January, the dispute in *Pohl* turned on ambiguities in section 4,887 of the U.S. Revised Statutes concerning the relationship between the lifetime of a foreign patent and a corresponding U.S. specification. The particular question in this case was what consequence the premature expiration of a foreign patent, such as by forfeiture, would have in the United States. Judge Wallace, referring to the *Bate* decision, concluded that Congress and the Court intended for the U.S. patent monopoly to end concurrently with the foreign one. When the *Pohl* case reached the U.S. Supreme Court, however, the justices held that its underlying legal issues were different than those in *Bate,* and they reversed Wallace's decision in March 1890. *Pohl et al. v. Anchor Brewing Co.* [S.D. N.Y.], Federal Reporter 39 (July–Nov. 1889): 782–85; "A Legal Monstrosity," *Electrical Engineer* 9 (2 Apr. 1890): 145–46; "An Important Decision by the United States Supreme Court," ibid., 195.

9. The Bernstein Electric Light Manufacturing Co., in Boston, had been making incandescent lamps since at least 1884. The Bernstein company and the Schaeffer Electric Manufacturing Co., also in Boston, were both listed as electric lighting contractors. *American Electrical Directory,* 1886, 154; Bright 1972 [1949], 73.

10. Leonard Eager Curtis (1848–1923) graduated from Yale in 1872 and Yale Law School in 1874. He practiced in New York for several years before becoming secretary of the U.S. Electric Lighting Co. He returned to legal practice in 1885 and represented several major electric light firms. Find A Grave memorial no. 15612770, accessed through www.findagrave.com, 6 June 2018; *NCAB* 5:17.

11. Eaton referred to British electrical engineer William Morris Mordey, a prominent designer and theorist of alternating current machinery. Mordey explored the conditions under which motors could be run as alternators and vice versa, but the editors have not found a new motor attributed to him at this time. Mordey had, however, recently claimed to have a new armature design that would permit alternating current dynamos to be coupled in parallel. His announcement of successful parallel generation, a problem that had throttled the commercial expansion of AC power systems, caused a stir in the technical press. "William Morris Mordey," *NYT,* 2 July 1938, 13; "Alternate Current Working," *Teleg. J. and Elec. Rev.* 24 (31 May 1889): 613–14; "Parallel Coupling of Alternators," *Industries, A Journal of Engineering, Electricity, & Chemistry* 6 (31 May 1889): 518–19; "Alternate Current Working," ibid., 521–23; Gooday 2004, 204–8.

12. Eaton pasted into his letter an article originally published in Pittsburgh on 31 August. It reported the departure of Henry Byllesby, general manager of the Westinghouse Electric Co., for London "with a large staff of electrical experts and mechanical engineers." Their stated purpose was the construction of a large manufacturing plant in London to meet English demand for Westinghouse electrical equipment. "Electricity For England," *Pittsburgh Dispatch,* 31 Aug. 1889, 2.

13. Eaton pasted onto the final page of his letter the article titled "Killed by 1,000 Volts" about the accidental electrocution of Darwin Henry, superintendent of the East River Electric Light Co. at its factory on E. Twenty-fourth St. in New York. Doctors arrived quickly and attempted to revive him (by artificial respiration, battery current stimulation, and brandy) but were unsuccessful. The *New York Times* reported Henry's apparently instantaneous death in similar detail, referring explicitly to how it might bear on the continuing debate about using alternating current for capital punishment. "Electricity Killed Him," *NYT,* 3. Sept. 1889, 1.

–3408–

Alfred Tate to Eugen Lommel,[1] *Leonhard Sohncke,*[2] *and Ernst Voit*[3]

[Orange,] Sept. 3, 89.

Dear Sirs:—

Referring further to my letter of 27th April last,[4] I have much pleasure in enclosing herewith Mr. Edison's check for Two Hundred and Fifty Dollars ($250), his contribution to the Ohm Monument[5] which you purpose erecting in Munich, endorsed payable to the order of Messrs. Merck Finckh & Co.[6] Kindly acknowledge receipt, and oblige Yours truly,

A. O. Tate Private Secretary. M[aguire].[7]

TL (letterpress copy), NjWOE, 32:214 Lbk. (*TAED* LB032214). Signed for Tate by Thomas Maguire.

1. Eugen von Lommel (1837–1899) became professor of physics at the University of Munich, his alma mater, in 1886 after a long tenure at the University of Erlangen. He specialized in optics, sometimes using phenomena of light to address problems in acoustics, and had also done research in the 1870s on electricity and electromagnetism. On arriving in Munich, Lommel became a driving force for the construction of the university's new physics building. *ADB,* s.v. "Lommel, Eugen Ritter von."

2. Leonhard S. Sohncke (1842–1897) was a mathematician and physicist at the Technical University of Munich since 1886. He specialized in the study of crystals, optics, and electricity. *ADB,* s.v. "Sohncke, Leonhard."

3. Ernst Voit (1838–1921) was a professor of physics at the Technical University of Munich. *ADB,* s.v. "Voit, Ernst."

4. Tate had written to the three physicists collectively "relative to the Ohm monument which you purpose erecting in Munich." In an 18 March letter to Edison (not found), the three had evidently suggested a $250 contribution, which Tate agreed to send at their convenience. Tate to Lommel, Sohncke, and Voit, 27 Apr. 1889, Lbk. 29:275 (*TAED* LB029275).

5. Academic and civic leaders in Munich planned to erect a statue honoring the centennial of Georg Simon Ohm (1789–1854), the physicist renowned for formulating a fundamental electrical law who spent his last years at the University of Munich. By January 1889 they had also enlisted the cooperation of the Royal Society of London. Altogether $10,000 was raised by subscription. The white marble statue was unveiled at the city's technical school in 1895. Planning soon began for a separate monument at Ohm's grave. "Memorial to G. S. Ohm," *Teleg. J. and Elec. Rev.* 24 (1 Mar. 1889): 240; "The Ohm Statue at Munich," *Electrical Engineer* 20 (18 Sept. 1895): 271; "Ohm Monument," *Electrician* 37 (21 Aug. 1896): 530.

6. Merck, Finck & Co. was a private bank in Munich specializing in the issue and financing of corporate bonds. Founded in 1870 as Merck, Christian & Co., the firm took its present name in 1879. *ADB,* s.v. "Finck, Wilhelm von"; Bähr and Kopper 2016, 27–29.

7. With Alfred Tate in Europe, Thomas Maguire evidently prepared and signed this letter in his name.

–3409–

Alfred Tate to Samuel Insull

Paris Sep 6/89

My dear Insull:

Your telegram in regard to Gouraud having captured Edison and my having assisted the former, did not surprise me for there is no doubt whatever in my mind as to the source from whence this story sprang.[1]

When Moriarity first came over here to negotiate with Gouraud he had a first class case and, had he been a capable man, could have presented a strong front without resorting to questionable methods. His first act was to unload himself of a pack of lies which were so palpably false that Gouraud at once became suspicious— Moriarity kept right on piling up his absurd statements, and later on was ably seconded by young Seligman. I could fill a book with these fairy-tales— Here are a few of them:— They said that their syndicate owned a <u>new</u> graphone entirely different from the one in use in the U.S. and far superior to the latter, which the American Graphone people did not use as they had no right to it; that they could market it for $20; that it was so far superior to the phonograph they would not use the phonograph in Europe even if they bought the rights to it; that Lippincott told them there were five graphones in use in the U.S. to one phonograph; that Mr Edison told Jesse Seligman he (Edison) had no confidence in the commercial success of the phonograph &c &c ad infinitum—a lot of damned rot which was absolutely unnecessary and impressed Gouraud with the idea that their real position must have been very weak to require so much bolstering. I have never seen such a display of bad judgement. They did everything they possibly could to place Mr Edison and myself in a position where we could render them no assistance—in fact they tried to jew[2] both Edison and Gouraud at the same time.

When I was here alone I did my best to keep from being placed in a position where it would be necessary for me to contradict anything they said—and as you know I took the stand that as they had already established relations with Mr Edison in New York it was unnecessary for me to interfere. In this way I assisted them. I even went further and gave Moriarity and young Seligman[3] an opportunity of knowing that I was personally aware of the absolute falsity of some of their statements and that they were weakening their case—but it was no use—they seemed to have the idea that if they could only manufacture a sufficient number of lies, no matter how absurd, they would succeed. They actually had the gall, in a private interview with me, to try and shove these down my throat. Young Seligman, forgetting I was present at the time, swore and swore again that you offered to sell the combined interests of Edison and Gouraud for $600,000#. I asked him if his father has the same understanding and he said yes. I asked him if he could not be mistaken as to the understanding of his father—and he said he was in perfect accord with him in every way. Well they bulled right ahead cutting off their noses and finally sat down to await Mr Edison's arrival.

When an interview occurred between these bright negotiators, Gouraud and Edison I did think they would have sense enough to drop lying and discuss real business—not that they stood the ghost of a show[4] of buying outright the phonograph patents—they killed that goose long before Edison got here—but because it ought to have been plain to them first: that Edison would appear before Gouraud as either a knave or a fool unless he contradicted them and second: in placing themselves in the position of having their statements questioned and disproved by Edison, they weakened themselves in Gouraud's estimation still further.

But apparently this never occurred to them. They ploughed right along in the same old rut. If ~~he~~ Edison had assisted them in the spirit they manifested he would have simply said "Here Gouraud, I've been lying to you right along about this phonograph business— Its no good—an absolute dead failure in the United States; we have'nt manufactured 300 phonographs; we'd better sell out for anything we can get."

Mr Edison ignored their lies as far as he possibly could and did everything in his power to steer them into real business. The proposition for an amalgamation on a basis of division—phonograph 60 and graphone 40—was made to them finally, and they pronounced it so absurd that it was not worth while cabling over to their principals—and there the interview ended as I cabled you at the time.[5]

They did cable to their people however, as in a few days they informed us they could negotiate only for an outright purchase. This is where the matter stands now. Gouraud returned to London a week ago and to my knowledge nothing new has transpired since. They have failed in their undertaking and are evidently trying to make their principals believe that Mr Edison and myself are responsible for the failure—whereas it would have been a miracle had they succeeded. You can rest absolutely assured that there was not one stumbling block set in their way by Mr Edison or by me—in fact they set up so many for themselves that it would have been next to impossible for anyone else to wedge one in between.

Before Mr Edison had any discussion with Gouraud about the phonograph business, I explained fully to the former all I had done and discovered, also what my views were—and are—as to the course we should pursue.

Both yourself and Mr Edison believe that Gouraud should go ahead and establish an Agency business. I have fear that Gouraud, for want of money to conduct such a business would injure the commercial success of the machine.[6]

In your letter to me under date Aug. 7th you say with regard to Gouraud's contract that it is "only an option contract, subject to his taking a certain number of instruments in a given time"[7] While this is quite true, it is very little protection to us. The provision you refer to reads thus:—

"Sixth[a] Should within the first year after the expiration of one year from the time when the said Edison has shipped and is able to supply for sale commercially the articles covered by this agreement xxx the royalties received by the said Edison xx amount to less than the total sum of Ten Thousand Dollars"[8]

You will remember that by a cablegram, and by letter, we fixed this date, I think in May last.[9] Gouraud has only to pay $10,000 within two years from that time.

There is a point here I want to mention. Mr Edison says that the copy of the Gouraud contract which I have, and which I got from Eaton, is not the one he signed.[10] That the real contract provides for the sale of a certain numbers of instruments.

I have taken an order from Mr Edison on Gouraud, for the latters copy of this agreement bearing Mr Edison's signature. I go to London on Tuesday and will advise you if Mr Edison is right. I fear that in any event we will find our guarantee in this respect to be of very little use for a long time.

After I had thoroughly explained everything to Mr Edison he[a] had ~~had~~ a number of discussions with Gouraud and the latter is convinced that he must do something in the~~y~~ way of initiating an Agency business. He went to London for the purpose of commencing his preliminary work. I am going to London Tuesday to see what he is doing and will write you fully from there.

He is squirming terribly about that order for a thousand machines and you wont hear from it till I get to London.[11]

The great hold which we have on Gouraud is the obligation which he is under to have an active agent in every country within one year from the date fixed by us engaged exclusively in the sale of phonographs.[12]

I was unable to start this letter in time for this mail.

I'll write you again as soon as I hear and see something of Gourauds present work.[13]

The Gilliland crowd passed through here a few days ago and have been in London. I think they are still there. [Yours truly?][b]

A. O. Tate

ALS, NjWOE, DF (*TAED* D8959ADP). [a]Interlined above. [b]Illegible.

1. The editors have not found Insull's message. Apparently in reply, Tate cabled on 5 September: "Statement absolutely false believe nothing you hear mailing full report." Tate to Insull, 5 Sept. 1889, DF (*TAED* D8959ADN).

2. That is, as in "try to jew you down," a colloquialism that stereotyped Jews as overreaching bargainers who pressed hard toward their own advantage. *OED*, s.v. "Jew | jew, v."; Jaher 1994, 238–40; Herbst 1997, s.v., "jew/jew down, Jew/Jew Down."

3. Theodore Seligman.

4. That is, they had no chance of success. Utter 1916, s.v. "Show."

5. Doc. 3398.

6. Tate had been expounding since July on the dangers of Gouraud starting an ill-conceived and under-funded agency business (see Doc. 3387 n. 8). Edison did not share his view, however, and in Paris brought "great pressure to bear" on Gouraud (in Tate's words) "to start him selling machines." Gouraud reportedly left his business manager in Paris to start an agency there, but Tate took a dim view of the whole plan and feared that Gouraud would "sell machines to any Tom Dick or Harry who comes along and let the devil take care of them," thereby damaging the phonograph's long-term prospects. Tate to Insull, 13 (quoted pp. 4, 6) and 18 Sept. 1889, both DF (*TAED* D8959AEF, D8959AEM).

7. The context of Insull's statement was his belief that the prospects of Gouraud succeeding with the phonograph and being able to mount a "big commercial fight" with the graphophone could discourage investment in any rival company the Seligman interests might form. He urged Edison not to wait passively for Gouraud to fail nor to put obstacles in his way (as Tate had suggested), either of which might embolden the graphophone forces. Insull to Tate, 7 Aug. 1889 DF (*TAED* D8959ADD).

8. The copy of this contract preserved in Edison's files was signed only by him and had a number of emendations, apparently intended to restrict it to the United Kingdom. Among them was the alteration of "ten" to "six" thousand dollars. Tate's quotation otherwise matches the text except that the underlining is not present in the contract. TAE [draft] agreement with Gouraud, 14 Oct. 1887, Misc. Legal (*TAED* HX87010); see also Doc. 3099 n. 1.

9. Tate referred to the 7 May cable and subsequent written confirmation (quoted in Doc. 3361; see esp. nn. 2–3) that Edison was

"Ready to ship phonographs in practical commercial form for sale and use commercially in such quantities as you require. Am impatient to get your orders." That declaration would start the first period of two years laid out in the 1887 contract for tabulating royalty payments. TAE to Gouraud, 7 May 1889, Lbk. 29:321 (*TAED* LB029321).

10. There was still confusion on Edison's side at the end of the year about the 1887 contract, a copy of which Gouraud sent to Orange in October at Tate's request. Sherburne Eaton to Tate, 18 Dec. 1889; Gouraud to TAE, 4 Oct. 1889; both DF (*TAED* D8959AGP, D8959AFA); see also note 8.

11. Clarifying the details of Gouraud's order occasioned a complex chain of cable and postal correspondence among Insull in New York, Edison in Paris, Gouraud in London, and Tate, who left Paris for London after Edison departed for Germany on 11 September. On 7 September, Gouraud affirmed his wish for 1,000 machines, even without having a firm factory price, "At the rate of 25 per week, The first hundred to be shipped here at the earliest possible moment." In a postscript to another letter the same day, he pressed the price question and raised the prospect of ordering "2,000 Phonographs, for which I have an offer from a large advertising firm." (That potential customer, Tate later explained to Insull, was a manufacturer of advertisement boards "such as you have seen in Hotels"; the phonograph, he expected, would "be used to acquaint an inquiring people with the merits of Pears Soap and Spaldings Glue, &C &C"). Edison promised the "Factory can ship two hundred 200 machines immediately twenty five weekly thereafter arrange credit for orders." Gouraud did not immediately arrange for payment, at least on terms satisfactory to Insull. The initial delivery was somehow reduced by half, and then Gouraud was forced to clarify that he did not intend "100 next week and 25 all the following weeks; I meant simply 25 per week, the first 100 to be shipped as soon as may be." The order was still unfulfilled in December, when Gouraud was in New York and affirmed that he could accept the unspecified remaining balance of 1,000 phonographs "as rapidly as you can deliver them." Gouraud to TAE, both 7 Sept. and 14 Dec. 1889; TAE to Insull, 9 Sept. 1889; Insull to TAE, 9 Sept. 1889; TAE to Gouraud, 10 Sept. 1889; Insull to Tate, 12 Sept. 1889; Tate to Insull, 13 (one letter and four cables) and 18 Sept. 1889; Gouraud to Tate, 14 Sept. 1889; all DF (*TAED* D8959ADW, D8959ADQ, D8959AGM, D8959ADR, D8959ADS, D8959ADZ, D8959AEB, D8959AEM, D8959AEF, D8959AEC, D8959AED, D8959AEE, D8959AEH, D8959AEM, D8959AEN).

12. Tate referred to the fourth article of the 1887 agreement (see note 8). Gouraud claimed to have had some plans for bringing the phonograph to the public in Denmark, Norway, Sweden, Portugal, and Brazil, and he anticipated sending one hundred instruments to South America. He had developed a contact in Denmark (through L. M. Ruben, a New York talent manager who visited the laboratory in connection with Adelbert Wangemann's recordings there) that led to a September order, and (with Edison's aid) he was represented in Mexico by Thomas Connery and in Brazil by Carlos Monteiro e Souza of Rio de Janeiro. TAE to Gouraud, 28 May and 22 July 1889; Tate to Ruben, 28 Feb. 1889; Lbk. 30:82, 31:381, 28:421 (*TAED* LB030082,

LB031381, LB028421); Gouraud to TAE, 20 July and 7 Sept. 1889; Tate to Insull, 13 and18 Sept. 1889; Gouraud to Edison Phonograph Works, 20 Sept. 1889; all DF (*TAED* D8959ACN, D8959ADW, D8959AEF, D8959AEM, D8959AER).

By October, Gouraud had reportedly placed one phonograph with a lecturer in a Belgium, two in Italy with Enrico Copello (a former associate of banker Egisto Fabbri), and one in Denmark. Thirty "style 'M'" machines were be shipped on 2 November to the Edisons Fonograph-Compagniet in Denmark, and another twenty-five were probably in Holland by year's end with Frederick Stieltjes and Co., which also represented the Remington typewriter. Gouraud to TAE, 20 Sept. 1889, DF (*TAED* D8959AEQ); Hamilton to Tate, 13 Oct. 1889, DF (*TAED* D8959AFL); "Personal Paragraphs," *Western Electrician* 5 (14 Sept. 1889): 152; Charles Coster to TAE, 31 Jan. 1893, DF (*TAED* D9302AAG); TAE to Gottfried Ruben, 30 Oct. 1889, Lbk. 33:342 (*TAED* LB033342); Gouraud to TAE, 14 Dec. 1889, DF (*TAED* D8959AGM); Ruben Collection description, Royal Danish Library website (dansklyd.statsbiblioteket.dk/samling/ruben-valserne), accessed 20 Dec. 2017; de Wit et al. 2002, 56.

13. Tate was in London by 12 September. Six days later, he advised Insull that while Gouraud had not fulfilled his promises to the letter, "the discrepancy between what he has done, and what we expected him to do is not sufficient to give us an opportunity of doing anything other than quarrel~~ling~~ with him—which is absolutely useless." Tate to Insull, 18 Sept. 1889, DF (*TAED* D8959AEL).

–3410–

From George Gouraud

[London,] 9th September, 1889.

Copy letter from Colonel Gouraud to Mr. Edison.[1a]

Dear Sir:—

In confirming my letter of the 7th inst,[2] it is of course understood that my order therein referred to, will be filled only with Phonographs of the latest type containing the improvements which you described to me in Paris, even though this should involve delay in the first shipment, anxious as I am to have it as early as possible.

It is obviously important that Phonographs that are first put out over here should be in all respects the very best, as they will be tremendously criticised if they do not realise expectations. I know that you appreciate this and could have no other idea in your mind, but I write this more with the object of asking you to give very positive instructions to the Works to this effect, lest through oversight or any other reason, they should fill any portion of the order with other than the latest Phonographs.

The experience of everybody here with regard to the phonograms with the grooves inside is that they slip very badly, so much so as to seriously interfere with any practical use of the machine. My personal experience with these phonograms since my return to Paris, confirms this statement. In other respects they seem to be better than those that came before.[3]

I feel no doubt in my own mind, that if any of these Phonographs that I have thus far received had been put into use with other than experts they would have seriously injured the prospects of the business; and I must therefore make it a condition that the Phonographs which are shipped to me under my order above referred to, are either accompanied with phonograms that will not slip, by reason of some modifications in their construction or that the machine shall have some device attached to it, which shall prevent their slipping. At a very important exhibition of the Phonograph here yesterday, the phonogram slipped to such an extent as to make an exceedingly prejudicial impression. I may mention that the slipping was not attributable to any alteration in the depth of the turning off knife, or the tracking of the recorder, which was set so as to be heard only to the least degree.

We have already written you in regard to the washer spring on the Spectacle head, and have explained to you personally its weakness.[4] We have had to change them all here.

We find that the small determining point on the reproducer wears out the record, and shall be glad to know if anything will be done to obviate this in the new machine. Faithfully yours

G. E. Gouraud

L (typed copy), NjWOE, DF (*TAED* D8959ADX). [a]Followed by dividing mark.

1. This letter was one of two from Gouraud to Edison that Johnathan Young, general manager of Edison's Phonograph Co., copied and sent to Charles Batchelor at the Edison Phonograph Works on 10 September. Young to Batchelor, 10 Sept. 1889, DF (*TAED* D8959ADV).

2. That letter, Gouraud's response to Doc. 3406, affirmed his order of 1,000 phonographs. It was the other letter copied by Young and sent to Batchelor (see note 1). Gouraud to TAE, 7 Sept. 1889, DF (*TAED* D8959ADW).

3. Gouraud pleaded directly to Charles Batchelor a few weeks later to send only the best machines and supplies, and he noted then the problem of slipping phonogram blanks. Batchelor explained that due to a shortage of blanks, the factory had shipped some before the wax was "what we call 'perfectly seasoned.' Since, however, we have got in to the new wax shop, we have had about [20,000?] seasoning all the time. You will not have this trouble in future I feel quite sure." Gouraud repeated

the complaint in mid-October in Doc. 3426. Gouraud to Batchelor, 21 Sept. 1889, DF (*TAED* D8959AET); Batchelor to Gouraud, 30 Sept. 1889, Lbk. 32:442 (*TAED* LB032442).

4. The editors have not found this correspondence.

–3411–

To the Editor of Le Figaro[1]

Paris, 10 September. [1889]

My dear *Figaro*,[2]

Next Thursday, in leaving Paris,—this magnificent city in which we believe ourselves reborn every day, and in which, as in other cities, you are known as one of the most celebrated representatives of French journalism—I will carry with me the memory of the brilliant reception you have so generously given me,[3] and for which I experience such feelings of gratitude that I am not able to translate it into words.

Will you permit me to charge you with transmitting in my name to the directors, the administration, and the editors, to all those who contributed to the success of this soirée my gratitude for the great honor they have done me, a great unmerited honor, but for which I am sincerely grateful to you. Your devoted,

T.-A. Edison.

PL (translation), "Une Lettre d'Édison," *Le Figaro,* 13 Sept. 1889, 1, PM (*TAED* PM890910A).

1. Edison's letter was published in French and has been translated by the editors. He was not fluent in French and presumably wrote the original in English.

2. *Le Figaro* was a leading daily newspaper in Paris covering national and international news, politics, and culture. It started in 1826 as an art-oriented gossip sheet but by 1866 had become a politically focused daily featuring some of the best writers in France. It provided extensive coverage of Edison's Paris visit and displayed in its dispatch room a photograph taken by Guiseppe-Napoleonne Primoli of Edison's first ascent to the top of the Eiffel Tower on 13 August. Francis Magnard (1837–1894) served as editor-in-chief since 1876 and was one of its three owners. At his death, Magnard was remembered for having moderated the strong monarchist editorial bent of his colleagues. *Ency. Brit. Online,* s.v. "Le Figaro"; "À Travers Paris," *Le Figaro,* 19 Aug. 1889, 1; "The Obituary Record. Francis Magnard," *NYT,* 19 Nov. 1894, 8.

3. *Le Figaro* hosted a "soirée" for Edison on the evening of 26 August at its Paris headquarters, which were illuminated with electric lights and decorated with the American flag and a large picture of Edison (see Doc. 3392 [headnote]). Edison was formally received by editor-in-chief Magnard and managing director Antonin Périvier with the paper's entire staff ("Edison au Figaro," *Le Figaro,* 27 Aug. 1889, 1; "Sa Majesté Edison," *New York Herald* [European edition], 27 Aug. 1889, 1). Comedian Coquelin cadet, among the evening's entertainers,

reflected to Edison that he "went to bed proud" that night, "saying to myself, I have been able to make Edison laugh" and pleased at "having beguiled a few minutes' time of him whom the Universe acclaims." He also enclosed a photo of himself that Edison seems to have requested (Ernest Coquelin to TAE, 12 Sept. 1889, DF [*TAED* D8905AFZ]).

–3412–

To Gustave Eiffel

Top Eiffel-Tower [Paris,] September 10—1889.[a]

To M. Eiffel[1] the engineer, the brave builder of so gigantic original specimen of modern engineering from one who has the greatest respect and admiration for all engineers including the great engineer the Bon Dieu.

Thomas-A. Edison.

PL, "À Travers Paris," *Le Figaro,* 11 Sept. 1889, 1, PM (*TAED* PM890910B). [a]Date not that of publication.

1. Edison wrote this note in the guest book in Gustave Eiffel's private apartment atop the famous tower following a lunch in his honor (see Doc. 3392 [headnote]). It was reprinted in other Paris newspapers ("Gazette du Jour," *La Croix,* 12 Sept. 1889, 1; "Chronique de l'Exposition," *Le Temps,* 12 Sept. 1889, 2).

–3413–

To Jules Janssen

Paris Sept 10 1889.

My Dear Mr Janssen,[1]

In taking leave of this beautiful city of Paris and in saying good bye to the host of friends which it has been my good fortune to find in France, my mind constantly reverts to the day which I spent with yourself and family in Meudon

For your great generosity and all your kind hospitality I am joined by Mrs Edison in offering you my warmest thanks, and I say Adieu to you in the hope that at some not distant day I may again have the honor of shaking hands with the man of[a] whom all France is justly proud, and who has excited the admiration of scienetists throughout the whole of the civilized world I am, my dear Janssen Yours very gratefully

Thomas A Edison

ALS, BIF, Ms. 4135-f96 (*TAED* Z252A). [a]Interlined above. A slightly variant transcription is in Launay 2012, 141.

1. Astronomer and inventor Pierre Jules César Janssen (1824–1907) was a member of the Académie des Sciences, the Bureau of Longitude, the National Academy of Sciences in the United States, and director

of the astrophysical observatory in the Paris suburb of Meudon. The French government granted him an estate at Meudon in 1876 that included a small chateau and the ruins of the formidable Chateau Neuf, which had been partially destroyed in the Franco-Prussian War. Janssen had the smaller chateau and its outbuildings transformed into offices and laboratories and restored the Chateau Neuf, to which he added an observatory dome. Edison's recollections of Meudon and his visit there are in App. 1.B.40–41. *CDSB,* s.v. "Janssen, Pierre Jules César."

Janssen earned a *licence ès sciences* from the University of Paris in 1852. His initial research involved analyzing the effect of radiation of light from molten iron on the human eye, a study for which he earned a doctorate in 1860. In 1862, he constructed a special spectroscope to study dark bands in the solar spectrum. He was appointed three years later as professor of physics at the École Spéciale d'Architecture in Paris. While the city was under siege during the Franco-Prussian War in 1870, Janssen escaped in a hot-air balloon in order to attempt observations from the Atlantic coast of a solar eclipse. In preparation for a transit of Venus in 1874, he invented the photographic revolver, a camera with three revolving discs—the first, in which he made twelve slits, acted as the shutter; the second contained a window; and the third held the photographic plate. This special camera allowed a series of images to be made in a circular pattern on the plate. At Meudon, Janssen also compiled an atlas of solar photographs using a photoheliograph of his own design. This camera, connected to a telescope, employed a specialized shutter that permitted exposures of approximately 1⁄3000 of a second. Of all Janssen's inventions, Edison specifically recalled only a very rapid gyroscope, which he later thought might be scaled up to stabilize steamships at sea (*CDSB,* s.v. "Janssen, Pierre Jules César"; App. 1.B.40). Janssen became interested in the new phonograph after seeing it at the Bath meeting of the British Association for the Advancement of Science in September 1888. George Gouraud gave him a portrait of Edison at that time, and, as Janssen told his daughter, "an autograph phonogram that he [Edison] sent to me from America." Janssen in return recorded a message to Edison, said to be the first recorded French voice sent across the Atlantic. Janssen helped to arrange a scientific demonstration of the phonograph in Paris in April 1889 (Launay 2012, 137–39; Doc. 3331 n. 2).

–3414–

To Henry Villard

Berlin Sept 16, 1889[a]

Henry Villard NY

Everything can be simplified if we agree to pay Siemens fifteen percent Ose[1] profit on all underground Including Tubes Instead twenty on Cable I think this all right[2]

Edison

L (telegram), Villard, Box 51, Folder 552 (*TAED* X11278552890916). Message form of Western Union Telegraph Co. [a]"1889" preprinted.

1. Presumably a telegraphic misinterpretation of "of."

2. Edison and Werner von Siemens, his host in the Berlin area, had evidently been discussing a license arrangement for manufacturing Siemens & Halske electrical cables in the United States. Villard's reply is Doc. 3418.

–3415–

To Orange Laboratory

Heidelberg 9:50 17 Sep 1889[1a]

Edison NY

Ship Helmholz Berlin Charlottenburg five motor phonographs dozen recorders receivers extra with supply cutting knifes ten lelande batteries books[2] two barrel blanks[3]

Edison

L (telegram), NjWOE, DF (*TAED* D8958AAH). Message form of Western Union Telegraph Co. [a]"1889" preprinted.

1. This message was stamped "RECEIVED" at the laboratory on 18 September.

2. The "books" were probably the inspector's handbook recently published by the Edison Phonograph Works. See Doc. 3351 n. 6.

3. That is, blank wax cylinders packed in two barrels. After he returned to the United States, Edison answered an inquiry to say that "two of the phonographs sent to Prof. Helmholtz were specially designed for the Gesellschaft Urania," a public observatory and center for popularizing science in Berlin. TAE to M. W. Meyer, 7 Nov. 1889, Lbk. 33:458 (*TAED* LB033458).

–3416–

From James W. Queen & Co.

Philadelphia, Sept. 18th. 1889.[a]

Dear Sir:—

We have transmitted your claim to the maker of the photographic apparatus[1] recently sent you, but as we desire to obtain some further particulars &[b] to transmit them[c] to him, we wish to ask whether the amount which you charged us for alterations included the altering of the holders or inside kits to suit the American size of plates, as certainly we could not charge him for such alterations.[2] In a letter received from him, dated Aug. 9th, he says: "What you wrote concerning the state of delapidation of the Micro-photographic apparatus surprised me as much as I find it vexing, you are however wrong in attributing the mischief to selection of bad wood. It is curious at any rate that cases of all the wood work cracking and warping do not occur in Europe: yet the material is the same in all cases. There must be some thing in your climate which renders the use of wood a rather critical question. I may mention that one of your country-men, a Minnesota

Professor, would have no wooden table at all, saying that Minnesota was too dangerous a place for that sort of thing. If that is how your client's apparatus came to grief—I do think it is—it is not fair to make either you or me responsible for the humours of his climate. As it is, the price of the Photo-micrographic apparatus has been reduced to such a degree as to render it a hardly profitable part of our business. I think you need not allow the defects, nor can I consider the charging of the amount of #20 to our account satisfactory. It is a bad business when it comes to [minus?][d]:— As to the Kits, I think they are not worth considering. Any joiner can make them for a few cents. It is to be regretted that Americans have not our system of plate-measurement. But you must admit that it will be cheaper to have the Kits made there, than have them sent over by us." Yours truly,

J W Queen & Co per E P[3e]

P.S. We think you will find Mr. Zeiss's[4] estimate of the dryness of our climate to be somewhat highly colored! Will you kindly advise us (however)[c] whether the goods, after they were unpacked, were placed in a heated room, so that they would be specially liable to warp or split by drying out of the wood?[5]

L, NjWOE, DF (*TAED* D8970ABS). Letterhead of James W. Queen & Co. [a]"*Philadelphia,*" and "188" preprinted. [b]Added by hand. [c]Interlined above. [d]Mistyped. [e]"J W Queen & Co" and "E P" written by hand.

1. That is, the instrument produced by the Zeiss Optical Works and discussed in Doc. 3301.

2. When the device arrived in March, William Dickson found the frames for holding photographic plates were warped and cracked, which he blamed on green wood. Queen & Co. was promptly notified, and they in turn advised the Zeiss Optical Works on at least two occasions. Edison and his staff corresponded with Queen through the springtime as they made repairs; they initially thought repairs might cost about $27, or five percent of the instrument's price, but Queen encouraged them to reduce that amount. William Dickson to Alfred Tate, 18 Mar. 1889; Queen & Co. to TAE, 23 Mar., 28 May (with Dickson marginalia), and 31 May 1889; Tate to Dickson, 3 June 1889; all DF (*TAED* D8970ABB, D8970ABC, D8970ABI, D8970ABK, D8970ABJ); Tate to Queen & Co., 22 Mar. and 27 June 1889; TAE to Queen & Co., 30 May 1889; Lbk. 28:746, 31:87, 30:132 (*TAED* LB028746, LB031087, LB030132).

3. Edward Pennock (1856–1944) of Philadelphia was listed in the 1880 federal census as an optician. He became head of Queen & Co.'s microscope department in 1880 and, three years later, began to edit the bimonthly *Microscopical Bulletin and Science News.* He held both positions until 1896, when he started his own instrument business in Philadelphia. U.S. Census Bureau 1970 (1880), roll T9_1173, p. 339A (enumeration district 224, Philadelphia, Philadelphia, Pa.);

Pennsylvania Death Certificates, 1906–1966 (certificate 75853), online database accessed through Ancestry.com, 11 Aug. 2018; Warner 1993, 1:xxvii; "Editorial Jottings," *The Observer* 7 (Mar. 1896): 115.

4. Probably Roderich Zeiss (1850–1919), eldest son of Carl Zeiss, who died in 1888. He began his business career in 1875 after earning a doctorate in medicine at the University of Jena. Roderich joined the firm in 1876 and became a partner with his father and Ernst Abbe sometime between 1879 and 1881. He was in the process of retiring from the business just at this time, leaving it solely in Abbe's hands. Auerbach 1904, 88–89; Paetrow and Wimmer 2016, 106–7, 111, 139.

5. The laboratory responded that the instrument had been unpacked at room temperature and that the defects were attributable to poor workmanship. Alterations to the "kits" were not charged to Queen & Co. or Zeiss as repairs. Edison laboratory to Queen & Co., 23 Sept. 1889, Lbk. 32:384 (*TAED* LB032384).

–3417–

Charles Batchelor to Samuel Insull[1]

[Orange,] September 19th, 1889.

Dear Sir:

I hand you to-day, model of the Phonograph Toy Doll with the new stamped body.[2] The cost of this case is $18.50 per hundred. The cost of the talking part, as I gave you before,[3] is $92.38 per hundred. This will make a total of $110.88 per hundred for the doll bodies, complete with the talking arrangement in. I would call your attention to the fact that this new model of the body is about three times dearer than the old model that we made. This is not surprising when you know there is over double the square inches of metal in it, and over three times the number of operations in it. I think myself that it is by far the better model of the two, and what they pay extra for this body they will certainly save on their finished doll, by reason of the fact that they have now only got to buy heads, arms and legs instead of having this stitched inside the body of the doll. As I said to you before, I think it quite probable that they may ask us to assemble the heads and legs etc. This we never intended to do, but should be glad to store them and assemble them whilst we are assembling the talking part, for a matter of about $3. per hundred, providing they furnish the box, the head, legs, arms and clothes complete, and keep a store man who will receive and deliver to us such goods, and receive for shipment finished dolls from us, giving us a receipt therefore. The packing is a thing that we can arrange for afterwards, but I think it is quite proper for us to tack on to our bill the receipt of their man who is stationed at our place, and which shall be the guaranty of the Company having received the goods, whether shipped by him or by us.[4]

In regard to the tools for the old body that we have had to throw away, they cost us about $1,000., which they (The Phonograph Toy Doll Co.) I think, ought to refund. The tools for making the new body will cost us in the neighborhood of $5,500, but this should belong to us. Very truly yours,

Chas. Batchelor

TLS (letterpress copy), NjWOE, Lbk. 32:364 (*TAED* LB032364).

1. This letter was addressed to Insull as treasurer of the Edison Phonograph Works.

2. This is probably the "New Body #3 for Toy Phono" (laboratory project #339) to which machinists Fred Ott and Henry Riebe devoted most of their time in the preceding week, after having worked at it off and on since late August. Ott and Riebe continued working intensively on the body into early October, when the project tapered off. Ott and Riebe time sheets, weeks of 29 Aug.–10 Oct. 1889, WOL.

3. Reference not found.

4. Possibly referring to this latest version of the body, Batchelor advised the Edison Phonograph Toy Co. in late September that "the holes in the socket of the doll body were liable to cut the rubber[s] that hold the legs in." He got around this problem "by making longer hooks in the inside, which do not interfere with our apparatus" and wished them to approve this change. By early November, Edison was ready to furnish a prototype made by the same tools and dies the factory would use in production. Batchelor to Edison Phonograph Toy Co., 30 Sept. 1889; Alfred Tate to Insull, 8 Nov. 1889, Lbk. 32:440, 33:464 (*TAED* LB032440, LB033464).

–3418–

From Henry Villard

Berlin, 20 9 1889[1a]

Edison Care Sir John Pender London=

Consider best postpone whole question Siemens contract until your return=

Villard=

<postpone>[2b]

L (telegram), NjWOE, DF (*TAED* D8905AGD). Message form of British Post Office Telegraphs, foreign and colonial telegrams; printed in upper case. [a]"188" preprinted. [b]Marginalia in unknown hand.

1. This message also bore a mark from Frankfurt, though which it evidently passed in being "Forwarded from Berlin" to London. The telegram is Villard's reply to Doc. 3414, which Edison sent from Berlin shortly before leaving that area.

2. See Docs. 3378 and 3434.

–3419–

Mina Edison to Mary Valinda Miller

Foot's Cray, Kent. [September 25, 1889][1a]

My darling Mamma.

You may be able to[b] receive this a day or two before we arrive so I thought I would write and tell you how every thing is with us today.

Mame has gone to walk, Mr. Edison has gone to London but I not feeling very well remain[c] in to write. This evening Lady Pender[2] gives a dinner for us. The Lords and Lad~~y~~e's will be here at eight and I suppose everything will be very fine. Yesterday we took Luncheon with the Lord Mayor of London[3] in the Mansion House[c] which was a great honor.[4] Mr. Edison has been greatly appreciated here but he is very tired and he as well as myself shall be delighted to be in[d] Orange once more.

You will read this letter there with my little family. Tell the boys they must not scold me too hard for not writing to them, for if I have not written I have often and often thought of them. I am glad they had such a nice time with their Uncle and Auntie[5] and I hope they are also happy now. We shall expect to meet them at the steamer and you and baby too Mamma if you can manage so as not to wait too long for the arrival of the steamer.[6] Little pet! You cannot imagine how long the time seems. Saturday we sail, on the French Line, steamer Champagne. We sail at ten in the morning so we shall probably reach home a week from next Sunday.

I shall have ever so much to tell you when we reach home about all the great times here. I hope you found everything allright and that all the girls have returned at the appointed time, everything looking and doing nicely.

Kiss baby thousands of times for me, love to the boys and kind remembrance to all. Miss McWilliams[7] no doubt is nicely settled with the boys and is delighted to have baby again.

Love to all who are there with you. Your loving daughter

Mina.

P.S. We telegraph when we sail.

ALS, CEF, EFP (*TAED* X018A704). Letterhead of Foot's Cray Place. [a]"Foot's Cray, Kent." preprinted. [b]"be able to" interlined above. [c]Obscured overwritten text. [d]Interlined above.

1. Edison and Mina were guests at Foot's Cray Place, the country home of Sir John and Lady Pender in Kent. The editors have supplied the date based on Mina's reference below to their lunch "yesterday" with the Lord Mayor, which occurred on 24 September. Pender to TAE, 19 July 1889, DF (*TAED* D8905AEM); "Edison in London," *Pall Mall Gazette,* 26 Sept. 1889, 1.

2. Emma Pender (née Denison, 1817?–1890) married John Pender in 1851. *Oxford DNB,* s.v. "Pender, Sir John"; *England & Wales, Civil*

Registration Death Index, 1837–1915, online database accessed through Ancestry.com, 11 Jan. 2017.

3. Sir Henry Isaacs (1830–1909) was Lord Mayor in 1889. *Jewish Ency.,* s.v. "Isaacs, Sir Henry Aaron"; *Short History of the Lord Mayors' Pageants,* 70.

4. Mansion House became the Lord Mayor's official residence in the mid-eighteenth century. In addition to Edison, Mina, and John Pender, guests at this event included James Anderson, James Staats Forbes, and George Gouraud and his wife Florence. *London Ency.,* s.v. "Mansion House"; "Mr. Edison in London," *Electrician* 23 (27 Sept. 1889): 516.

5. According to a published interview with William Pitt Edison, young Thomas, Jr., and William Edison had gone to stay with the Miller family in Akron, Ohio, several weeks before Edison and Mina left for France. When news of Mary Miller's unspecified illness reached Akron, William reportedly brought the boys from Ohio to the Michigan farm he shared with his wife Ellen. Mina's mother noted that the boys left Akron on 6 August; they seem to have returned by early September, when they apparently headed for home from Ohio. "Wm. Pitt Edison," *Canton Repository,* 12 Aug. 1889, Clippings (*TAED* SC89107); Mary Valinda Miller to Mina Edison, 11 Aug. and 4 Sept. 1889, both MFP (*TAED* X018D1AS1H, X018D1AS1N).

6. Lewis Miller reportedly took the boys to the Hotel Normandie in New York to await the steamer's arrival on the morning of 6 October. When Edison and Mina reached the dock at nine o'clock, however, they did not go into the city but were conveyed by a launch directly to Jersey City, where they boarded a 9:25 train to Orange. Learning this too late, Miller and the boys followed on the next train at 1:42 p.m. "Edison Back from Paris," *NYT,* 7 Oct. 1889, 5

7. Sarah McWilliams (b. 1843?), an acquaintance of the Miller family, had been a governess or tutor with the Edisons since 1887. Doc 3035 n. 7.

–8– October–December 1889

Edison and Mina's busy European trip neared its end when *La Champagne* dropped anchor in New York harbor early on 6 October. Quite unlike their tumultuous arrival in France exactly eight weeks before, they disembarked unnoticed, slipped aboard a ferry, caught a local train, and arrived home a few hours later. So quietly efficient was their transit that Mina's father and the two Edison boys missed them in New York and had to hurry back to Orange on their own.[1] Edison returned to the news that, the day before, a federal court had decided in favor of his electric lighting companies in a major patent lawsuit. The ruling decisively turned back efforts by the Westinghouse lighting interests to invalidate the fundamental patents on the Edison incandescent lamp. Speaking to the press after hearing this news, Edison took the opportunity to question the integrity of George Westinghouse, Jr., further inflaming the already heated rivalry between their two companies.[2]

Edison wasted little time getting into his laboratory again. It is unknown how, or to what extent, he followed up on his long August list of projects for the laboratory (Doc. 3391). Almost immediately, however, William K. L. Dickson seems to have presented him with major advances in moving picture technology. The exact chronology of events is uncertain, but Dickson claimed to have shown off a functioning kinetoscope in short order (in the new photographic studio built in Edison's absence). Within a few days, he may also have been able to project the images onto a screen. Not only that, he reportedly coordinated the moving pictures with phonograph recordings. Dickson later recalled that "Mr. Edison was handed phonograph ear tubes, in order to see and hear and to judge if the apparatuses were sufficiently well synchronized by the subject taken, which was a picture of myself, remarking that I welcomed him back and to show him exactly the two machines synchronized. I raised my hand counting one, two, three, four, at each gesture."[3] Regardless of the details and timing, significant advances had been made while Edison was gone, and subsequent work reportedly was carried out in a locked room to which only a select few were admitted. Edison claimed the achievements in a massive omnibus draft caveat (Doc. 3435) in early November. He said little about the marriage of image to sound, however, perhaps because it did not work as well just then as Dickson later recalled.[4]

Edison used the big November draft caveat to describe broader changes to the phonograph. Unlike the kinetograph, which had progressed in his absence, the phonograph seems to have undergone a redesign immediately after his return. The most visible change (described in Docs. 3435 and 3440) was in the distinctive "spectacle" appliance that carried separate diaphragms and points for recording and reproducing. "I have cut the spectacle itself in two," he explained to George Gouraud, "and thrown one side away, using one diaphragm for recording and reproducing."[5] Aware of complaints about the difficulty of using the phonograph for dictation,[6] he altered the mechanism for lifting the points from the cylinder to pause the recording or playback process. After the redesign, output from the Edison Phonograph Works dropped precipitously and did not rebound until December. The factory had been making as many as two hundred machines more than it shipped every week, but its output began to match demand in December as orders surged.[7]

That twenty-page November caveat draft can be read more generally as a rough index of Edison's most immediate inventive and research interests in the fall and early winter. It included (in addition to the phonograph and kinetoscope) variations on magnetic ore separators, a friction drive for electric railway motors, a system of conveying power to electric trains, electrical distribution networks, converters to change alternating to direct current, a direct-current transformer,[8] and an electric brake for railroad cars. Two subjects in that list—ore separation and electric railways—became major projects in the final months of the year.

Edison hired a mining engineer to prospect for him in North Carolina, starting in early November.[9] He was also acquiring and personally scouting iron mining properties in

New Jersey, Pennsylvania, and probably New York.[10] He went away for several days in early November to meet mining engineer John Birkinbine in Peekskill, New York.[11] Soon after, he spent a few days in the vicinity of Reading, Pennsylvania, (more than a hundred miles southwest of Orange) before heading to Bechtelsville, where the plant of the New Jersey and Pennsylvania Concentrating Works was running on an experimental basis.[12] At the end of November, he investigated properties near Dover, New Jersey, about twenty-four miles northwest of Orange. Planning to be gone a week and a half, he returned "unexpectedly" a few days early on 6 December.[13]

Just six days later, Edison was off again, this time with Alfred Tate, to western New York and Ontario, Canada, likely in connection with his proposal for the electrification of Niagara Falls.[14] Edison returned a week later to catch up on business and testify before a New York City grand jury about the safety of electrical wires on 23 December. Later that day, he left again with Mina to spend Christmas with her family in Akron, Ohio.[15] They then spent a few days visiting Edison's niece Nellie Marion (Edison) Poyer and her husband William in Norwalk, Ohio, before returning home after a stop in Cleveland at the beginning of the New Year. By that time, Mina would have been nearly two months into a pregnancy: Charles, her second child, entered the world on 3 August 1890.

Edison returned in a big way to electric railroads, a subject of perennial interest, in the latter part of October. The genesis of this particular idea is unclear, but his goal became the electrification of a short section of the local horse-drawn street railroad near his laboratory. Charles Batchelor, Arthur Kennelly, and other staff members began working on motor design in October. The electrification project soon grew to include dozens of laboratory staff members (some hired specifically for this work) and scores of laborers. Expenses through the end of the year totaled $4,338 for construction and $527 for transformers. The biggest charge, though, was $10,498 to design and build a new motor. Edison split all the costs with Henry Villard, who had his own longstanding interest in railroad electrification. Villard was simultaneously steering the Edison General Electric Company's absorption of the Sprague Electric Railway & Motor Company, just as the former was facing stiff competition in the potentially lucrative traction market. (Edison scorned Frank Sprague and his firm, a pioneer of heavy direct-current motors.)[16]

Edison also took up work on two notable projects not on the August list. Perhaps prompted by ill-effects from a rich diet in France, he directed experiments—involving two human subjects—on electrochemical processes to alleviate the painful symptoms of gout. And at the urging of financier Edward Dean Adams, he and Arthur Kennelly gathered information and made a series of calculations about the economic feasibility of generating large amounts of electric power at Niagara Falls and transmitting it to an industrial center such as Buffalo, New York.[17] Work continued on other projects on the list, notably an electric railroad brake. He also tried to extend the range of the phonoplex telegraph, in part by developing a repeater.[18]

Villard had long since declined to help realize Edison's dream of building "a great Industrial works in the Orange Valley," but Edison was taking his own steps toward that goal.[19] The Edison Manufacturing Company (as yet unincorporated though operating under that name since at least July) began occupying new factory buildings at nearby Silver Lake, where it started turning out the new Edison-Lalande battery. The cell was designed to run the phonograph, but Alfred Tate envisioned a more ambitious marketing plan to "try and displace all other forms of cell which are now used for telephone, telegraph, signalling and motor work."[20] The Manufacturing Company also began (probably by the end of the year or perhaps very early in 1890) to make the new wax compound recently named by Edison as the standard for phonograph cylinders. This wax, designed by Jonas Aylsworth through months of painstaking trials, was molded into cylinders at the Edison Phonograph Works factory adjacent to the laboratory. Manufacture of both the wax and the finished cylinders was scaled up quickly, though a disconcerting number of the early cylinders proved defective. In December, with the kinks presumably worked out of the molding process, production reached almost 48,000 blank cylinders.[21] Sales of cylinders and phonographs to the North American Phonograph Company no doubt helped ease Edison's cash flow when Jesse Lippincott failed to make a scheduled $65,000 payment toward his 1888 purchase of phonograph patent rights.[22] The laboratory's "Musical Department" was, as Alfred Tate told contralto Anna Lankow in mid-November, "very busy getting out musical cylinders" for sale and had "musicians, bands &c., &c. engaged to play to the phonograph every day for the next month."[23] The lamp factory, long settled in nearby East

Newark, was hit by labor unrest when general manager Francis Upton, fresh from Europe with information about English wage scales, imposed a salary reduction and stringent new work rules. All fifty glassblowers walked out, followed by the rest of the factory's 200 hands. The length and outcome of their action are unclear, but when seven "girls" left the factory in November over a pay cut, they were banished from the plant.[24]

Alfred Tate expressed confidence in late November that the Toy Phonograph Company and its prospects were "now in excellent condition." However, despite having "a number of girls engaged" in recording nursery rhymes for talking dolls, another holiday season would pass without the dolls reaching toy shelves. Separately, Edison was negotiating for the assignment of foreign manufacturing and sales rights for the dolls. In December, he completed a master patent specification for the toy phonograph that may have been filed in as many as thirty foreign countries. The design emphasized the ease and low cost of manufacturing and replacing the mechanism, as well as its durability, but there was some question about the patent's originality with respect to similar inventions of William Jacques.[25] For the phonograph proper, negotiations were well underway in December to vest all foreign sales and manufacturing rights for it and the graphophone together in a new entity. The Edison United Phonograph Company was formed for that purpose in February 1890.[26]

When Edison came home from France, he left behind Adelbert Wangemann—already well-traveled in Europe with the phonograph—as an ambassador for the instrument. Wangemann made a highly successful exhibition in Berlin, where he worked behind the scenes to draw Werner von Siemens into a group of investors for manufacturing. He personally showed the instrument to Czar Alexander III at the Russian embassy in Berlin, and with help from Siemens, recorded the voice of Otto von Bismarck. In short order, he recorded several cylinders of German military hero Field Marshall Count Helmuth von Moltke before going on to exhibit in Vienna in late October.[27] Julius Block, acting as another phonograph emissary in Europe, showed the instrument (again) to the czar and his family and to members of the famed Russian Musical Society, including Pyotr Il'yich Tchaikovsky and Anton Rubinstein; he also hoped to record Antonin Dvořák, Charles Gounod, and Camille Saint-Saëns in Moscow.[28] Edison subsequently arranged to send an engraved phonograph to the Russian czar, as he did as well for the president of Mexico, the royal heads of Korea and Japan, prominent Chinese leaders, and piano prodigy Josef Hofmann.[29]

Two matters related to Edison's trip to the Exposition Universelle lingered after his return. For one, having just participated in the latest world's fair, he declined a request to help plan for another in New York in 1892.[30] And he authorized William Hammer, who had remained behind in Paris, to purchase a marble statue displayed in the Exposition's fine arts section. Hammer paid about $1,700 for "The Genie de l'Electricite" by Aurelio Bordiga of Rome. The six-foot sculpture reached New York in December and was mounted on a three-foot pedestal in the library, where (according to the *Electrical World*) it was "the first thing seen by the visitor as he enters," and where it still occupies a prominent place. At the feet of the youthful figure lie chiseled representations of the telephone, telegraph, battery, and dynamo; in his upraised hand, Edison placed a 100 candlepower light bulb.[31]

1. See Docs. 3392 (headnote) and 3419 n. 5.

2. See Doc. 3420.

3. Dickson's testimony, p. 163, *Motion Picture Patents Co. v. Chicago Film Exchange*; Edison's testimony, p. 97, *Edison v. American Mutoscope Co. & Keith*; both Lit. (*TAED* QM003143 [image 14], QM001091 [image 63]); Spehr 2008, 117–18, 164–69.

4. Edison did include, among the many phonograph improvements in that caveat draft, a new form of governor designed to prevent "jerky" regulation of the motor. That was the same type of motor running the kinetograph and kinetoscope, and Edison's unusual choice of this visual adverb perhaps alludes not only to the motion of the governor itself but also to the visible manifestation of poorly regulated moving images.

5. Doc. 3440.

6. James Andem's testimony, pp. 579–82, *New York Phonograph Co. v. National Phonograph Co.,* Lit. (*TAED* QP0100579, images 540–42).

7. The unsold machines presumably had to be retrofitted, as were some that had already been shipped. Cat. 1337:70 (item 582, n.d. [Dec. 1889]), Batchelor (*TAED* MBJ004070); cf. Doc. 3440 n. 4.

8. Arthur Kennelly was testing a transformer in December (perhaps in connection with the electric railroad project) when he received what Charles Batchelor described as "the full force of about 1150 Volts from one of our Municipal machines. It knocked him down," quickly breaking the connection. Kennelly's hand was "burned a little where the contact was made but other wise he felt very little effect afterward." Cat. 1337:105 (item 628, 18 Dec. 1889), Batchelor (*TAED* MBJ004105A).

9. See Doc. 3436.

10. Henry Livor to Alfred Tate, 24 Oct. 1889; Livor to TAE, 25 Oct. 1889; both CR (*TAED* CJ001AAV, CJ001AAX).

11. TAE to Birkinbine, 7 Nov. 1889; TAE to Mary Hemenway, 7 Nov. 1889; Lbk. 33:444–45 (*TAED* LB033444A, LB033445).

12. "Visiting Berks' Iron Mines," *Reading (Pa.) Times,* 19 Nov. 1889, 4.

13. See Doc. 3450.

14. See Doc. 3444 esp. n. 2. Cat. 1337:102 (item 621, 12 Dec. 1889), Batchelor (*TAED* MBJ004102B); Henry Villard to George Westinghouse, 16 Dec. 1889, Letterbook 64:500, Villard.

15. Jesse Lippincott to TAE, 26 Dec. 1889, DF (*TAED* D8962ABD); *Akron City Times,* 25 Dec. 1889, 1; "Entertaining Edison, The Inventor," *Chicago Daily Tribune,* 31 Dec. 1889, 1; Henry McIntosh to TAE, 27 Jan. 1890, DF (*TAED* D9047AAC).

16. See Docs. 3431 and 3457.

17. See Docs. 3422 (gout) and 3434, 3437, and 3441 (Niagara Falls).

18. See Doc. 3427.

19. See Docs 3080 and 3144.

20. See Docs. 3439 n. 3 and 3449 esp. n. 4.

21.See Docs. 3426 and 3439; Cat. 1337:71 (item 582, n.d. [Dec. 1889]), Batchelor (*TAED* MBJ004070).

22. Lippincott agreement with TAE, 31 Oct. 1889, Misc. Legal (*TAED* HX89054); Sherburne Eaton to TAE, 1 Nov. 1889, DF (*TAED* D8962AAX).

23. Tate to Anna Lankow, 11 Nov. 1889 and 6 Jan. 1890; Tate to Thomas Lombard, 21 Dec. 1889; Lbk. 34:10; 35:405, 213 (*TAED* LB034010, LB035405, LB035213).

24. "Strike at Edison's Works," *Philadelphia Inquirer,* 8 Oct. 1889, 1; Board of Mediation and Arbitration 1891, 274.

25. See Docs. 3445 and 3447; Edison's foreign set 92, Box 311, Series 4, PS, NjWOE.

26. See Doc. 3458.

27. Docs. 3428 n. 1 and 3430 n. 9; Puille 2012; *Vienna News,* 21 Oct. 1889, Clippings (*TAED* SC89186C). Digital audio reproductions of a number of Wangemann's recordings from this time are available through the National Park Service's web presentation of Stephan Puille's article (Puille 2012).

28. See Doc. 3430.

29. TAE to Thomas Connery, 9 Oct. 1889, Lbk. 33:44 (*TAED* LB033044); see Docs. 3448 and 3456.

30. Eugene Beebe to TAE, 8 Oct. 1889, DF (*TAED* D8945AAW2); Alfred Tate to Beebe, 12 Oct. 1889, Lbk. 33:87 (*TAED* LB033087).

31. TAE to Hammer, 11 Nov. 1889; TAE to Morris European and American Express Co., 26 Dec. 1889; Lbk. 33:496, 35:278 (*TAED* LB033496, LB035278); Paris Universal Exposition to TAE, 4 Dec. 1889; Hammer to TAE, 8 Dec. 1889; Morris European and American Express Co. to TAE, 10 Dec. 1889; all DF (*TAED* D8905AJJ, D8905AJI, D8905AJO); "'The Genius of Light' Statue," *Electrical World* 15 (1 Feb. 1890): 72.

–3420–

From Sherburne Eaton

New York City, 7th Oct. 1889.

My dear Sir:

I intended to go out and dine with you, and spend the evening. But the conference on the Filament case[1] has lasted all day in my office until 5-30, and the accumulated work of the day will compel me to continue at work this evening. I am pushing things all along the line, and it keeps me busy day and night.

I procured a certified copy of Bradley's decision[2] late this afternoon. I am keeping the typewriters at work to night making copies. One copy has just come in, and I send it to you by bearer, thinking you may like to look it over this evening.[3] Please keep it.

When I took the lawyers up stairs to lunch today, Mr. Kerr[4] called me over to a table where he, Westinghouse and associates were lunching. Mr. Westinghouse remarked to me that he felt very much hurt by your calling him a "shyster" in this mornings "Herald."[5] He was really cut up about it.

I shall certainly go out to see you tomorrow morning. Please present my compliments to the Countess,[6] and believe me to remain, Sincerely yours,

S. B. Eaton

TLS, NjWOE, DF (*TAED* D8954ADC).

1. That is, *Edison Electric Light Co. v. United States Electric Lighting Co.*

2. Justice Joseph Bradley handed down the court's decision on 5 October. He offered a number of reasons for upholding Edison's carbon filament patent against that of Sawyer and Man. Among them was the view that the specific nature of the carbon material, a central point in Edison's specification, was in the other merely an "after-thought" added only during substantial revisions in 1885, and he questioned whether Sawyer and Man had ever made a useful lamp according to their own descriptions. Bradley also applied a more expansive criterion in holding that Sawyer and Man had adopted a "wrong principle" in using thick low-resistance carbons and strong electrical current, whereas Edison had shown the necessity of high resistance and low current for a commercially viable lamp (Bradley decision for U.S. Circuit Court, 5 Oct. 1889, *Edison Electric Light Co. v. U.S. Electric Lighting Co.,* Complainant's Proofs Vol.1:382–98 [quoted p. 394], Lit. [*TAED* QD012B0382]). The appeal of this ruling reached the U.S. Supreme Court in October 1894. In November 1895, the court upheld the original decision in what was by then widely known as the Incandescent Lamp Patent Case. It declined to rule directly on the question of inventive priority, holding instead that the Sawyer-Man claims were too non-specific to justify the legal grant of a monopoly, particularly against the record of Edison's painstaking experimentation to determine exactly which fibrous materials would suffice as filaments

(*Consolidated Electric Light Co. v. McKeesport Light Co.,* 159 U.S. 465 [1895]).

3. Alfred Tate later requested ten copies from Eaton for the laboratory. Tate to Eaton, 12 Oct. 1889, Lbk. 33:90 (*TAED* LB033090).

4. Thomas Bakewell Kerr (1849–1920) grew up in Pittsburgh, graduated from Western Pennsylvania University, and in 1870 started practicing law in the area. He spent much of his career representing Westinghouse enterprises in patent matters, even after he moved to New York City in 1888. "Thomas B. Kerr," *Pittsburgh Daily Post,* 3 Apr. 1920, 7; [Ferree] 1921, 72.

5. Edison was interviewed by a *New York Herald* reporter on the evening of 6 October, the day that he and Mina returned from France. Reflecting on the decision in the McKeesport case, Edison reportedly said:

> Westinghouse used to be a pretty solid fellow, but he has lately taken to shystering. The Sawyer-Man patent was rammed through the Patent Office by a company organized in New York for the purpose of speculation. Westinghouse simply grabbed fifty-four of my patents and started into business, saying that he could sell his manufactures cheaper because he did not have to pay out money experimenting. I have one hundred and fifty suits against Westinghouse and there must be a settlement soon. ["Mr. Edison At Home Unspoiled By Glory," *New York Herald,* 7 Oct. 1889, 3]

Edison's sensitivity may have been whetted by the warning Eaton recently sent him in Paris that "The Westinghouse experts are getting up an attack on your record as an inventor in the electric light" in connection with the *McKeesport* case. Eaton cautioned that his remarks on the subject were "confidential, extremely so. Please do not mention it, for reasons which I had better not state in writing" (Eaton to TAE, 18 Sept. 1889, DF [*TAED* D8905AGC]).

6. This title was bestowed upon Mina in Paris on behalf of King Umberto I of Italy. See Doc. 3392 (headnote).

–3421–

From Henry Livor

New York, October 8th 1889[a]

My Dear Mr. Edison:

We can leave New York, Pennsylvania Road, on Saturday afternoon at 10 minutes past four, reaching Ogdensburg at 6-35, and we can leave Odgensburg Sunday afternoon at 4-38, reaching New York at 7-10. This will give us ample time at the Mines.[1]

I hope nothing will interfere with your going, especially as cold weather is approaching, and if we are to put up a Mill at the Ogden Mines, we must act promptly to get the foundations in and under cover before the worst of the winter sets in.[2] Yours truly.

H. M. Livor. General Manager.

TLS, NjWOE, CR (*TAED* CJ001AAQ). Letterhead of New Jersey and Pennsylvania Concentrating Works, H. M. Livor, general manager. [a]"New York," preprinted.

1. The editors have not found other information about this trip. Livor proposed that he and Edison visit several mining properties during the fall (Livor to TAE, 25 Oct. and 30 Nov. 1889, both CR [*TAED* CJ001AAX, CJ001ABI]). Edison's growing interest in the area around Ogdensburg, N.J., is discussed in Doc. 3309 (headnote). His uncle, Simeon Ogden Edison, arranged for the New Jersey and Pennsylvania Concentrating Works (NJPCW) to lease rights to the Ogden Iron Co. mines in early July 1889. The NJPCW's directors approved the leases on 16 October and authorized construction of a mill there (Ogden Iron Co. minutes pp. 34–35, 14 and 21 June and 5 July 1889; NJPCW minutes, pp. 24–26, 16 Oct. 1889, all CR [*TAED* CJ201, CJ074024]; NJPCW agreement with Ogden Iron Co., 16 Oct. 1889, Miller [*TAED* HM89ABS]).

2. Structural plans for the ore-separating plant began taking shape in October but, as much depended on knowing the dimensions of the steam engine, they were still incomplete on 23 November (Livor to TAE, 31 Oct. 1889; Cornelius Field to TAE, 23 Nov. 1889; both CR [*TAED* CJ001AAZ, CJ001ABF]). Although Edison had good relationships with American engine builders, particularly Armington & Sims, while in Paris he solicited a proposal by the French makers Weyher and Richemond, four of whose 150 h.p. machines ran the dynamos in his Exposition display. At Livor's urging, he cabled for drawings of their 150 and 300 h.p. vertical triple expansion engines. The builders promised to comply quickly and advised that the larger engine could be ready by the end of November. On 4 November, Edison wired an order for it (and a condenser), although the builders' acknowledgment referred to the smaller one as well (U.S. Commissioners 1890–91, 3:99–103; Weyher and Richemond to TAE [with TAE marginalia], 10 Sept. 1889; TAE to Weyher and Richemond, 18 Oct. 1889; both DF [*TAED* D8970ABQ, D8970ABR]; Livor to TAE, 14 Oct. 1889; TAE to Weyher and Richemond, n.d. [14 Oct. 1889?]; both CR [*TAED* CJ001AAR, CJ001AAR1]; TAE to Weyher and Richemond, 19 and 21 Oct. and 4 Nov. 1889; Lbk. 33:182, 195, 388 [*TAED* LB033182, LB033195, LB033388]). Edison importuned them to hurry so the foundation work could begin, and only after hearing that blueprints and foundation drawings were complete did he mail a formal order on 21 November for the 300 h.p. machine. The remaining drawings were done by the end of November. The engine itself was shipped on 24 December and billed to Edison at 55,000 French francs, or roughly $11,000 (Weyher and Richemond to TAE, 5 Nov. and 24 Dec. 1889; TAE to Weyher and Richemond, 14, 21, 25 Nov. 1889; Lbk. 34:98; 35:252A; 34:51, 180, 228 [*TAED* LB034098, LB035252A, LB034051, LB034180, LB034228]; Weyher and Richemond to TAE, 15 and 29 Nov. and 31 Dec. 1889, all DF [*TAED* D8970ABW, D8970ABY, D8970ACK]).

–3422–

To William Somerville

[Orange,] Oct. 9, 1889.

My Dear Somerville,—[1]

I have received your very kind letter 8th instant,[2] informing me that the Lotos Club[3] desires to extend to me certain hospitality in the shape of a dinner.

When I acquaint you with the state of my system you will not be surprised nor consider me ungrateful for having trembled when I read your note, and I feel that I can count upon your assistance in saving me from meeting with a fate in my own country that I barely escaped while abroad—the complete disruption of my internal apparatus.

Eight days on the ocean have failed to repair the damage done to my digestion by a series of French dinners which it was impossible for me to avoid. I bore up bravely and ate everything that was set before me, like a plain American citizen, but I have returned a perfect wreck. I momentarily expect a violent attack of gout which will probably end up in blood poisoning and have four doctors watching me night and day.[4]

It is not so much of myself that I think, but I have a young family to which I owe a duty and for its sake I want to enlist your sympathy and get you to obtain me a respite of at least a month until my present symptoms have had time to develop. If I still live at the end of that time I will be glad to report to you upon my condition and consider further the acceptance of the generous invitation of the Lotos Club.[5] Sincerely yours,

Thomas A Edison

TLS (letterpress copy), NjWOE, Lbk. 33:82 (*TAED* LB033082).

1. William B. Somerville (1840–1897) was acquainted with Edison from their days as itinerant telegraphers after the Civil War. Somerville was born in Toronto but came to the United States as a young man and spent most of his working life with Western Union; he was superintendent of its press service at the time of his death. Obituary, *Electrical Engineer* 23 (5 May 1897): 483; John Cassell to TAE, 1 June 1889, DF (*TAED* D8905ADR); John Lonergan to William Simonds, 1 Aug. 1932, EP&RI, Series I, Manuscripts (*TAED* X001E12A).

2. Somerville advised Edison that the Lotos Club wished to honor him with a dinner, at which the speeches made would be recorded by a phonograph. Somerville to TAE, 8 Oct. 1889, DF (*TAED* D8912AAQ).

3. The Lotos Club was incorporated in New York in 1870 in order (according to its official history) to "promote social intercourse among journalists, literary men, artists and members of the musical and dramatic professions" as well as "merchants and professional gentlemen of artistic tastes." The name derived from Tennyson's popular poem "The Lotus-Eaters" and was intended to evoke "an idea of rest and harmony." Now located on Fifth Ave. at Twenty-third St., the club had

given dinners for such luminaries as Mark Twain, William Gilbert and Arthur Sullivan, and Ferdinand de Lesseps. Somerville became a full member in 1893. Elderkin 1895, 7–9, 15, 42, 37, 49, 50.

4. Some contemporary medical authorities understood gout to be associated with "a morbid condition of the blood," specifically an excess of uric acid. The condition was attributed to many causes, some hereditary, but particularly to an excess of food (notably beef) and drink (especially heavy wines and champagne). Quain 1883, 544–45.

During Edison's absence, Arthur Kennelly had made a few avowedly physiological experiments on how an electric current affected the diffusion of lithium oxide, first through a membrane and, secondly, into the urine of a human subject. Perhaps these tests informed experiments that the laboratory staff undertook before the end of the year aimed specifically at treating gout by reducing deposits of uric acid in affected joints. Initial trials seemed to show the efficacy of electric currents for stimulating endosmosis, the diffusion of a fluid through a membrane to mix with another fluid on the other side. The next step was to subject a healthy young man, identified only as a laborer, to an electric current passed between his hands for eleven hours over the course of a week. Encouraged that this process seemed to cause a noticeable change in the constituents of the man's urine, Edison then found a volunteer who suffered severely from gout. This elderly man, a resident of nearby Montclair, N.J., came to the laboratory regularly for about two weeks in late December. Afterward, Kennelly summarized in a notebook the "Particulars of a Test made of the effect of Electrical Endosmose upon the reduction of uric acid calculi in a gouty patient." The treatment consisted of applying an electric current through the hands, which were immersed in electrolytic solutions. Kennelly measured less swelling in the man's joints after about two weeks, which he took as "evidence of a beneficial effect. Patient also felt better during treatment." Though the man reported less gout pain, one of his hands was blistered by the electrolyte, and he declined to continue because of the difficulty he had getting to the laboratory. All these experiments were summarized in a paper submitted in Edison's name to an international medical conference in Berlin in 1890. The paper concluded that "satisfactory use can be made of the principle of electrical endosmose" to treat gout. Edison seems to have shared the cost of these experiments with Henry Villard. Edison 1890; Kennelly Notebook #2:51, 61, 125, Lab. (*TAED* NM024051, NM024061, NM024125); Laboratory "Statement of Experimental Accounts to January 1st 1890," project #326, [1 Jan. 1890], DF (*TAED* D9064AAA, image 1).

5. Edison accepted the club's suggestion to schedule the dinner for 23 November. On 1 November, however, Alfred Tate advised that Edison would have to be away from New York for several weeks from the middle of the month, and the event apparently was not rescheduled. Lotos Club to TAE, 15 Oct. 1889, DF (*TAED* D8912AAT); Tate to Lotos Club, 21 Oct. and 1 Nov. 1889, Lbk. 33:200, 381 (*TAED* LB033200, LB03381).

–3423–

To Lloyd Bryce[1]

[Orange,] Oct.14, 89.

Dear Sir:—

I beg to confirm the following telegrams received from you and sent by me to-day:—[2]

"Will you explain in three or four hundred words for the next North American Review the means of avoiding the dangers from electric wires in our streets?[3] If desired will send stenographer. Answer paid. Lloyd Bryce."

"When must article be prepared? Edison."

"Thursday,[4] for unless we can have it by then, it can't go in next number, and after that the public will probably have forgotten too much about the circumstances to give full weight to even your word. Shall I send stenographer? You could dictate to him, for though I should be pleased to have a long article, a page or so will be sufficient. Editor, North Am. Review."

"I will write it myself and send it over. EDISON."[5]

Very truly yours,

T A Edison[a]

TL (carbon copy), NjWOE, Lbk. 33:114 (*TAED* LB033114). [a]Signed for Edison in unidentified hand.

1. Lloyd Stephens Bryce (1851–1917), raised in Washington, D.C., graduated from Oxford in 1874. He studied law in New York and served one term in the U.S. House of Representatives but was defeated for re-election in 1888. He was a budding novelist when his friend Thorndike Rice died unexpectedly, bequeathing him control of the *North American Review.* Bryce took over with the September 1889 issue and largely continued his predecessor's policies of exploring a range of contemporary topics. *DAB,* s.v. "Bryce, Lloyd Stephens"; Mott 1966 [1938] 2:221, 249–55.

2. The two telegrams from Lloyd Bryce quoted below are in DF (*TAED* D8907ACA, D8907ACB).

3. The potential danger of overhead uninsulated wires—to electrical workers and the public—had been a political topic in New York and other cities for years, but several recent accidents in New York's busy streets brought the issue into local headlines again (see, e.g., Docs. 2568 n. 1 and 2816 nn. 3–4). One victim was a shopkeeper electrocuted on his rooftop in September. Another was a lineman fatally injured in early October, a few days after several pedestrians received shocks from a broken wire in the Bowery. The latest and arguably most gruesome accident occurred on 11 October when John Feeks, a lineman working on a pole in lower Manhattan, touched a live wire and fell; his body became entangled in other wires and remained there, roasting, to the horror of the crowd gathered below. The Feeks death became a newspaper sensation and reporters sought Edison's reaction to it ("Across the Fatal Wires," *NYT,* 14 Sept. 1889, 1; "Scared by a Live Wire, *NYT,* 3 Oct. 1889, 9; "Another Lineman Killed," *NYT,* 9 Oct.

1889, 2; "Met Death in the Wires, *NYT,* 12 Oct. 1889, 1; "Edison on the Danger," *New York Evening World,* 12 Oct. 1889, 1; "Edison's Remedy, *New York Sun,* 14 Oct. 1889, Clippings [*TAED* SC89182A1]). The accident and the responses to it from political and industry voices became signal events in the ongoing battles over urban electrification and especially the Edison lighting interests' attacks on alternating current distribution ("The Companies' Side," *NYT,* 14 Oct. 1889, 2; "Correspondence. New York Notes," *Western Electrician* 5 [19 Oct. 1889]: 211; on the broader implications of Feeks's death see, e.g., Essig 2009, chap. 17, and Freeberg 2013, 187–89). Edison was asked to testify at the coroner's inquest into yet another accidental electrocution in December (see Doc. 3452).

4. Three days later, 17 October.

5. Bryce acknowledged Edison's acceptance the next day and later paid him $100 for the manuscript, the same fee given for Edison's previous submission to the magazine (Bryce to TAE, 15 and 29 Oct. 1889, both DF [*TAED* D8907ACB, D8907ACH]). The editors have not found a draft but the article (Edison 1889), titled "The Dangers of Electric Lighting," filled nine-plus pages in the November issue. (The same issue had Harold Brown's article arguing the physiological merits of "The New Instrument of Execution" by high-voltage alternating current [Brown 1889a]). Edison explicated the dangers of high-tension wires (and especially those carrying alternating current) using the grisly Feeks accident as a symbol of a growing urban peril. He framed the issue as fundamentally a political and regulatory one that defied technological solution. Claiming that burying conductors underground, as some cities now required, would only exacerbate the risks, he argued for an outright ban of high-voltage conductors. Such action was especially important for alternating currents (AC), he said, referring to recent French experiments showing the outsized effects of AC on animals. The article seems to have pleased Bryce, who invited Edison to critique British regulations on electrical wires. Edison demurred because of the British rules' inapplicability to conditions in the United States. Bryce then asked him in January to draft his own set of regulations, but Edison again declined, citing the heavy criticism he would expect to draw because of his obvious commercial interest in the question (Samuel Insull to TAE, 16 Dec. 1889; Bryce to TAE, 30 Nov. 1889, 18 and 25 Jan. 1890; all DF [*TAED* D8907ADF, D8907ACX, D9004AAJ, D9004AAM, D9004AAN]; Alfred Tate to Bryce, 30 Nov. 1889; TAE to Bryce, 14 and 22 Jan. 1890; Lbk. 34:337; 36:43, 271 [*TAED* LB034337, LB036043, LB036271]). By that time, the original article had drawn at least two direct responses: one coauthored by AC power pioneer Sebastian Ferranti in *Engineering* and "A Reply to Mr. Edison" by George Westinghouse in the December *North American Review,* which was itself lampooned by a later Edison Electric Light Co. pamphlet (James Dredge to TAE, 28 Dec. 1889; DF [*TAED* D8907ADH]; Ferranti and Ince 1890; Westinghouse 1889; Edison Electric Light Co. [1889]).

–3424–

Draft to the New York World

[Orange,] Oct 15th 1889[a]

NYork World

Expert Wheelers[1] statement before Mayor[2] reported in Evening papers that if Manhattan Co were ~~compelled~~ made[b] to reduce pressure to three hundred volts they would be compelled to use the Edison system.[3] ~~Allow me to state~~ is not correct. The Manhattan Co ~~can still use their present system~~ as well as Mr Wheeler know perfectly well that by rewinding their[c] present transformers with larger wire to adapt it to the reduced pressure, they can go right ahead with their present system and still [~~make~~?][d] require[b] but half of the Copper wire now used in the Edison system.[4]

T. A. Edison

<Mayor Grant>

<NYork Sun[5]— Tribune[6] Herald Times[7] Star[8] Morning Journal[9]>

ADfS (letterpress copy), NjWOE, Lbk. 33:154 (*TAED* LB033154). [a]Date written in an unidentified hand. [b]Interlined above. [c]Obscured overwritten text. [d]Canceled.

1. Electrical engineer, inventor, and manufacturer Schuyler Skaats Wheeler (1860–1923) was identified at this time as the staff expert for the New York Board of Electrical Control, the body charged with regulating electrical wires in New York City. Wheeler worked for Edison and his lighting businesses from 1882 to 1886 and is widely credited with having invented a practical electric fan. "Opposed to Underground Wires," *NYT,* 29 June 1888, 8; *TAEB* 7 App. 4.C n. 8; "Committee on Science and the Arts," *Journal of the Franklin Institute* 158 (Aug. 1904): 158.

2. Hugh John Grant (1852–1910), a Tammany Hall Democrat, was elected mayor of New York City in 1888 on his second try, after stints as alderman and sheriff. He was re-elected in 1890. Hamersly 1906, 165–66; Caliendo 2010, 1:381–82; "Ex-Mayor Grant Dies Suddenly, *NYT,* 4 Nov. 1910, 1.

3. Edison apparently referred to a convening of the New York Board of Electrical Control at midday on 15 October, one of several such meetings following the electrocution of John Feeks a few days earlier (see Doc. 3423 n. 3). At this latest gathering, the board discussed a resolution that would effectively limit electric lighting wires to no more than 300 volts. A representative of the Manhattan Electric Light Co. objected that the proposal would force most companies to cease operations because "It would be substantially impossible [for them] to adopt the Edison system of lighting." Schuyler Wheeler reportedly endorsed the opinion that such restrictions would largely force operating companies to adopt the Edison distribution system. Hearing this, Grant announced his opposition on the grounds that the board "has created enough monopolies, and I don't propose to allow it to effect this most gigantic monopoly of all." "Blow at the Companies: A

Resolution Against Overhead Wires Carrying over 300 Volts," *New York Evening World,* 15 Oct. 1889, 3; "The Obstructive Trio," *NYT,* 16 Oct. 1889, 1.

4. The editors have not found a finished version of this letter nor have they systematically examined all the newspapers to which Edison wanted it sent. The *New York Times* published his letter in substantially the same form on 16 October ("A Word from Mr. Edison," p. 2). The *Evening World* summarized and quoted from it amid a long story about the electrical commission's deliberations ("Grant Rebels," 16 Oct. 1889, 1). And the *New York World* summarized his remarks in an even longer article about the overhead wire issue generally, based on an interview conducted at the laboratory on 16 October ("The Modern Mage's Views," 20 Oct. 1889, Series 2, Box 27, WJH [*TAED* X098HC10]).

5. The *New York Sun,* one of the first successful penny newspapers, aimed for a working-class audience. Published and edited since 1868 by Charles A. Dana, the paper took an independent outlook often at odds with its past Democratic allegiance and Dana's personal commitment to Republican causes. *Ency. Am. Journ.,* s.vv. "Dana, Charles A." and "New York Sun."

6. Horace Greeley established the reform-minded *New York Tribune* in 1841 and ran it until his death in 1872. His assistant Whitelaw Reid then assumed editorial control and reliably steered the paper along Republican lines; personally, Reid was serving as U.S. minister to France during the 1889 Paris Exposition. *Ency. Am. Journ.,* s.v. "New York"; B. Duncan 1975, chaps. 5–6.

7. The *New York Times,* published since 1851, was at this time under the editorial control of George Jones, its surviving cofounder. Under his leadership, the paper gained fame for investigating Tammany Hall corruption and, with its endorsement of Grover Cleveland in the 1884 presidential election, for departing from its formerly reliable Republican editorial views. *Ency. Am. Journ.,* s.v. "The New York Times."

8. The *New York Star,* founded in 1867 by a rump group of *Sun* employees, struggled through a series of editors and owners (including railroad baron Collis Huntington about this time) until 1891. "History of a Newspaper," *The Newsman: A Journal for Newsdealers Publishers Booksellers and Kindred Trades* 8 (Feb. 1891): 8; Turner 1999, 179.

9. Albert Pulitzer, younger brother of the more famous Joseph Pulitzer, founded the one-cent *New York Morning Journal* in 1882. Lacking a consistent editorial outlook or loyalties, the *Journal* focused on scandal and gossip and was known as "the chambermaids' delight." Several years after Pulitzer sold it in 1895, the paper came into the hands of William Randolph Hearst. Brian 2001, 62; "Albert Pulitzer Dead," *New York Tribune,* 5 Oct. 1909, 2.

–3425–

To Jesse Lippincott

[Orange, October 17, 1889][1]

<Johnny get address>[2]
Jesse H Lippincott

Experimental machine finished & turned over to factory last night. Its a daisy[3]

Edison

ALS (telegram), NjWOE, DF (*TAED* D8962AAT).

1. John Randolph noted at the bottom of the page that he sent Edison's telegram at 11:43 a.m. on this date. A confirmation of its text was mailed the same day. TAE to Lippincott, 17 Oct. 1889, Lbk. 33:152 (*TAED* LB033152).

2. Randolph supplied Lippincott's address as 160 Broadway in New York City, the offices of the North American Phonograph Co.

3. The sparse information found by the editors about this prototype suggests some of its features were included in the text and drawings of a 2 November caveat (Doc. 3435) and that it closely resembled the machine Edison described in a letter to George Gouraud (Doc. 3440) soon after that. On or about 10 October, Edison hastily sketched what would become the machine's most distinctive feature: the drastically redesigned recorder/reproducer head (formerly called the spectacle) with an attached handle or "arm" for raising or lowering it from the cylinder. John Ott made both rough and more refined drawings of the recorder/reproducer the next day, and within a few days he also sketched a complete phonograph, though its features are not clearly discernible. N-88-03-15.2:65–79, Unbound Notes and Drawings (1889); all Lab. (NA023065, NS89ADB, NS89ADC, NS89ADD, NS89ADE).

According to later court testimony, the North American Phonograph Co. prepared a circular letter to its local affiliates this very day. It stated that as soon as Edison returned from Europe, the company alerted him to customers' complaints and urged him to simplify he phonograph:

> Mr. Edison at once realized the importance of this and immediately set to work to make such changes in the construction of the machine as he thought would result in accomplishing the desired end. We take pleasure in announcing to you that he has made radical changes in the instrument, and of such importance that we authorized the factory to change all machines now on hand into the new style, and for that purpose we are holding back orders for machines until about November 1st, when they have promised they will be able to make regular shipments of the new type of machines. [Testimony of James Andem, pp. 579–80, *New York Phonograph Co. v. National Phonograph Co.,* Lit. (*TAED* QP0100579)]

–3426–

From George Gouraud

London, 18th October, 1889.[a]

Dear Sir:—

Hand-Machines[b]

Your cable[1] says you do not make these, although I under stood you to say you did. In any case, I may state that the Graphophone people make the ones I explained to you, and I have just seen a gentleman who has one and uses it for dictating his letters while traveling in the train. He speaks of it in the highest terms. He also uses it when travelling for grapho-grams which he mails to his family. I certainly think you ought to have this form of a machine for the Phonograph[2]

Mailing-grams[b]

I hope you will make some of these on the plan of the Grapho-gram. They are using a very simple, and so far as it goes, a very satisfactory gram in a stiff paste-board box that carries it all right, and people are constantly coming here with them thinking they can find a Graphophone here upon which to hear them reproduced. Our grams break too easily in the mailing, besides the expense, although of course I am aware they are not intended for mailing purposes. Kindly write me with respect to the above, and whenever you adopt anything please make it somebody's business to send me a gram by every mail as it is quite the most effective thing we have to show. The only one I have received of the kind, soon got damaged in putting in and out of the box;[3] besides the method of closing the box was, as you yourself expressed the opinion, too troublesome to be practical. It would do well enough between Agents, but hardly between the public. At any rate you said you could easily simplify that and you no doubt will; but until you do make some thing better I wish you would send me one of these by <u>every mail</u>.[c] with some good talk on it.—[d]

Slipping-grams.[b]

All the last grams sent have been most unsatisfactory. They slip badly, and certainly warp with any provocation. Batchelor explains that those sent to me were "too fresh," and "not sufficiently seasoned."[4] If this was so, why were they sent? Please see that only the best is sent me in the future. Yours sincerely

G E Gouraud

TLS, NjWOE, DF (*TAED* D8959AFN). Letterhead of Edison House. [a]"London," preprinted. [b]Followed by dividing mark. [c]Underlined by hand. [d]"with some good talk on it.—" written by hand.

1. Gouraud referred to Edison's 12 October cable, confirmed by

letter two days later. Its second (and final) sentence read: "We do not make hand phonographs." TAE to Gouraud, 14 Oct. 1889, Lbk. 33:106 (*TAED* LB033106).

2. No phonograph counterpart to the portable graphophone was available in May 1890, when delegates to the first convention of local phonograph companies discussed the question of portability. Opinions were divided, with some representatives wary of how such machines might affect demand for instruments leased to hotels and other places frequented by travelers. One delegate predicted that the hand graphophone would not become popular because of its weight. James Clephane, by contrast, viewed the "commercial travellers' machine" as an effective form of advertising. Phonograph Convention 1890, 5, 20–21.

3. Gouraud received a mailing phonogram in early September "in splendid condition. It was a great success and has been repeated many times. It will now be shown as a curiosity. We shall be glad to have some more of them." Possibly it was one of the new type discussed in Doc. 3391 n. 9. Jonathan Young to Charles Batchelor, 10 Sept. 1889, DF (*TAED* D8959ADV).

4. Gouraud would recently have received a shipment of 2,250 blanks, and on 19 October, he addressed a long handwritten letter to Edison on the subject of cylinders that slipped, warped, and were not readily interchangeable. Edison apologized and explained that the problems arose from a different cause than the slipping Gouraud had noted in Doc. 3410: "we found before your complaints reached us, that one of our workmen had used a mandril of improper size in reaming a lot of grams a part of which went to you and caused the trouble." Hugh Hamilton had recently complained as well about incorrect diameters of the cylinders' bore. TAE to Gouraud, 26 Sept. 1889; Gouraud to TAE, 19 and 26 Oct. 1889; Hamilton to TAE, 12 Oct. 1889; all DF (*TAED* D8959AEU, D8959AFO, D8959AFR, D8959AFK); TAE to Gouraud, 29 Oct. and 23 Nov. 1889; Lbk. 33:312, 34:207 (*TAED* LB033312, LB034207).

–3427–

Alfred Tate to Nathaniel Smith[1]

[Orange,] Oct. 24, 89.

Dear Sir:—

Mr. Edison received your phonogram in good condition,[2] and at his request I am sending you by this mail, under another cover, copy of our "Inspector's Hand Book for the Phonograph," containing suggestions in regard to the operation of the instrument &c., &c.[3] By following the instructions contained in this little book you will be able to obtain the best results from the phonograph, and perhaps be able to do away with the hard scraping sound of which you complain in your phonogram.

Referring to your letter of 21st instant addressed to myself,[4] Mr. Edison is at present experimenting with the phonoplex, with the view of improving the system.[5] When he has concluded his experiments I will communicate with you, and I hope then to be able to overcome all the difficulties which you mention. Yours truly,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 33:227 (*TAED* LB033227).

1. A native of Southbridge, Mass., Nathaniel E. Smith (1855–1918) worked in New Haven, Conn., as chief train dispatcher for the New York, New Haven & Hartford Railroad. He had recently inquired about getting musical recordings, particularly those made at the laboratory by Ericsson Foote Bushnell, whom he knew in New Haven. Headstone photograph for Nathaniel Smith, Oak Ridge Cemetery, Southbridge, Mass., Find A Grave Memorial no. 93929548, online database accessed through Findagrave.com, 7 Mar. 2018; "Fraternal," *Railroad Telegrapher* 36 (Jan. 1919): 52; Tate to Smith, 20 Sept. 1889, Lbk. 32:367 (*TAED* LB032367); Smith to Tate, 21 Sept. 1889, DF (*TAED* D8955ADA).

2. The editors have not located Smith's phonogram; a typed transcription was made on or before 21 October, when a reply was sent. Smith said that the New Haven railroad had recently adopted the phonoplex telegraph on its New York division but could not get it to work all the way to Grand Central Depot because of induction from other wires. He asked that Edison reply by a recorded message that he might play in New Haven, and also inquired about the scratchiness of his own message, a common problem on recordings he made. Smith to TAE, n.d. [20 Oct. 1889?], DF (*TAED* D8905AHM).

3. This seventy-five page booklet contained instructions for unpacking, setting up, operating, and troubleshooting the phonograph and batteries. It also included a detailed parts list. Edison Phonograph Works, "Inspector's Handbook for the Phonograph," Aug. 1889, PPC (*TAED* CA025B).

4. The editors have not found this letter from Smith. In addition to the induction problems noted in his phonogram to Edison, Smith had complained to Tate in September about a "gradual weakness" in the phonoplex, presumably caused by attenuation of battery current. Smith to Tate, 21 Sept. 1889, DF (*TAED* D8955ADA).

5. Edison had been making and directing experiments to increase the operating length of phonoplex circuits for the benefit of western railroads. Part of Edison's work (according to Tate) was on a repeater that would give the phonoplex a "practically unlimited" range. William Logue to Samuel Insull, 14 Sept. 1889, DF (*TAED* D8966ACG1); Tate to Logue, 9 Oct. 1889; Tate to Harry Tuttle, 24 Oct. 1889; Lbk. 33:45, 239 (*TAED* LB033045, LB033239).

–3428– [Orange,] Oct. 26, 89.

To Werner von Siemens

Dear Sir:—

I take pleasure in complying with your request for information concerning the graphophone.[1]

This instrument is a modification of the phonograph. Apart from details of design, the only claim to originality and the only claim covering a broad principle embodied in the patents on the machine, is that of cutting a record upon a revolving surface such as wax by means of a knife or cutting tool. It is claimed by the promoters of the graphophone that the methods of recording sound vibrations described and illustrated in the various patents both domestic and foreign on the phonograph, anticipate only the process of indenting, or in other words, a recording surface broken only by the effect of sound waves upon a diaphragm carrying a stylus, as contra-distinguished from a method by which a revolving recording surface is continuously cut or ploughed by a knife or cutting tool attached to the centre of a diaphragm, and the sound waves recorded at the bottom of the furrow thus produced. As I have stated, the graphophone people claim originality in the latter method, and patents upon the same have been issued to them here and in a few foreign countries.

In the specifications of my British patent of 1878 on the phonograph, and in the Laboratory records of the early experiments which I conducted upon this machine, various methods of recording are described and illustrated in a way which clearly show that the idea of cutting a revolving surface before and when recording was not only anticipated but actually practised by myself, and reference is had to my experiments with waxes, paraffine and resin, and combinations of these, which, owing to the form and general construction of the machine at that time used, were displaced and preference given to a metallic surface, such as tinfoil.

In the issue of "LA NATURE," published by Tissandier, of Paris, under date May 3rd, 1879, is an article relative to a phonograph made by M. Lambrigot, in which he describes a method of replacing the point of the Edison phonograph by a blade of steel in the form of a knife and cutting a record in stearine wax—clearly an anticipation of the method which the graphophone people claim as original in their instrument. This is the fundamental patent on their machine, and it is worthless. The authorities of the United States Patent Office were unaware of the existence of the Lambrigot article and machine when they granted the claim, and fail also to review my British specifications.[2] The remaining graphophone patents cover the details of their imperfectly constructed machine.

The patents which I have myself taken out upon the phonograph throughout the world during the past three years are fundamental in character, for the reason that they control absolutely all methods by which perfect articulation and a faithful reproduction of the more delicate sounds can be attained. Since my return from Europe I have made further improvement upon the phonograph by which all of the adjustments and one-half of the 'spectacle' are done away with, and the instrument rendered automatic throughout,[3] while maintaining all of its former capabilities with which you became partially familiar during my very pleasant visit with you in Berlin.

With respect to the commercial status of the graphophone, the rights to the instrument in the United States and Canada are vested in the American Graphophone Company. This Company some time ago effected an arrangement whereby Mr. Jesse H. Lippincott became its sole licensee. Mr. Lippincott, subsequent to the arrangement mentioned purchased from myself and my associates the whole of the capital stock of the Edison Phonograph Company (which controls the phonograph in Canada and the United States), I retaining the manufacturing rights, and thereby became possessed of the right to merchandize both instruments, the graphophone and the phonograph, in the territory named above, the various agreements providing amongst other things that there should be no discrimination in the matter of sale—this is, that both machines should be offered to the public without favor to either, so that the public should become the sole arbiter of the respective merits of the two instruments. This course has been pursued for nearly a year by the thirty odd sub-companies which have been formed in the various States.[4] A few hundred graphophones were placed in the hands of the public and served but to demonstrate the utter impracticability of the machine as a commercial instrument. In its operation the hissing sounds represented by the letter "S" and the explodents[5] are entirely lost, the result being an imperfect and incomplete reproduction of articulation, and the consequent mutilation of any record entrusted to this machine. The annoyance and inconvenience this caused was so great that customers of the different Companies have everywhere returned their graphophones and replaced them with phonographs. This is an accurate statement of facts which goes farther than anything else to prove the uselessness of the graphophone for other than purely speculative purposes.

Some few months since a New York Syndicate arranged for the control of the graphophone in Foreign countries.[6] This movement was suggested and stimulated by the reports which came from abroad of the great public interest which had been excited in the phonograph, a circumstance which favored speculation. Representatives of this graphophone syndicate were sent abroad and by threats and misrepresentation attempted to force an alliance with the phonograph. This I would not permit, first because the graphophone itself represents no value as a commercial article, and secondly, because I have no desire to assist a purely speculative enterprise by lending whatever aid my name and connection might bring. Failing thus to secure my co-operation, this syndicate will without doubt attempt to draw money from the public abroad. I know that they are continuing their systematic misrepresentation with respect to their patents and the commercial value of their instrument as developed in this country, which however deplorable is perhaps not surprising, as a statement of facts approaching accuracy would mean the failure of their speculation, which will succeed to the same extent as they are successful in deceiving the public.[7] Yours very truly,

Thomas A Edison

TLS (letterpress copy), NjWOE, Lbk. 33:306 (*TAED* LB033306).

1. Siemens was considering joining a group of investors to manufacture and sell the phonograph in Germany, where graphophone representatives were also seeking capital (see Doc. 3429). Adelbert Wangemann cabled Edison from Berlin on 18 October (in part) that "siemens desires letter explaining fully your stand towards graphophone to contradict rumors." Wangemann had earlier prepared a display of Edison products at the ground-floor exhibition space of Siemens & Halske in Berlin, where Edison made an appearance in September. According to the editor of Berlin's *National-Zeitung,* Wangemann had turned the phonograph into "'the' event of the season" by showing it "continually from morning to night to Emperors, Kings, generals, bankers, professors—in fact to every body amounting to anything in public and official life" (see Doc. 3392 [headnote]; Wangemann to TAE, 18 Oct. 1889; Max Horwitz to TAE, 14 Oct. 1889; both DF (*TAED* D8958AAM, D8958AAL]). Wangemann received some support from Siemens & Halske to make a recording of Otto von Bismarck ("Bismarck Phonograms," *NYT,* 3 Nov. 1889, 16; Dickson and Dickson 1894a, 152–53).

2. In response to queries from Gouraud's patent agent (G. G. M. Hardingham), Edison's attorneys looked into whether the U.S. Patent Office had referred to Jacques Paul Lambrigot's 1879 article during the examination of applications by Edison and by Chichester Bell and Charles Tainter. Dyer & Seely determined that the article had not come up regarding Edison's U.S. Patents 393,967 and 393,968 or Bell and Tainter's U.S. Patent 341,214. Gouraud to TAE, 12 Oct. 1889; Dyer & Seely to Alfred Tate, 29 Oct. 1889; both DF (*TAED* D8954ADJ, D8954ADI).

3. See Doc. 3440.

4. The proceedings of the first convention of local phonograph companies, held in May 1890, listed thirty-two such "sub-companies" in attendance. Phonograph Convention 1890, 3–6.

5. That is, the plosive consonants, formed by interrupting and then suddenly releasing the flow of air. *OED,* s.vv. "explodent," "plosive."

6. Edison probably meant the International Graphophone Co., incorporated in New York on 26 August 1889. By early 1890, syndicate members included Darius Ogden Mills, Jesse Seligman, H. G. Marquand, H. H. Cook, W. Martin Grinnell, and J. M. Waterbury, all from New York; and Thomas Cochran, William Wood, George McFadden, Thomas Wanamaker, and Thomas Dolan, all from Philadelphia. John Wanamaker was also involved in some fashion. "Special Correspondence. The Telephone," *Electrical World* 14 (7 Sept. 1889): 175; "Miscellaneous Notes: Controlling the Phonograph and Graphophone," *Electrical World* 15 (22 Feb. 1890): 157; Phonograph Convention 1890, 209.

7. Siemens replied in December that he was "perfectly enlightened" with this account of the graphophone situation and had already used it on Edison's behalf. (He also sent similarly appreciative remarks to Henry Villard, who copied and forwarded them to Edison; see Doc. 3454.) Siemens acknowledged a phonograph delivered to him through Hermann von Helmholtz, which was then sent to Stuttgart for demonstrations. He additionally pointed out that, at a recent meeting of the Berlin Elektrotechnischer Verein (Electrotechnical Association), a phonograph had performed better than a Berliner gramophone. Siemens to TAE, 3 Dec. 1889, DF (*TAED* D8905AJA).

–3429–

From George Gouraud

LONDON, 26th October, 1889.[a]

Dear Edison:—

I beg to confirm my cable of yesterday:—[1]

"Noside New-York,[2] After three weeks negotiations powerful Syndicate Berlin Bankers probably including Siemens offer immediate cash bonus Fifty Thousand pounds for half cash and shares they get for us from German public Companies they will form on terms of your approval. I advise accepting. Committee leave tomorrow. Answer quickly"
and acknowledge receipt of yours in reply:—

"Gouraud Norwood, Is it for Germany only. Is Siemens certainly in it. Is Grapho mixed with it."
to which I replied to-day as follows:— "Only Germany. No Grapho. Siemens certain if can make for German Company only on terms of your approval. Don't hesitate."[3]

It is not intended that the contract between us and the Syndicate shall be in any way public; and it may be that the Syndicate will be registered in England in order to avoid making known in Germany the members of it, or the conditions of their participation in the profits to be derived from the formation of a German Company.

The effect of this arrangement will be that we will receive £50,000 as a bonus for giving the members of the Syndicate one half of what we subsequently receive from the German Company or Companies which we may form with their assistance. Their idea is to bring out a large German Company which would form subsidiary Companies on the American plan. By adopting this plan it will be unnecessary to disclose under the German law, as would otherwise be the case, the participation they receive from us in consideration of their assistance and the £50,000 they pay us for that participation. This method they prefer because of some objectionable features in the new German law regarding public Companies.[4]

I am told that all the members of the proposed Syndicate are wealthy Bankers. Siemens at first refused to have anything to do with it, and tried to prevent the formation of the Combination. He told Mr Quellmalz[5]—the Dresden Banker who is getting up the Syndicate, and who was one of the earliest to communicate with you from Dresden, and who is a most energetic and able man—that he would join the Syndicate if he could have the manufacturing of the machines for the public Company; and Quellmalz tells me that Siemen's Lawyer[6] attended one of the meetings of the Syndicate and intimated to him in very plain terms that if Siemens & Halske did not have the contract for the manufacturing of the machines that we should have their opposition. The Syndicate are anxious to have Siemens join, and see no objection to his firm manufacturing for the German Company on terms acceptable to them and ourselves, but the intention is to complete the Syndicate with or without Siemens, and having completed the Syndicate the question of manufacturing can then be settled. You are aware that the Phonographs have to be made in Germany after 3 years, so that to keep the first Patents alive manufacturing will have to begin next year.

The Graphophone people have been in Berlin making a good deal of stir, and it is with no little difficulty that we have succeeded in making this combination in spite of them. They are showing a very good instrument apparently, and talk about their low price of cost of manufacture and consequent low price to the public.

I am anxious to close this business promptly and trust there will be no delay in your reply. The Committee are returning to Berlin to-night taking with them a sample of each of our machines. I shall follow them early next week and close the business while it is hot.

I tried to make the cash larger, but the negotiations finally resolved themselves into the amount named or nothing, and I regard it as a very good transaction everything considered. If we did not close with these people it would be difficult for us, if not impossible, to get on with any fresh group in face of their having abandoned it.

My idea is that, until arrangements for manufacturing are completed satisfactory to yourself and after we have been paid our £50,000, the Phonographs shall be furnished by you on the same terms as you furnish them to the American Company, viz:—cost price, labor and material and 20 per cent. Yours sincerely,

G. E. Gouraud

TLS, NjWOE, DF (*TAED* D8959AFS). Letterhead of Edison House. [a]"London," preprinted.

1. This message and the others quoted below were confirmed in a letter at the end of the month. TAE to Gouraud, 31 October 1889, Lbk. 33:339 (*TAED* LB033339).

2. "Noside New York" (or sometimes simply "Noside," the backward spelling of "Edison") was a coded cable address for Edison. *TAEB* 6 App. 4.

3. Edison, in turn, drafted a reply stating, in part, that he would "have no objection" subject to these conditions:

> If Siemens manufacture, and Company agree to adopt American standard, make no changes for ten years without my approval, & you deduct no Expenses from any receipts as mine Exceeds yours twice over with factory investment in addition and I get two fifths of all receipts from transaction no graphone, Co called Phonograph Co— sell in no other country and satisfactory contract drawn. [TAE to Gouraud (draft), 31 Oct. 1889, DF (*TAED* D8959AFU)]

Alfred Tate cleaned up Edison's draft (writing on the reverse) and cabled the message on 27 October; the text was confirmed in a letter a few days later (TAE to Gouraud, 31 Oct. 1889, Lbk. 33:339 [*TAED* LB033339]).

4. That is, the revised German Stock Corporation Law of 1884. Kayser 1884, passim; Guinnane, 2018, 191–94, 200, 203; Fohlin 2005, 259–60; Fohlin 2007, 40–41; Schuster 1900, 1.

5. Emil Quellmalz (1843–1906) likely began his banking career in Leipzig, the city of his birth. He also worked in Lübeck before settling in Dresden, where he apparently gained prominence with the firm of A. L. Mende. With Th. H. Adler, he founded the Dresden firm of Quellmalz & Adler in 1874. Quellmalz and Adler were also co-directors of the Dresden-based Sächsische Bankgesellschaft, which two years earlier had asked Edison about acquiring rights to his European phonograph patents. Schiffbautechnische Gesellschaft 1907, 72–73; *Jahrbuch der Berliner Börse* 1885, 120; *Jahrbuch der Berliner Börse* 1895, 206; Sächsische Bankgesellschaft to TAE, 25 Nov. 1887, DF (*TAED* D8751AAG).

6. Not identified.

–3430–

Julius Block to Charles Batchelor

Moscow October 16/28 1889[1a]

My dear Sir:—

I am afraid I begin to annoy you, but, this time, it will surely interest you to hear of the grand success of my first private demonstration to our celebrated composer, who asked me[b] to bring the professors of the "conservatoire" (academy of Music, of the Russian Imperial Society of Music)[2] & its director[3] with him. Tschaikoffski,[4] as well as his friends were all amazed & did not find words to express their astonishment at the great wonder. The phonograph worked wonderfully well with the branch tube, constructed as per your device & with a Grenet[c] cell, which I filled with a solution prepared by myself as follows:

8 parts water to 1½ parts natr: bichromic: & 3.6 parts sulphur: acid, poured into the former solution in a very fine stream, whilst mixing the liquid all the time. Then, after it has cooled down, it is poured into the cell. This cell worked successfully for a little over 2 hours, but worked stronger, than the former solution. It just gave ample time to reproduce the principal splendid phonograms, you so kindly gave me & to make a recording trial, which came out as unsuccessful as my former attempts with the piano & at the end, through overexcitement on my part closed with a most disastrous finale for both the phonograph & myself. I am now quite heartbroken & apply to you for help. The glass of the diaphragm broke, whilst the reproducing ball pierced the cylinder, which also broke. It was due to the diaphragm holder falling back on

the cylinder. My most earnest request is: please send me at least 2 complete recording[b] diaphragms & an extra 2 glasses for the reproducer & instructions how to fix the reproducing point to the glass, which, I believe I will be able to do with the necessary instructions. I purposely ask for several glasses & diaphragms, because I at once put the "extra" diaphragm in, &, to my great grief, it is not by far so sensitive & powerful as the former. This accident has made me actually sick & I cant calm down yet. It has affected me the more, because I succeeded so wonderfully well.

The second trouble is of as great importance as the first one for another reason: I have made several attempts to record speeches & music. The talking comes out ever so much better, than music, but has not the true pitch & clearness as it should have, so that the voice, though heard well, cannot be recognized.

Even this would not be so great a drawback, if the ENTIRE cylinder would work alike, but now comes a most CURIOUS fact: Out of 10–15 experiments made, there was not a single one, where the cylinder recorded the talking at a uniform speed from beginning to end, though the governor worked properly & the battery was in good shape; I am positive of that, because I watched the number of revolutions of the cylinder & it invariably occurs, that, after the cylinder reproduces the first few words & sometimes phrases quite uniformly & distinctly, it then commences to rattle off the middle part at a terrific speed, [also?][d] taking up[b] almost the normal talk at the end. With musical performances this is still more striking: At the beginning, I can hear pretty well, what I played; formerly after 30 or 35 now at 20 (on the scale)[5] the harmony suddenly ceases & a terrific conglomeration of sounds, the piece in a most mutilated state, comes to the ears of the listener. Sometimes it is possible to decipher the melody played at prestissimo, but generally it sounds as if a dozen acrobats whirl their indian clubs over the keys, thereby smashing almost every string existing on the piano. Dickens' expression "tuning like fifty stomachaches"[6] would suit here pretty well. The cause of this strange action is quite a mystery to me 1) Because putting in any of the musical cylinders you gave me, the tempo is always quite uniform & there has not been a single instance of such epileptic fits. 2) Because I cannot find any change in the speed, during the working of the recorder, nor could there be, where the governor & battery are all right. What strikes me most is the absolute constancy of this occurrence & I am absolutely unable to explain it. I do trust you will be able to give a clue to this; I do not find any explanation pertaining to this in your hand book. I would not write such a lot about this if it were not of very great importance for me to get this trouble remedied without any delay. Fact is Tschaikowski has promised to persuade Rubenstein[7] to permit me take up a few phonograms of his farewell concert, which is he is going to give here during the celebration of his 50 years anniversary[b] service ~~celebrations~~. This will be his last appearance & you may imagine how the whole world will be grateful to the great Edison for giving the world the possibility of hearing Rubenstein long after his last performance. I learn, if newspapers reports are correct, that Mr. Edison has already solved the problem he spoke to me about, of manifolding the phonograms. If that is the case, you will do a great deed by helping me to get all square for that great event & I now already express my entire willingness to place the exploitation of the future manifolding into the hands of Mr. Edison & leave it up to him to direct me how to act in this case & how to manage it.

I have arranged an album, which is to serve the purpose of collecting autographs of all prominent men,[8] beginning with the czar.[9] Tschaikowski & the professors have already written down their impression received from listening to this wonderful instrument &, no doubts, it will give Mr. Edison[c] some pleasure to read these expressions, when fully collected.

And now, I do not want to take up more of your valuable time & would ask you to write me to whom I may address my applications for advice in urgent cases, so as to avoid bothering you always???[10]

You will understand, that I am very anxious indeed to receive prompt & minute replies, since I will not spare any amounts necessary to bring my scheme to a successful end, but this is a matter of impossibility without your assistance.

You cannot well understand what exceptional interest I take in this matter & I gladly put my heart & soul into this affair, which [----][d] I consider a great honor &, with special pride, I am glad to sacrifice a good deal of business in order to bring my aims to a successful end, viz: to demonstrate the phonograph to its very best advantage to all Russia, whatever the future result in regard to the commercial part may be, since I cannot know who Col Gouraud will appoint as representative. What I am aiming at is, to close my successful demonstrations <u>before</u> the ground is tampered by any inexperienced man & so install "all the glory, that is due to the great Edison" as Tschaikowski expressed himself.

With my warmest wishes to you & deepest esteem to Mr. Edison yours very truly

J. H. Block[11]

TLS, NjWOE, DF (*TAED* D8958AAQ). Letterhead of J. Block, importer of machinery and hardware. [a]"*Moscow*" and "188" preprinted. [b]Interlined above by hand. [c]Obscured overwritten text. [d]Illegibly interlined above. [e]"Mr. Edison" typed below the paragraph and circled, with a line indicating its intended insertion point.

1. The two dates represent the "Old Style" Julian calendar and the "New Style" Gregorian calendar. Western countries adopted the Gregorian calendar by the end of the eighteenth century, but Russia did not do so until 1918. In the nineteenth century, the old calendar was twelve days behind the new one. Leatherbarrow and Offord 2010, xv.

2. The Russian Musical Society was founded in 1859 by Anton Rubinstein, Matvei Vielgorsky, Dmitry Stasov, and Grand Duchess Elena Pavlovna. It opened conservatories in St. Petersburg in 1862 and Moscow in 1866, as well as a number of secondary music schools in other areas, all aimed at encouraging musical professionalism. It became the Imperial Russian Musical Society in 1873 after it began receiving some funding from the government. Tomoff 2006, 13 n. 1; Sargeant 2011, 55.

3. That is, composer and teacher Sergey Ivanovich Taneyev (1856–1915). Taneyev was a close friend of Tchaikovsky, under whom he studied at the Moscow Conservatory; when Tchaikovsky resigned in 1878, Taneyev took over his classes in harmony and orchestration. He became professor of piano in 1881 and served as the conservatory's director from 1885 to 1889. *GMO,* s.v. "Taneyev, Sergey Ivanovich."

4. Russian composer Pyotr Il'yich Tchaikovsky (1840–1893) entered the Russian Musical Society's conservatory in St. Petersburg in 1862. He studied with Anton Rubinstein and graduated in 1865. He took a position as music theory teacher at the new Moscow Conservatory of the Russian Musical Society, where his compositions and public performances won him growing popularity. By the mid-1880s he had emerged as the most important figure in Russian music, his works performed in Germany, the United States, and at the 1878 Paris International Exhibition. *GMO,* s.v. "Tchaikovsky, Pyotr Il'yich."

Block had only recently made Tchaikovsky's acquaintance. In his memoir, Block says they met in the fall of 1889, when Tchaikovsky made a visit to his shop. Block asked for his autograph, which Tchaikovsky sent later along with a handwritten excerpt from his "First Quartet." In his letter of thanks, Block offered to show the composer Edison's phonograph, which he had just brought to Russia, though he had wished to make his first demonstration to the Czar before introducing it to the public. Tchaikovsky, however, arranged with Block to allow him and his friend Sergey Taneyev to secretly hear the phonograph before anyone else in Russia. Immediately after, Tchiakovsky recorded his impression in French in Block's autograph book, translated as "The Phonograph is certainly the most surprising, the most beautiful & the most interesting among all inventions that circumscribe the 19-th century." Block [1965], 26–27; Block to TAE, 22 Nov. 1922, DF (*TAED* D8958ABI).

5. That is, the ruled guide on the phonograph to indicate the horizontal position of the recorder or receiver on the cylinder.

6. Block closely paraphrased from *A Christmas Carol:* "In came a fiddler with a music-book, and went up to the lofty desk, and made an orchestra of it, and tuned like fifty stomach-aches." Dickens 1868, 21.

7. Russian composer, conductor, and virtuoso pianist Anton Grigor'yevich Rubinstein (1829–1894) helped to found the Russian Musical Society. He also established the St. Petersburg Conservatory in 1862 and served as its director until 1867. He returned as director in 1887 and celebrated his jubilee, to which Block alludes, two years later. As a composer, however, Rubinstein's popularity was waning by the 1880s, giving way to his one-time pupil Tchaikovsky (*GMO,* s.v. "Rubinstein Rubinshteyn, Anton Grigor'yevich [opera])." Rubinstein never did record on the phonograph, saying, according to Block, that "he did not want to have his mistakes immortalized." The one time he relented and Block set up the machine at his piano, the battery failed and they did not make a recording (Block 1965, 21–22).

8. Block's autograph album is at the Rodgers and Hammerstein Archives of Recorded Sound at the New York Public Library and is available digitally at digitalcollections.nypl.org/collections/edison-album.

9. Czar Alexander III (1845–1894) ruled Russia from 1881 to 1894 *(Ency. Brit. Online,* s.v. Alexander III). Alexander first saw the phonograph in October in Berlin, where Adelbert Wangemann demonstrated it to him and his family, likely on 12 October, in the salon at the Russian Embassy. According to a press report, Alexander did not speak into the machine but listened to a Strauss waltz. He merely asked, "What is the motive power," to which Wangemann answered, "A small dynamo." ("Czar and Phonograph," *New York Herald,* 19 Oct. 1889, Clippings [*TAED* SC89164C]). After returning from Berlin, the Czar and his family took up residence in the royal palace at Gatchino, where Block demonstrated the phonograph to him and his family. On the appointed Sunday (10 November), Block wrapped the phonograph, battery, and a box of recorded cylinders in "heavy covers and rugs" to protect them from a blizzard and, with an office clerk as assistant, set out from St. Petersburg by train for Gatchino. Some forty persons, including the Czar and Czarina, were in attendance in the palace dining room. After explaining how the instrument worked, Block played some recordings of American and Russian music, as well as of "sounds audible at the works in Edison's American laboratories." At one point the Czar sat on the floor with his two little nephews, taking them on his knees and holding the ear tubes to each child. Alexander again declined to speak into the phonograph himself and handed the speaking tube to the Czarina, who "appeared embarrassed, and after much hesitation spoke into the receiver" (in French), inviting one of the dignitaries present to speak, who then recorded a longer message in Russian. The reproduction of these speeches, Block recalled, "created a tremendous sensation." The Czar, exhibiting much more interest than he had in Berlin, asked if he could purchase a phonograph (Block 1965, 13, 15–16; see also Doc.

3456). The next day, Block cabled Edison from St. Petersburg: "Upon Czars invitation introduced your creation surprise admiration Full paralization" (Block to TAE, 11 Nov. 1889, DF [*TAED* D8958AAT]).

10. On 5 November, Batchelor answered this letter and a previous one from Block. He enclosed a list of items sent separately by express, including a dozen musical recordings, 150 blank cylinders, two recorders, two reproducers, battery supplies, and three main shafts, presumably to replace one Block had accidentally damaged. He could not, however, meet Block's request for a very fine (200 to the inch) screw thread for Tchaikovsky to use in experimenting with the phonograph for composition. Referring to Block's hope of recording such luminaries as Antonin Dvořák, Charles Gounod, and Camille Saint-Saëns in Moscow, Batchelor sent back a check Block had sent because "If you get good results & exhibit it to the persons named successfully I am sure Mr E. will feel amply repaid for what little trouble we have had." Block to Batchelor, 19 Oct. 1889, DF (*TAED* D8958AAN); Batchelor to Block, 5 Nov. 1889, Lbk. 33:409 (*TAED* LB033409).

11. Julius H. Block (1858–1934), a British subject, was born in South Africa and received his early education in St. Petersburg, Russia, where his father was a sales representative for American machinery companies. At fifteen, Block was sent to London and then to New York for business and technical training. His father afterward posted him to St. Petersburg to open a branch of the business there. His shop in St. Petersburg showcased the latest American inventions (he reportedly introduced the bicycle) and was frequented by members of the nobility. Block spent five years in St. Petersburg before being recalled to Moscow to attend to the company's burgeoning business there. In 1888, he and partners took over the business, which from then on was known as "J. Block, importers of machinery, hardware, and other items." In Moscow, Block became well acquainted with the intelligentsia and with musicians connected to the Moscow Conservatory. An amateur pianist himself, Block frequently attended musical performances. Between 1889 and 1898, he amassed a large collection of recorded cylinders of musicians from Moscow and Berlin—including Sergey Taneyev, Anton Arensky, and Josef Hofmann. He also recorded the voices of Tchaikovsky, Rubinstein, and Leo Tolstoy. Block moved to Berlin, where his business had a branch, in 1899. After World War I, he divided the recording collection among museums in Warsaw, Berlin, and Bern. The cylinders deposited in Warsaw and Berlin were thought to have been destroyed in World War II but were rediscovered in the late twentieth century in the archive of the Institute of Russian Literature. Block 1965, 1–4 and Introduction; "Classical Ghosts, Audible Once Again," *NYT,* 26 Oct. 2008, AR1.

Block made a ten-day trip to the United States in July 1889, but Edison was too busy with preparations for the Paris Exposition to see him. Undeterred, Block obtained a letter of introduction from Charles Cheever and, after making a second written request of Edison, apparently arrived at the laboratory uninvited with the letter of introduction and simply asked to see Charles Batchelor. While Batchelor was showing him around, they encountered Edison, who took Block into the library for a private discussion. Once Block made clear he was in a position to introduce the phonograph to the Czar and the learned societies of Russia, Edison took him to the phonograph room and played a few recordings. Since Block was to sail the next day, he spent the rest of the day at the laboratory receiving instruction. Edison himself chose the recordings to send to Russia and oversaw the packing of the phonograph, battery, and the cylinders for shipment, "smoking the while," recalled Block, "cigar after cigar, and chatting with the workmen." Block 1965, 6–9; Block to Batchelor, 15 July 1889, DF (*TAED* D8958AAB).

–3431–

To Henry Villard

[Orange, October 29, 1889?][1]

Friend Villard

Was talking with Local street car Supt[2] today who has just returned from Street Car Convention at Minneapolis—[3] He says general opinion is that Thompson Houston is far superior to Sprague[4] also that Richmond Road[5] given Sprague Co very bad reputation,[6] and 3rdly they are all down on overhead wire system, 4thly Electric System increased traffic 33 per cent on majority roads & if it made no saving this 33 pct would warrant change Yours,

Edison

ALS, NjWOE, Lbk. 33:297 (*TAED* LB033297).

1. The conjecture of this date is based on the letter having been copied into Edison's letterpress book amid others of 29 October. The book, however, was not kept in strict chronological order.

2. Originally from York, Pa., Francis M. Eppley (1845?–1913) was president of the Orange Crosstown and Bloomfield Railway. Edison relied upon the company's routes and equipment for testing his electric traction system. Obituary, *NYT,* 18 Oct. 1913, 13; TAE to Eppley, 6 May 1891, Lbk. 49:249 (*TAED* LB049249); American Street-Railway Association 1888–89, list of officers, [viii]; see Doc. 3457.

3. The American Street Railway Association held its eighth annual meeting in Minneapolis on 16–17 October. American Street-Railway Association 1888–89, i.

4. In early 1888, the Thomson-Houston Electric Co. purchased the electric railway patents of the Van Depoele Electric Mfg. Co., as well as the inventive services of its namesake electrician. The patents and the company's own innovations, especially a reduction of destructive sparking at the motor commutators, made Thomson-Houston a formidable competitor to the Sprague Electric Railway & Motor Co. (SERM). It was operating at least two lines by this time (in Lynn, Mass., and the Boston suburb of Cambridge) and had received orders for several more. Dalzell 2010, 95; "Purchase of the Van Depoele Motor Business by the Thomson-Houston Co.," *Western Electrician* 2 (24 Mar. 1888): 145; Passer 1972 [1953], 249–53.

5. The Richmond Union Passenger Railway, formed by New York investors in 1887, hosted Frank Sprague's pioneering electric traction installation beginning in spring 1888. Dalzell 2010, chap. 2.

6. The Sprague Electric Railway & Motor Co. had recently complained to Henry Villard about poor workmanship in the armatures of motors made by the Edison Machine Works. As part of his investigation, Villard asked Edison to assess whether the problems might stem from the motor's design. Edison blamed a recent change in the field magnets so that on starting "the whole of the current comes to the armature like a cannon ball," burning out the windings. SERM had also complained about manufacturing quality six months earlier, when Frank Sprague personally enumerated a number of defects in new motors. The company held that manufacturing errors over and above what they would expect from doing the work themselves amounted to an unknown but "considerable" sum of money. Villard to TAE, 16 Oct. 1889; TAE to Villard, n.d. [c. 18 Oct. 1889]; both DF (*TAED* D8938ABP, D8944AAN); TAE to Villard, 18 Oct. 1889, Lbk. 33:174A (*TAED* LB033174A); Sprague to Edward Johnson, 22 Apr. and 18 Nov. 1889, both Sprague (*TAED* X120CAR, X120CAS).

–3432–

To Jacob Herrick

[Orange,] Oct. 30, 1889.

Dear Sir:—

In reference to the attached correspondence[1] relative to the alternating system of Mr. Elmer A. Sperry,[2] my opinion is that what the Edison General Electric Company requires, is an alternating system which will follow as closely as possible the model of the Westinghouse system.[3] The policy of our Company is to offer to the public alternating apparatus so like the Westinghouse in every respect that they cannot deceive the public by referring to the points of difference in our system as weaknesses and the basis and cause of our condemnation of that method of electric lighting. In other words, if our apparatus differs materially from the Westinghouse, it will simply mean competition between two alternating systems; whereas if we offer practically the same system as the Westinghouse people, our condemnation of our own apparatus would carry with it condemnation of theirs, for we are, of course, agreed that the Edison Company has no desire, and no intention of actually selling alternating apparatus for electric lighting, if they can possibly avoid it[a] Very truly yours,

Thomas A Edison T[ate]

TL (letterpress copy), NjWOE, Lbk. 33:319 (*TAED* LB033319). Signed for Edison by Alfred Tate. [a]"if they can possibly avoid it" written by hand.

1. The editors have not found the attachments, which Herrick sent out of a sense of "duty." Probably they concerned an agreement negotiated in Edison's absence by Herrick, Samuel Insull, and Harry Ward Leonard for the United Edison Manufacturing Co. to acquire manufacturing and sales rights to the arc lighting system of Elmer Sperry. The urgency for making a deal while Edison was abroad was, according to Sherburne Eaton, due partly to fears that the Western Electric Manufacturing Co., a growing competitor in incandescent lighting, might soon acquire the Sperry Electric Co. (Herrick to TAE, 1 Nov. 1889; Eaton to TAE, 18 Sept. 1889; both DF [*TAED* D8943AAE, D8905AGC]). In addition, the recent semi-annual convention of Edison illuminating companies had aired some unease about competitive deficiencies in the Edison system. A resolution calling attention to the lack of a high-voltage distribution system and a good arc light (especially one adapted to the three-wire plan) prompted William Jenks to deliver a lengthy prepared statement on the various schemes being pursued by the Edison General Electric Co., including arc lights and mixed arc and incandescent systems. Notable on his list was the concession that transformers (alternating or direct current) might be used with high-voltage distribution in limited circumstances. Herrick promised that the company was taking immediate steps to allow its agents to meet all requests by potential customers ("Convention of the Edison Illuminating Companies," *Western Electrician* 5 [24 Aug. 1889]: 111–14).

2. Elmer Ambrose Sperry (1860–1930) developed a complete system of arc lighting in the early 1880s. With a dynamo, regulator, lamps, and the ability to incorporate incandescent lamps, the system enjoyed quick commercial success in and around Chicago, where the inventor relocated from Cortland, N.Y. As the chief electrician for his company (the Sperry Electric Light, Motor, and Car Brake Co.), Sperry gained valuable experience in the manufacture and installation of lighting equipment. The enterprise failed, however, and was reorganized in 1887 as the Sperry Electric Co., whose chief assets were the arc light patents. Sperry was not closely involved with the new concern, his interests by that time having turned from lighting to power machinery, especially for underground mining, leading him to consider the application of alternating current to motors. *ANB,* s.v. "Sperry, Elmer Ambrose"; Hughes 1971, 19–33, 40–44, 55–61; Hunsaker 1954, 224–25; Doc. 3103 n. 2; Sperry 1890, 112–13.

3. Cf. Doc. 3435.

–3433–

From Jesse Lippincott

New York, Oct. 30th, 1889.[a]

Dear Mr. Edison,

After leaving the Works yesterday, I had quite an extended talk with the two gentlemen from Chicago[1] and with Mr. Benson from Omaha.[2] Their opinion is that unless we have a start and stop movement, different from the one now contemplated, that we will make a great mistake. In talking with Mr. Easton[3] of the Columbia Company[4] on last Monday, he was of the same opinion. I am also in receipt of a letter from the Pittsburgh Company,[5] which is very emphatic in the same direction. These people are brought in daily contact with typewriters and other practical users of the machines. They want the motion in starting or stopping a machine to be similar to that made by the typewriter in touching the keys. They say that typewriters, who copy for so much a folio, find fault with any, even slight, impediment in doing their work rapidly. If this movement could be arranged by two keys, it would meet all criticism.[6]

You may look upon this as a very small or insignificant matter but really the testimony we get from all quarters is so unanimous as to the advisability of using a suitable device, that we would be going greatly against our own interests to not recognize it.[7]

We are to have a meeting of seven of the near by managers at our office next Monday. I should like very much to be able to show them the complete machine on that day. With the start and stop movement satisfactory and the cylinder the length of the mandrel and a single record cylinder for mailing, my conviction is that the graphophone will be practically shelved.[8] Very truly yours,

Jesse H. Lippincott.

TLS, NjWOE, DF (*TAED* D8962AAW). Letterhead of North American Phonograph Co.; Jesse Lippincott, sole licensee of American Graphophone Co. [a]"New York," and "188" preprinted.

1. Not identified.

2. Erastus A. Benson (1854?–1932) was a real estate dealer in Omaha, Neb., who was already involved with the phonograph business in that region when Charles Cheever gave him a letter of introduction to Edison in March 1889. In 1890, he was promoting an adaption of the nickel-in-the-slot machine for multiple paying customers; two years later, he negotiated a small share of Edison's profits from exhibiting motion picture devices at the Columbian Exposition in Chicago. He later organized the International Novelty Co., based in Omaha, for the sale of motion picture machines. "Edison Associate Dies," *Nebraska State Journal* [Lincoln], 11 Feb. 1932, 12; "The Central Nebraska Phonograph Company," *Nebraska State Journal* [Lincoln], 3 Oct. 1889, 8; Cheever to TAE, 26 Mar. 1889; Benson circular letter, 24 Oct. 1890; Benson agreement with Alfred Tate and Thomas Lombard, 1 Nov. 1892; all DF (*TAED* D8963AAH, D9052AAO, D9335AAI).

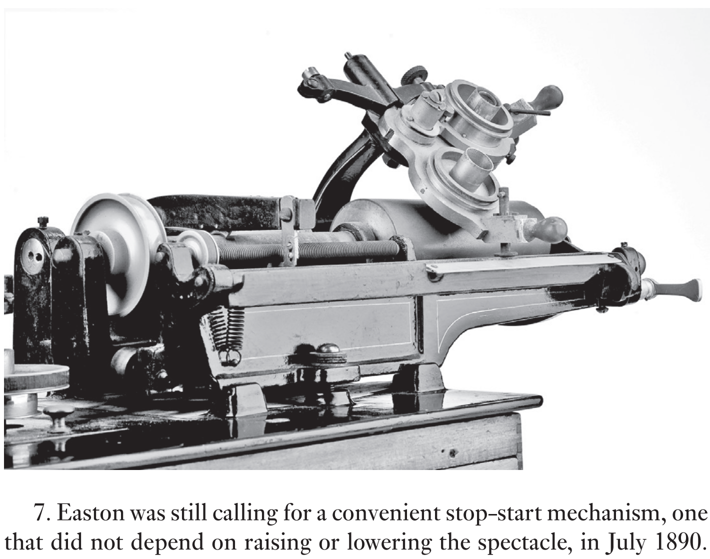
3. Edward Denison Easton (1856–1915) from Gloucester, Mass., graduated from Georgetown University and grew interested in sound recording while working as a court reporter in Washington, D.C. He became the founding general manager of the American Graphophone Co. in 1887; the next year, he co-founded and became president of the

Columbia Phonograph Co. *ERS,* s.vv. "Easton, Edward Denison"; "American Graphophone Co. (AGC)"; "Columbia (Label)."

4. The Columbia Phonograph Co. began operating in 1888 (though not officially incorporated until January 1889) and was one of the many regional "sub-companies" of the North American Phonograph Co., covering Maryland, Delaware, and Washington, D.C. It was immediately profitable in the dictation business but, under Easton's direction, the company quickly expanded into musical recordings as well. *ERS,* s.v. "Columbia (Label)."

5. Probably the Western Pennsylvania Phonograph Co., chartered in Pittsburgh in November 1888, or possibly the Pittsburg Phonograph and Graphophone Co. *Laws of the General Assembly* 1889, a86; *Electrical Trades' Directory and Handbook* 1889, 252, 264.

6. Edison had tried a variety of stop-start mechanisms. The short-lived model shown at the Electric Club in New York in May 1888 did have two keys for this purpose, directly in front of the cylinder, but they vanished from the redesigned model that appeared weeks later (see Doc. 3209 [headnote]). Their job of lifting the spectacle from the cylinder seems to have been handled at different times by a knob, thumbscrew, or handle to tilt up the straight edge on which the weight of the spectacle rested. The instrument taken to Europe by Adelbert Wangemann in June 1889 had a handle at the extreme right that turned a long bar, pivoted at each end, on which the shorter straight edge was mounted so as to move up or down in a small arc, but that design seems to have been discontinued just at this time (see Doc. 3440). A set of printed instructions issued by the North American Phonograph Co. in December 1889 referred to a mechanism, intended specifically for typewriter transcribers, with a lever that somehow worked through a long rod to disengage the spectacle. During the recording process, the rod could be removed as a precaution against accidental interruptions. North American Phonograph Co. instructions, n.d. [1889?] and 2 Dec. 1889, PPC (*TAED* CA028D, CA028B1).



The handle at extreme right, shown on Wangemann's instrument, would raise or lower the spectacle from the cylinder to stop or start sound playback.

7. Easton was still calling for a convenient stop-start mechanism, one that did not depend on raising or lowering the spectacle, in July 1890. Despite its absence at that time, newspapers reportedly looked forward

to using the phonograph in tandem with the linotype machine as a way of thwarting their unions, because "a 'reader' can give all directions on the Phonograph as to punctuations, arrangement, spelling of proper names, etc., and thus they may be enabled to use girls, or other unskilled labor." Easton to Mergenthaler Printing Co., 8 July 1890; Mergenthal Printing Co. to Samuel Insull, 1 July 1890; both DF (*TAED* D9059AAI, D9059AAD).

8. By the end of the month, the North American Phonograph Co. reportedly had shipped about 1,100 graphophones and about 2,500 phonographs to its licensee companies. Relaying these figures to George Gouraud, Edison added that "We know instruments in actual use exceed greatly this proportion in favor phonos." Thomas Butler to Alfred Tate, 31 Oct. 1889, DF (*TAED* D8920ABA); TAE to Gouraud, 4 Nov. 1889, Lbk. 33:387 (*TAED* LB033387).

–3434–

To Werner von Siemens

Orange N.J. Nov 2 1889—

Friend Siemens

Have been thinking over the system proposed for Frankfort,[1] and I cannot clearly see what becomes of the lamps should a short circuit occur on one of the split circuits—

I think it would be safer to double wind your regular dynamo and use it as a continuous current transformer, opening three or four sub stations each in charge of a boy.[2] There is absolutely no spark on these transformers the action as a motor being the opposite as a dynamo. You can have several transformers at each station taking them off as the load diminishes thus obtaining best economy. 1200 volts could be used on trunk main leading to sub stations all being in multiple arc—

I have not received details of copper process—[3]

Your contract will probably go through if we can remove the objections of Drexel Morgan & Co—[4]

I cabled Siemens Bros[5] today for prices 140 miles cable for conveying 20,000 horsepower to Buffalo from Niagara Falls—[6]

I propose laying gutta percha cable all the way (20 miles) in the river and canal. Drexel Morgan & other bankers are interested and I think they will do it.[7]

Give my respects to your kind[a] wife[8] Very truly

Thomas A Edison

ALS, DLC-MSS, MMC (*TAED* X042DB). [a]Obscured overwritten text.

1. Edison used a common English spelling of Frankfurt, Germany (*Gazetteer* 1885–1887, s.v. "Frankfort on the Main"). The city was in the midst of trying to select for its municipal lighting plans either the direct current (DC) system championed by Siemens or the alternating current (AC) plan put forward by Ganz & Co. of Budapest. The lack of a decisive advantage of one system over the other led the city to organize a major electrical exhibition as a showcase in 1891. The editors have not learned the details of the Siemens proposal. Hughes 1983, 130–31; G. Siemens 1957, 1:118–23.

2. Edison evidently had in mind a set of substations for reducing high-voltage current for local use, a feature of several distribution system patents he filed in late 1886. One specified that each substation would be staffed by "A single attendant…whose only duty is to observe the indicators and adjust the resistances accordingly" (U.S. Pat. 365,978). His notion of a rotary converter, with windings for a motor and a dynamo on the same armature, dates from about the same time (see Docs. 3008, 3010, and 3014 n. 3; U.S. Pat. 369,442). Wilhelm von Siemens replied that Siemens & Halske engineers had anticipated the problem identified by Edison and had designed an automatic cutout mechanism to protect individual lamps. He also declined the suggestion to use direct current transformers because it would prove too expensive (Siemens to TAE, 6 Dec. 1889, DF [*TAED* D8941ABI]).

3. Siemens & Halske had long been a leader in the electrolytic refinement of smelted copper. Werner von Siemens had developed and patented (in 1886) an electrolytic process to produce pure copper straight from the raw ore, without the direct use of fuel. The company was making large-scale trials about this time and, by mid-October, had some agreement with Edison about using its processes. G. Siemens 1957, 1:199–201; Siemens to Alexander Siemens, 10 Oct. 1889, copy book SAA Z 223, SHI; Siemens & Halske to TAE, 25 Oct. 1889, DF (*TAED* D8949ACB).

4. Between Edison's return from Europe and the start of 1890, Edison General Electric and Siemens & Halske came close to an agreement to license the manufacture of armored cable in the United States. In February, the parties settled on terms that led to construction of a new factory at Schenectady in 1891. Siemens to TAE, 3 Dec. 1889, DF (*TAED* D8905AJA); TAE draft agreement with Siemens & Halske, 2 Jan. 1890, Box 77, Folder 538, Villard (*TAED* X11277538900102); Wilkins 1989, 534–35.

5. Siemens Brothers & Co., Ltd., of London was organized as a stock company in 1880 after operating since the 1850s as part of the Siemens family enterprises. Its manufacturing works in Woolwich, alongside the River Thames, were famous for producing submarine cables and telegraphic devices but during the 1880s, they moved into making dynamos, arc lamps, and other equipment for electric light and power. The firm was managed in 1889 by Alexander Siemens, a cousin of Werner von Siemens. "Slip," *Electrician* 6 (15 Jan 1881): 97; Lubinski 2013, 41, 45, 47; Scott 1958, map following p. 268; G. Siemens 1957, 1:42, 69–71, 107–10.

6. According to a transcription by his office staff, Edison wired: "Cable approximate price of 100 knot lightly armoured cable with stranded core 420 square millimeters with gutta-percha 5 millimeters

total thickness in several layers with intermediate compound." Arthur Kennelly copied it under date of 1 November amid several pages of calculations about the costs of copper for an electric system in Buffalo, N.Y.; by that date, he had already made some estimates of the cost of conductors from the Falls to a nearby factory and to Buffalo. Siemens Bros. replied a few days later that the cable would cost £1,750 per knot, exclusive of packing or shipping. TAE to Siemens Bros., 2 Nov. 1889, Lbk. 33:387A (*TAED* LB033387A); Kennelly Notebook #2:72, 75, 80, Lab. (*TAED* NM024072, NM024075, NM024080); Siemens Bros. to TAE, 5 Nov. 1889, DF (*TAED* D8941ABB); see also Doc. 3441 n. 1.

7. Edison mentioned the possibility of lighting the city of Buffalo, N.Y., with electricity from Niagara Falls as early as November 1886 and likely made some preliminary calculations of transmission losses about that time (see Doc. 3008; Cat. 1151, Lab. [*TAED* NM020ABH, image 111]). He may have had some involvement with a proposed Niagara scheme by September 1888, when Arthur Kennelly wrote several pages of "Calculations for the rough conditions of transmitting 5000 H.P. from Niagara to Buffalo." Edison himself made some undated sketches and schematic drawings, perhaps about the same time. Then at the start of 1889, one of the project's promoters asked Gardiner Sims to secure Edison's endorsement. In August of that year, Kennelly attempted to estimate the total waterpower available at the Falls (N-88-09-28:5–7; N-87-11-15:215–47; Lab. [*TAED* NB056004, NA011200]; Alexander Porter to Sims, 9 Jan. 1889, DF [*TAED* D8934AAB]; Adams 1927, 1:122–24; Kennelly Notebook #2:23, Lab. [*TAED* NM024023]). Edison's official involvement seems to have started in recent months. According to the Edward Dean Adams history of the project, Adams wired him in September: "Has power transmission reached such development that in your judgment scheme practicable." Edison answered on 28 September from Le Havre, France: "No difficulty transferring unlimited power. Will assist. Sailing today" (Adams 1927, 1:144). The general plan was to find a market for power large enough to support the investment required to build a Niagara plant; Buffalo (population 255,000) was the most obvious possibility, provided that transmission and distribution costs did not price Niagara power out of the market relative to local steam plants. During October, Adams sent a preliminary engineering study and maps of the Buffalo area, leading Edison to ask for more detailed information about the distribution of the demand for industrial power in Buffalo. He also requested more maps and sought charts of the Niagara River from Charles Speirs, his bookseller of choice. He apparently met with Adams and two unnamed engineers at the laboratory. Adams received (and forwarded to Edison) additional information from Charles Gaskill, who operated a mill at Niagara, and he seems to have been ready to commit to the effort as an investor by the end of October (Adams to TAE, 16, 21, and 29 Oct. 1889; Verplanck Colvin to Speirs, 29 Oct. 1889; Speirs to TAE, 30 Oct. 1889; Charles Gaskilll memorandum, n.d. [Oct. 1889]; Gaskill to Francis Stetson, 24 Oct. 1889; Gaskill to William Rankine, 27 Oct. and 5 Nov. 1889; all DF [*TAED* D8933ABO, D8933ABP, D8933ABQ, D8911AAN, D8911AAL, D8933ABY, D8933ABV, D8933ABX, D8933ACG]; TAE to Speirs, 26 Oct. 1889, Lbk. 33:276 [*TAED* LB033276]; TAE to Adams, 21 Oct. 1889, Lbk. 33:188 [*TAED*

LB033188]; TAE to Adams, 27 Oct. 1889, LM 2:142 [*TAED* LM112142]).

As Adams relates in his history, the dream of applying Niagara's force to mechanical devices was an old one. A succession of mid-century endeavors outspent their capital and were abandoned before Charles Gaskill's flour mill began operating about 1875. Attention had more recently turned to electrical rather than purely mechanical power. The present scheme dated to 1886 and the Niagara River Hydraulic Tunnel, Power and Sewer Co.'s plans to divert part of the river through a tunnel and apply it to waterwheels. The company was reorganized in early 1889 and another entity, the Cataract Construction Co., was formed in the summer to carry out its plans to create an industrial town close to the falls or to somehow reach Buffalo. Among the Cataract Co.'s backers were J. P. Morgan and his associates at Drexel, Morgan & Co., and Winslow, Lanier & Co., of which Adams was a member. Adams remained closely associated with Niagara hydroelectric power generation for decades. Adams 1927, 1: chaps. 4, 7, 8; Passer 1972 [1953], 282–84; Sharlin 1961; Hughes 1983, 137–39.

8. Antonie Siemens (1840–1900) was the second wife of Werner von Siemens. She was a Swabian native, the daughter of Carl Georg Siemens, and distant cousin of her husband, whom she married in 1869. They had two children, Carl Friedrich and Hertha. N. Siemens 2016, 4, 161, 165, 203, 207.

–3435–

Draft Caveat: Miscellaneous

[Orange,] Nov 2 1889

Caveat[1]

Fig 1 & 2 represent a form of friction gearing Especially adapted to that form of Electric Street Car such as the sprague motor. The friction wheel replaces a gear wheel & is mounted on a lever so as to be removeable thus allowing the motor to be running at full speed when the Car is started.[2] The wheel may be of metal, rawhide, Leather, Celluloid, Lead, Babbit, Copper—

The dynamo[3] is connected to it by a universal joint—

fig 1

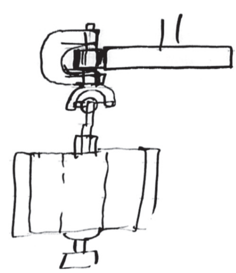
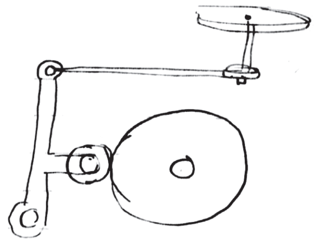


fig 2



A loose belt as in fig 3 may be also used
fig 3

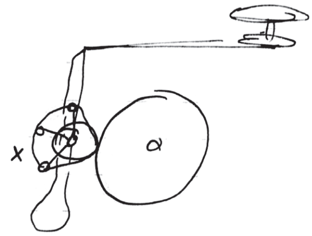


Fig 4 shews device for translating Alternating Currents into Currents all one direction which serve to work a Continuous Current motor. A is the iron core of the transformer B the high volt coil worked by an alternating machine C a small coil used to work the polarized relay. F. D & E are coils ~~wound opposite to each other. The middle being connected~~ which are the low volt coils. A Reversing device is connected to the relay and reverses the coil just at the moment when there is a change of sign so the spark on the points will be very small.

fig 4[4]

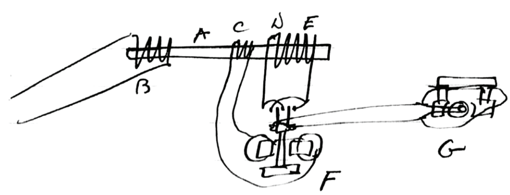


fig 5— shews two transformers A being connected to the supply main all the time and provided with a helix & sucking coil without iron[5] so that when the A transformer becomes Loaded the lever will be drawn up and the transformer B thrown in circuit—

fig 5

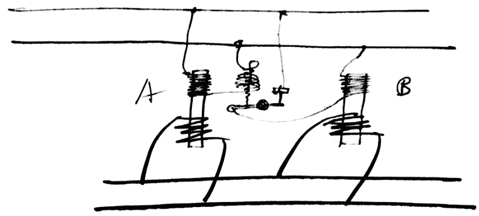


Fig 6 shows the same thing but with both high & low coils thrown in or out according to the supply— This device saves the loss during the hours when but little if any light is used.

fig 6

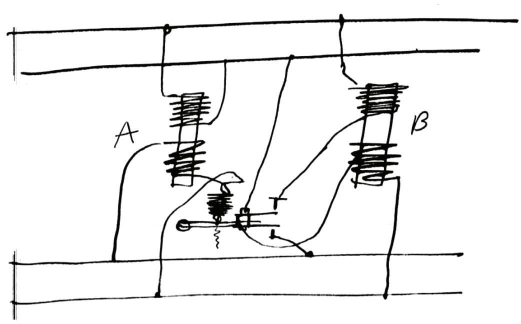
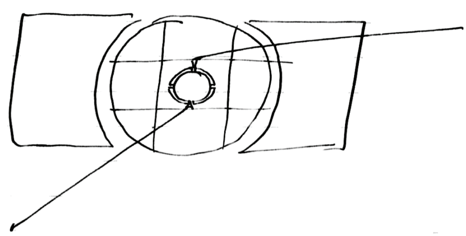


Fig 9[6] is an ordinary Siemens type of Dynamo[7] wound in two sections and provided with 4 contact segments. The contacts being made at the point of change of sign

Fig 7



alternating.

Fig 8 shews a street Railway system with Electric Cars provided with Condensers to prevent rapid changes of Current from Effecting telephones & also as protection from lightning

fig 8

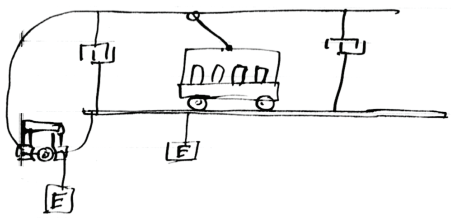


Fig 9 shews Large[a] magnet with armature on placed in main line through which all the Cars must get their Current. This serves to weaken the Current at the moment of starting the Cars & thus save the armature & field— The size of field is such that it is only saturated when all the Cars are starting It may be placed at the station Or a number may be placed along the line in the same and at intervals so all current going to any Car must pass through the magnets.

fig 9

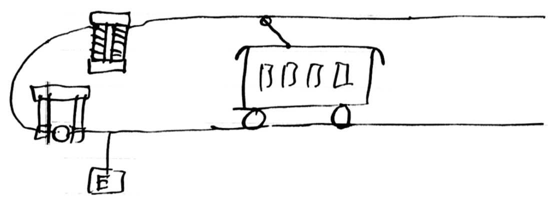
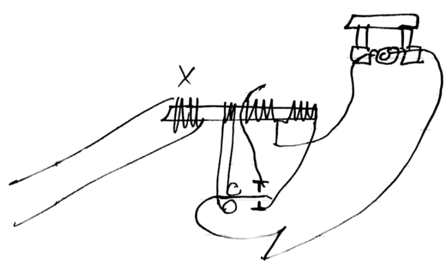


fig 10 is device for changing alternating Currents into currents of one direction

fig 10



Single coil X is high tension coil a small coil works the polarized relay— two large wire coils wound in opposite directions have the Cross wire connected to motor & their Ends to the relay points the lever of which connects to motor The coils by action of relay are thrown out in in according to sign of Current & at the moment when there is scarcely any Current The position of the relay Coil timing the point of change.

Fig 11 shews the relay coil just over the double coils

fig 11

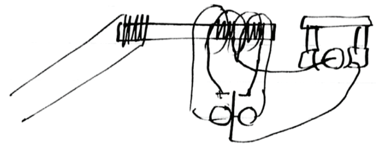
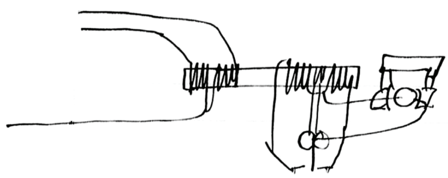
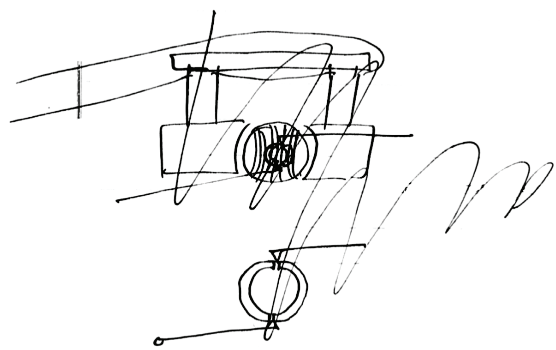


fig 12 is same as 10 but Currents are recd from distant station in same direction but going through two coils ~~are~~ produce same Effect as alternations

fig 12

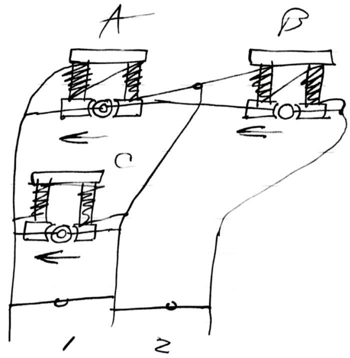




~~Break at change of sign~~

Fig 13 shews a system of Electric Lighting in which there is unlike the three wire system no two sources of Electromotive force, the two Electromotive forces being connected in multiple instead of series as in the three wire system. in this System the neutral wire connects between the Dynamos connected in multiple instead of connecting between the two Dynamos in series as in the 3 wire system   The Dynamos A & B form a sources [-][b] of Energy of 200 volts with no central wire between them   C is connected to the main in same direction as A B.[8]

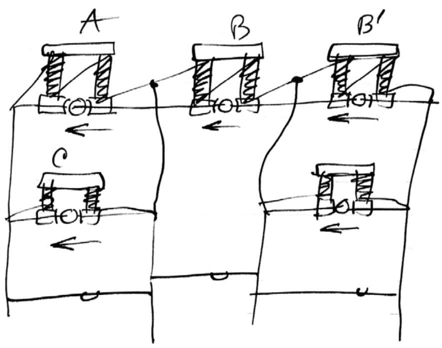
fig 13



The field Coils of A & B are connected across the 200 volt circuit C has 100 volts. If all lamps are off of 2 C furnishes Current If all of[9] of 1 A & B furnishes the Current. The 200 volts are met by ~~1~~Counter pressure of 100 volts at C leaving but 100 volts, C being run as a motor giving its power back to the steam source without loss If a short circuit occurs on Either Circuit the fields of Either A or B are short Circuited. & it becomes a motor reducing the volts from 200 to 100—

Fig 14 shews this principle arranged for 3 circuits.

fig 14



The object of dividing A B into two is to obviate the Effect only of short circuits should they Ever occur otherwise a single Dynamo[a] could be used ~~and its field coil split in two half The~~ both A B & C being regulateable the Emf could be kept exact for the Lamps— Short cktg does not effect the 3 wire system whereas in every variation of this principle devices must be used to obviate the results which comes from short Circuiting outside the station

fig 15 shews the same system with 200 volt dynamo A & 100 volt dynamo C half of the field of A being short circuited when a cross occurs on the line

fig 15

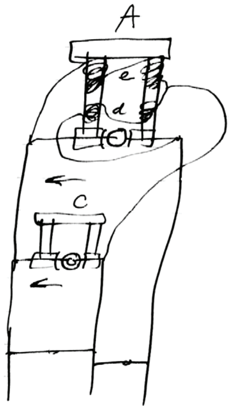


Fig 16 shews double iron fields   The short circuiting of half the wire not only weakens the field by removing the Current but the iron ~~of~~ on which the coil is serves as a magnetic shunt & quickly reduces Electromotive force of Dynamo—

fig 16

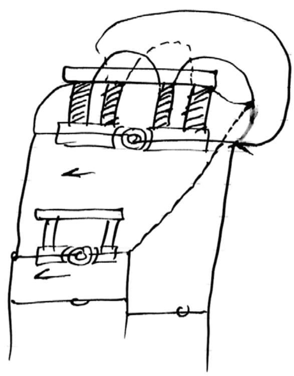


Fig 17 shews the Double fields the current being obtained from an Exciting Dynamo

fig 17

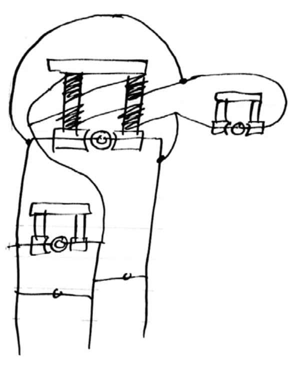


Fig 18 shews plain system without provision for short circuiting

<9 New System>[10]

fig 18

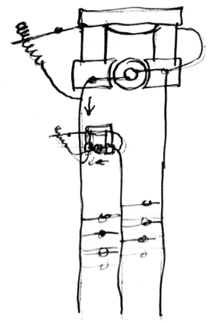


Fig 19 shews system Connected to mains [–][b] by feeders—

fig 19

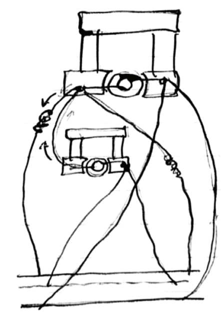


fig 20 shews this system applied to 3 circuits.

fig 20

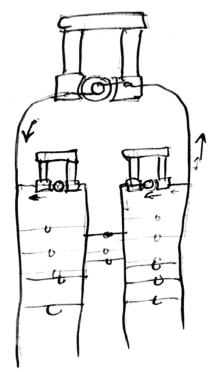


Fig 21 shews a system whereby by switch Dynamo can be thrown from one side of split to the other.

fig 21

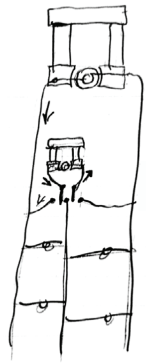
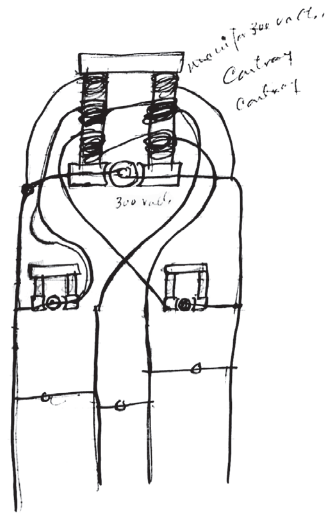


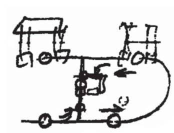
fig 22[11] ________

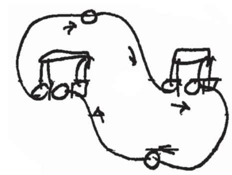
Fig 23 shews series coils on field of high tension dynamo opposed to regular Current, Energizing the field—

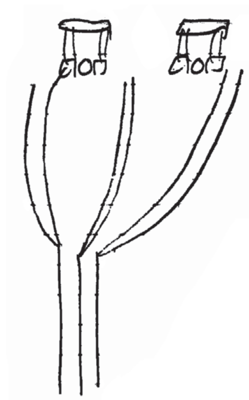
fig 23[12] <OK>

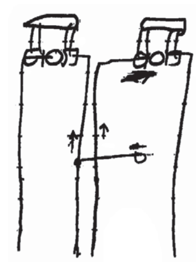


<Rub out pencil E[dison]>









[A][13]

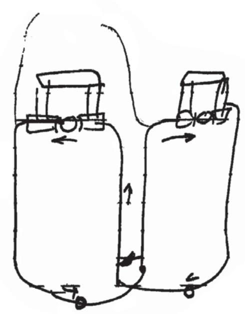


Fig 24 shews 200 volt Dynamo with double field coils & two relays on short circuit occuring on one or other branch relay Closes on opposite branch by increase of voltage or if points [a—][b] are under lever relay opens & throws in big resistance in ½ of the field or opens it altogether or throws in a Counter Current Coil & reduces Volts from 200 to 100

fig 24

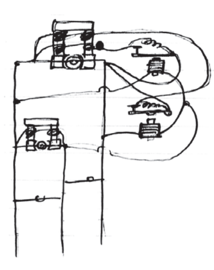


fig 25

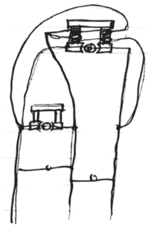


fig 25 shews variation of previously described system of directly short circuiting part of field on 200 Volt dynamo

fig 26 shews a 3 circuit arrangement same as fig 24

fig 26

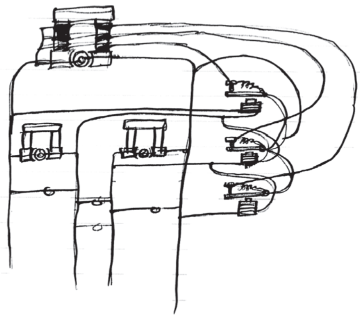


fig 27 shews practically same thing as 24—separate exciter being used & relays are diffrential

fig 27

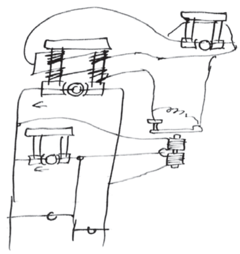


fig 28 shews same as 27 without seperate exciter.

fig 28

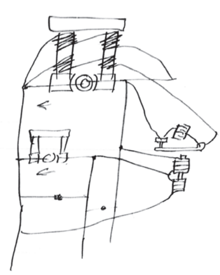


Fig 29 & 30 shews systems.
<10   New System>
fig 29

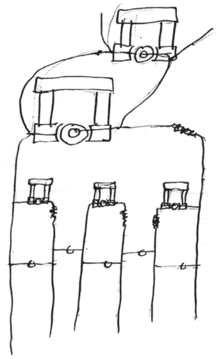
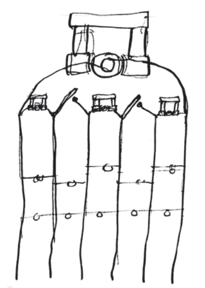


fig 30



<No 11>
fig 31

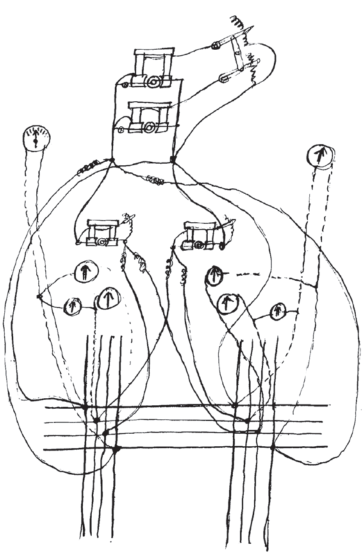


Fig 31 shews a system with feeders indicators etc

<12>
fig 32

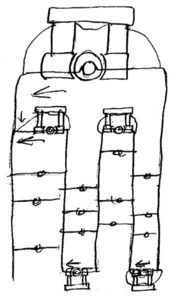
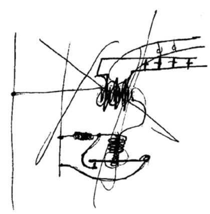


Fig 32 shews a system



<auto Converter off>
Fig 33 shows a Tromp with air ball to throw out the rubber diaphragm to lift the spectacle of the phonograph[14]
fig 33

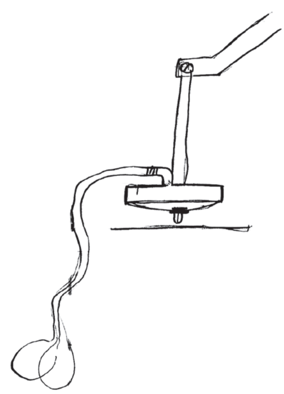


Fig 34 shews the Tromp applied to the regular raising lever
fig 3~~6~~4

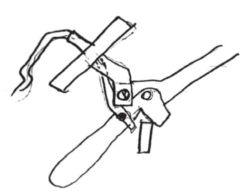


Fig 3~~7~~5 a mechanical device for doing same thing
fig 37

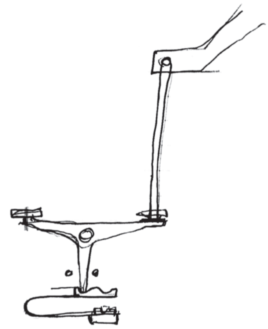
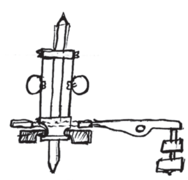


Fig 36 a friction governor which has the all important peculiarity that one of the friction surfaces is loose like a ~~break~~ brake shoe hence is seated perfectly in the act of governing which is important in the phonograph to prevent Jerky regulation[15]

fig 3~~8~~6



<4 phono>
fig 37

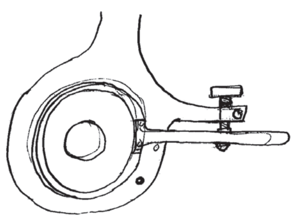


Fig 37 shews the shifting Talking device on phonograph The same diaphragm serving to record & reproduce. The lever for adjusting the reproduction is springy & is sprung over into the groove in End of adjusting screw.

fig 38. shews spectacle with single diaphragm[16] for recording & reproducing having shifting devices not shown[a] provided with a determining pendulum the whole being hinged on Spectacle arm & a tightning screw to hold in position after pendulum has determined position this allows any thickness of cylinder being used—

fig 38

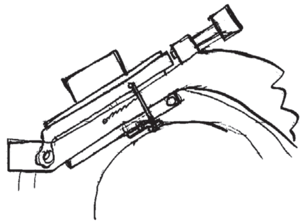


Fig 39 shows an air cushion or dash pot to prevent breaking mechanism on spectacle arm when carelessly dropped—

fig 39[17]

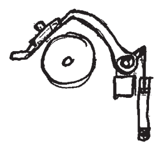


fig 40 shows a mandril with same diameter & not taper. This is dipped in the recording material & a shell is formed by the chilling effect of the mandril. A harder shell not taper outside but taper inside is previously prepared & while the dipped shell is warm & Expanded it is shoved over the prepared shell & contracts on it= The Expansion Coefficient of the shells are the same

fig 40

fig 41 shews [~~show~~?][b] such a Compound phonogram blank The inner shell has great strength & is cheaper & may be used again—

fig 41

<8 Seperators>

fig 42 is ~~an~~ magnetic seperator.

fig 42

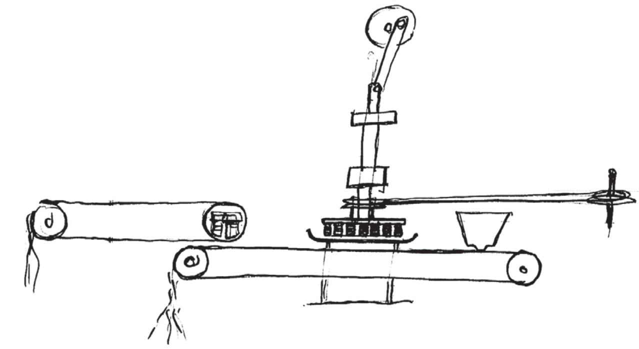


Fig 43 & 44 also magnetic separators

fig 43

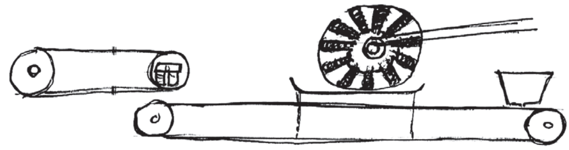


fig 44

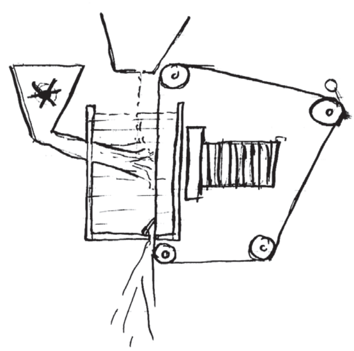


Fig 45 is device for utilizing[a] waste Chimney heat of boilers to heat the air forced under the grate by a blower

<7 Boilers>

fig 45

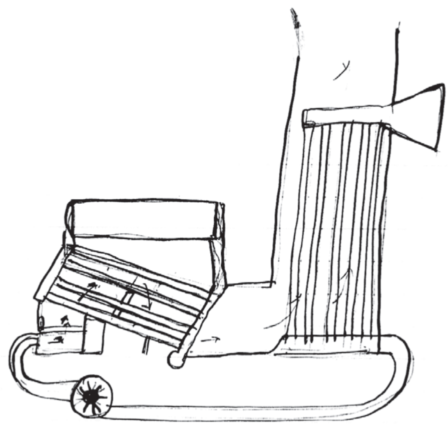
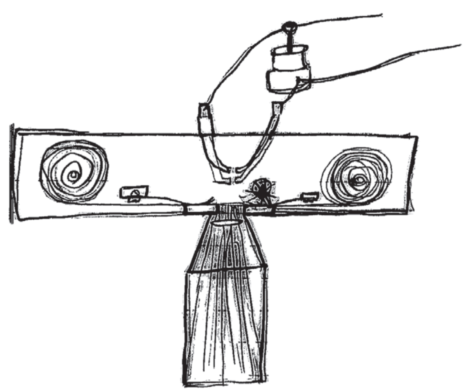


Fig 46 is a Kinetoscope.[18] The sensitive film is in the form of a long band passing from one reel to another in front of a square slit as in fig 47. on each side of the band are rows of holes exactly opposite each other & into which double toothed wheels pass an in the Wheatstone Automatic telegh instrument.[19] This ensures a positive motion of the band— The [f––][b] film being transparent. The Leyden jar spark illuminates back & by means of a lense the image is projected on a screen Instead of a leyden spark a Continuous light with revolving shutter may be used

<5 Kinetoscope>

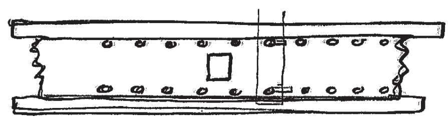
fig 46



The operation of photographing is as follows— in front of the apparatus where the film is exposed the Microphotographic apparatus is placed. A Motor preferably an Electric Motor drives a shaft at great velocity on this shaft is a sleeve[a] carring double toothed wheels engaging in the holes of the band of photo film The connection between this sleeve & shaft is a friction one, on the sleeve is a release escapement with fork connected to the tongue of a polarized relay. This polarized relay is reciprocated by means of a break wheel alternating Currents through it or by an alternating small dynamo The time is so arranged with these Currents that The band is advanced one step for a photograph 10 times in one second the Escapement working of course 10 times in a second but of this $\frac{1}{10}$ of second $\frac{9}{10}$ths of the $\frac{1}{10}$th the band is still with $\frac{1}{10}$ of the $\frac{1}{10}$ of a second the band is moving In other words If there were but one photograph to be taken in 10 seconds the band would be shifted in 1 second & stand still 9 seconds, and this proportion holds good up to any number of photographs per second until the mechanism fails to act. by thus causing the band to be in a state of rest $\frac{9}{10}$ of the time yet taking 10 photographic images per second most perfect results are obtained & the great necessity of a shutter is modified.

The break wheel which controls the polarized relay may be Connected to the screw shaft of the phonogh hence there will be a positive connection & all the movements of a person photoghd will be exactly coincident with any sounds made by him—

fig 47



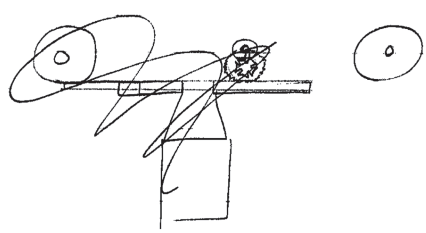


Fig 48 gives rough idea of positive feed mechanism of course this principle can be applied to cylinders covered with the photo material as well as in bands—[20] When a leyden spark is used the break wheel is arranged that it takes place while band is in state of rest or if shutter used reciprocating or revolving It is to be released by ~~ap~~ the same devices that release ~~the~~ & move the band and the shutter so devised that light only passes to one image while projecting it on the screen when in a state of rest.

fig 48[21]

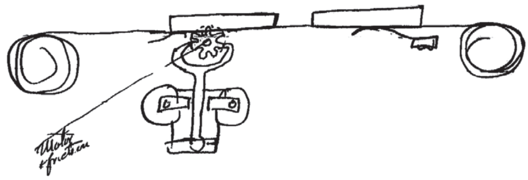


Fig 49 shews ~~the~~a single diaphragm with both Recording & Reproducing points thereon with the usual weight but made adjustable by a ball on a lever held by friction.[22]

<3 phono—>

fig 49

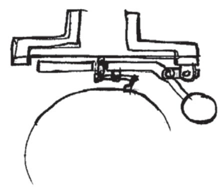


Fig 50 [~~& 51 shew~~?][c] shews the recorder & reproducer on the same lever by moving the diaphragm apparatus in direction of arrow the recording point is carried away from the center or highest pont of cylinder & reproducing ball takes its place hence one can either record or reproduce by moving the lever & diaphragm from or towards the cylinder—

fig 50

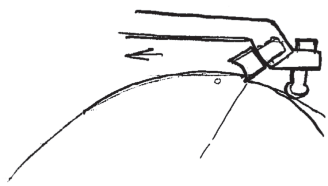


fig 51 shews the recorder ball cut in half & cupped out so that if placed in the position shewn it acts as a recording tool but if the same is given a half revolution it acts as a reproducer without cutting the record

fig 51

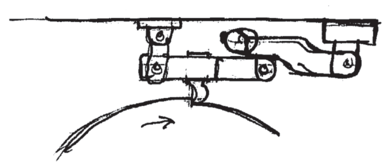


fig 52

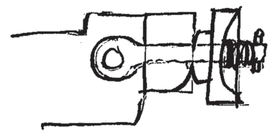


Fig 52 shews an automatic tightening nut on the swinging arm of the phonograph

Fig 53 shews the raising lever on the new phonograph

fig 53

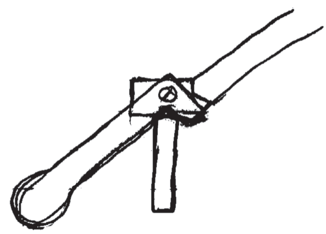


Fig 54 shews a double recording and reproducing device when recording the ball lever is thrown in position shewn by dotted lines but when reproducing is thrown forward in the Cup of the recorder—

<2 phono>

fig 54

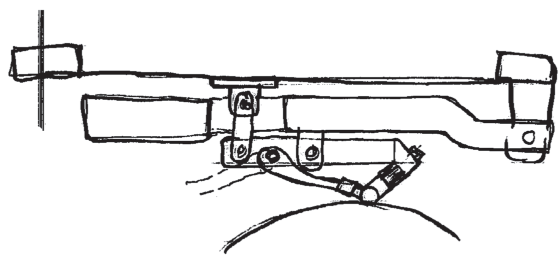


Fig 55 shews swinging arm on diaphragm lever whereby either Recorder or Reproducer can be thrown into position.

fig 55

Fig 56 is same as 50—
fig 56[23a]

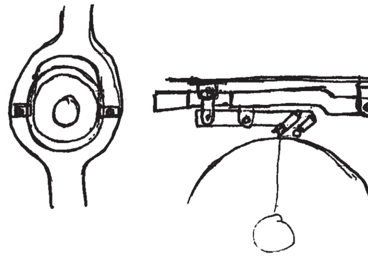


Fig 57 shows Recorder & reproducer points on one lever & diaphragm holder pivoted so as to swing bringing the recorder or reproducer in contact with the cylinder as case may be
fig 57

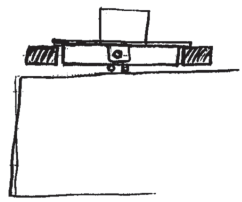


Fig 58 & 59 shews the single diaphragm with lever & double points.
<1^{d} phono>
fig 58

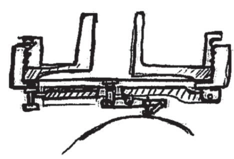


fig 59

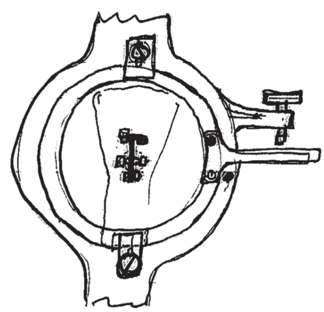
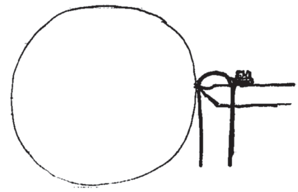
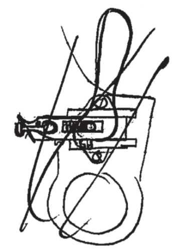


Fig 60 shews chip box on turning off tool on the diaphragm arm

fig 60





For determining the position of the Sun & horizon at sea use a Kodak instantaneous photograph apparatus[24] & afterwards measure[b] the distance on the photogh this would render artificial horizons unnecessary and probably the photo by proper glasses for screening could get position even in a fog— To detect icebergs at sea send a seven foot Sims-Edison torpedo[25] ahead of ship with reels of wire on ship 20 feet apart & run Torpedo motor faster than ship both wires being taut, rudder in center of torpedo veers either way one wire taut other loose hence rudder thrown around bringing it straight

Fig 61 shews a wire rope transmission for brake for freight trains a worm wheel is removeably connected to the regular brake wheel into this meshes a worm driven by a pulley and wire rope—[26] The frame holding pulley & worm being removeably Connected to the walk on the car[27] or otherwise say 10 or 15 wheels are connected up. The wire rope passes over all the pulley wheels to a main pulley in the Caboose then by a wire rope to Engine to winder pulley connected to the wheel or seperate Engine a friction wheel in Caboose may also[a] work the rope. The tight side is the one that is not connected to the ~~p~~Brake pulleys hence on braking the train the all important object is gained of applying the brakes first to the last cars gradually pulling them [---- --][b] towards the engine which is due to the slack The worm wheel or worm are connected to brake through friction which being adjustable serves always to put some degree braking power on

fig 61

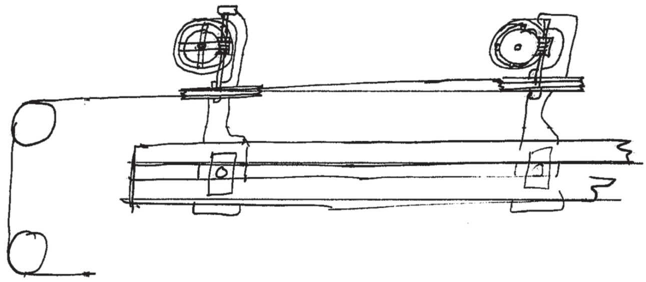


fig 62 shews side view
fig 62

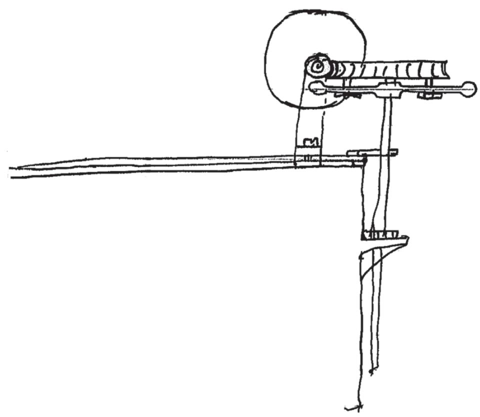
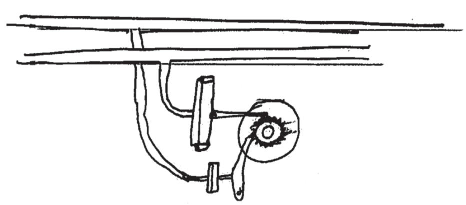
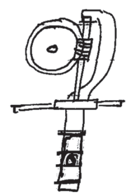


fig 63 shows regular brake moved step by step with an air tromp pulsations being sent over flexible pipe from Engine—a secondary small tube or flexible pipe works a small releasing tromp.
fig 63

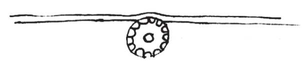


Glycerine or water & glycerine or light oil say parafine oil could be used instead of air. A piston in large chamber on Engine worked up & down giving necessary pulsations.

fig 64''' shews a water motor ~~only~~ steam could be used
fig 64



64'



64''

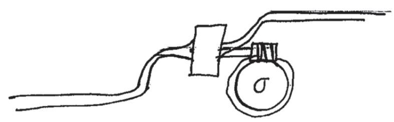


Fig 65 shews a phonograph diaphragm apparatus connected to lever through an oil bath to permit of thick or thin cylinders being used without adjustment

fig 65 <~~OK~~>

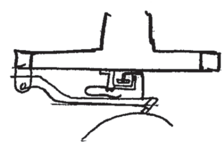


fig 66 shews connection through magnetism

fig 66 <~~OK~~>

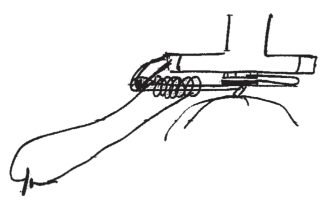


Fig 67 ~~sh~~ a sucking coil

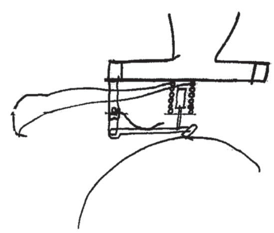
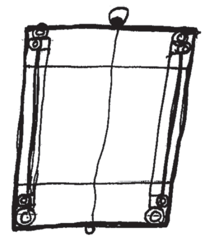


fig 67 <~~OK~~>

fig 68 a mailing box for phonograms
fig 68 <OK—>



~~T A Edison~~

fig 69

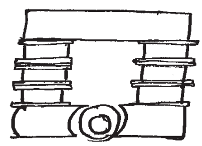


Fig 69 shews the fe~~e~~ild magnet of a street car motor in which the wire is wound wholly on bobbins of Hard rubber or other insulating material which are slipped over the cores the object being to prevent piercing when the field is broken[28]

Fig 70 shews the method of[a] Connecting street car track rails together by bolt nuts & Copper strips the rail being tinned as also the Copper strips— I also propose to electrically weld the iron to the copper—

fig 70

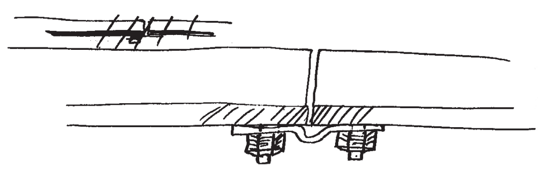
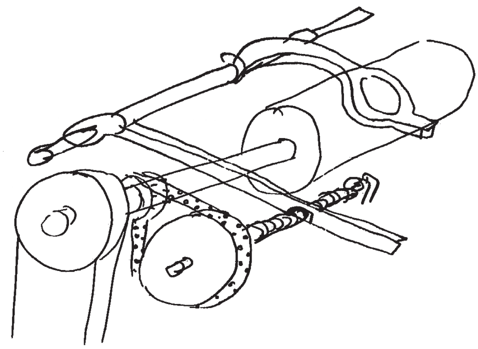
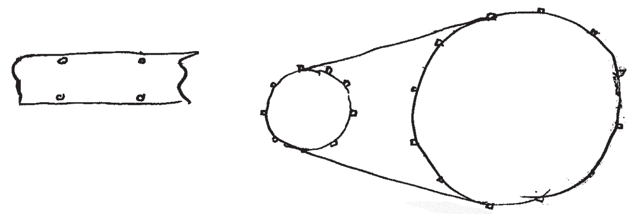


Fig 71 shews a multiplying device for phonographs 200 thread screws are difficult to make, but 50 thread are easily made hence by using a 50 thread to inch shaft & rotating it 4 times slower than phonogram we get 200 threads to inch on its surface; but this must be [-][b] positive driven & gears make Irregularity[a] & belts slip hence I use a perforated truing bank & insure positiveness by pins on the wheels entering the holes

fig 71





T A Edison

ADfS, NjWOE, PS (*TAED* PT031AAH1). Document multiply signed. Figures drawn on 26 separate pages; several incomplete and unclear or erased drawings not reproduced. [a]Obscured overwritten text. [b]Canceled. [c]Circled.

1. Edison filled a handful of loose-leaf pages with drawings dated 1 November and marked for a caveat, but he wrote no accompanying text (Cat. 1151, Lab. [*TAED* NM020ABI]). The full draft presented here was the basis for a caveat prepared by Dyer & Seely that was executed by Edison on 16 December and filed four days later as his Caveat 117 for phonographs. The Patent Office files (but not those of his attorneys) include the finished drawings made from Edison's sketches. As with Doc. 3353, the attorneys rearranged blocks of the draft text to produce a more coherent final version (renumbering figures 1 and 33 and omitting those not marked with figure numbers) but otherwise made few changes. And as was the case with Docs. 3353 and 3358, the Patent Office refused to accept the caveat until it was narrowed to a single invention (Edison Caveat 117, RG-241, MdCpNA [*TAED* W100ACA) and PS (*TAED* PT031AAH]).

2. See Doc. 3388. On 2 December, Batchelor sketched and described a variant mechanical arrangement of a friction gearing system for a Sprague motor. Yet another form of friction gearing was tested on a Sprague motor in early January. Cat. 1337:98, 109 (items 618, 639; 2 Dec. 1889, 9 Jan. 1890), Batchelor (*TAED* MBJ004098, MBJ004109).

3. Edison presumably meant the motor, although the word was not changed in the finished version.

4. Figure labels (across top) are "A," "B," "C," "D," and "E"; at bottom are "F" and "G."

5. A sucking coil (also called a coil and plunger) consisted of insulated wire coiled into the shape of a hollow cylinder. The magnetic field created by an electric current would draw up (or repel) an iron or steel rod through the cylinder. Edison probably had in mind a common variation in which the plunger was a thin wire coil rather than a solid metal rod. Sloane 1892, s.vv. "Coil and Plunger" and "Coil and Coil Plunger."

6. This number was changed to 7 at some point, matching the number Edison originally gave to the associated drawing.

7. Edison probably meant the general idea of a drum-type armature wound longitudinally with wires across its outside face, as devised by Werner Siemens and later modified by his manufacturing engineer Friedrich von Hefner-Alteneck. Thompson 1888, 188–90.

8. Edison made schematic drawings of new three- and four-wire distribution systems in a notebook entry he dated 5 October, the day before his return from Paris. His rough sketches for the abortive 1 November caveat (see note 1) also appear to be related to the systems described and illustrated below. N-87-09-02:45–55, Lab. (*TAED* NA010B45).

9. Presumably intended to be "off," as in the preceding sentence.

10. Edison applied numbered subject headings to several pages of drawings, probably in an attempt to group similar things together in preparation for the final version, but the numbers have no clear correlation with the sequence of drawings in the finished caveat. Figures 18 through 21 appear to represent forms of three-wire distribution systems; figure 23 may be a four-wire system. In mid-October, Arthur Kennelly wrote out a one-page "Mathematical Examination of System about to be patented by Mr Edison," which may refer to the drawings here. Kennelly Notebook #2:71, Lab. (*TAED* NM024071).

11. No figure 22 was added to the final caveat.

12. Figure labels, written faintly, are "main for 300 volts," contrary" and "contrary"; at center, "300 volts." This drawing, like several others in this document (notably figs. 18–21, 24–26, and 29–30), was made in ink over lighter pencil lines.

13. In the drawing below, the two wires at the top rose toward a small figure that was either extremely faint or almost completely erased, with a caption (similarly faint and partially illegible) of "2 Lamps."

14. Edison executed a patent application on 11 December that more clearly described and illustrated this pneumatic mechanism. The bulb shown here at lower left was a bladder that could be compressed by a foot pedal to send a burst of air to an expandable diaphragm that would, in turn, raise a metal plate and linkage to lift the recording and reproducing diaphragm from the cylinder. The patent did not refer particularly to a "tromp," a word imported from the French in the early nineteenth century to indicate a type of blowing apparatus. U.S. Pat. 443,507; *OED,* s.v. "trompe"; "On A New Laboratory Tromp," *English Mechanic* 45 (25 Mar. 1887): 84.

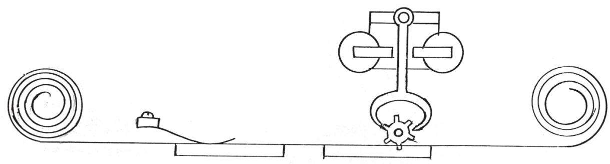
15. In a patent application covering the water motor phonograph, Edison explained more fully that the friction shoe's loose fit allowed it to compensate for any imperfections in the surface of the disk, thereby

offering uniform resistance to the motor. Edison signed the application on 11 December. U.S. Pat. 513,095.

16. See Doc. 3440 for Edison's description of the single diaphragm unit. It was part of the new phonograph (see Doc. 3425), some other features of which are shown in drawings here.

17. A figure label, too faint to reproduce, is "dash pot."

18. This figure was significantly simplified in the final form to show the escapement mechanism more clearly; see also figure 48. The text and drawings here relate to the new kinetograph/kinetoscope design discussed in Doc. 3391 n. 36.



19. Like other forms of automatic telegraphy, in which the actual transmission and reception of signals was done by machine rather than by hand, the system patented by British scientist and telegraph pioneer Charles Wheatstone employed long strips of perforated paper encoded with messages. The strips were fed through the transmitting instrument at a high rate of speed. Prescott 1877, 702–11; see Doc. 457.

20. Edison had moved decisively away from the phonograph-inspired cylinder design and the separate break wheel (see Docs. 3358 n. 44 and 3391 n. 36), but he characteristically sought to document outmoded ideas as well as current ones. Interestingly, although William K. L. Dickson later claimed to have synchronized the moving images of the kinetoscope with the sounds of the phonograph to some degree by the time Edison returned from Paris, Edison did not include that arrangement in this caveat draft. Dickson's testimony, p. 163, *Motion Picture Patents Co. v. Chicago Film Exchange,* Lit. (*TAED* QM003143).

21. Figure label is "Motor & friction."

22. The phonograph drawings below resemble a number of rougher sketches made by Edison on or around 10 October and by John Ott five days after that, all devoid of significant explanatory text. N-87-09-02:56–99; N-88-03-15.2:65–81; Unbound Notes and Drawings (1889); all Lab. (*TAED* NA010C56, NA023065, NS89ADC).

23. In the final caveat, the two parts of this drawing were separated and each numbered 56.

24. George Eastman coined the name "Kodak" in late 1887 in connection with creating a small camera that novice photographers could operate with the click of a button. The Kodak camera went on the market in mid-1888 and was an immediate commercial success. Among its distinctive features was the long strip of flexible film, wound on a roll, on which images were recorded. The Phonograph Works seems to have gotten a Kodak camera in May 1889; Edison apparently ordered another for the laboratory that was received on 23 November. Jenkins 1975, 112–16; Spehr 2008, 173.

25. The Sims-Edison torpedo was a naval weapon designed by Winfield Scott Sims. Propelled by an Edison motor, it ran well ahead

of the operating ship, to which it was attached by long electrical cables. Edison was an incorporator of the Sims-Edison Electric Torpedo Co. in 1886 and its consulting electrician. See Doc. 2897.

26. Arthur Kennelly tested the power and efficiency of a motor and worm drive for the electric brake on 29 October. Kennelly Notebook #2:76, Lab. (*TAED* NM024076).

27. Brakemen on freight trains had the notoriously dangerous job of clambering on catwalks from car to car to set or release the brakes when signaled by the engineer. Licht 1983, 182–88.

28. Edison seems to have intended the rubber as extra insulation to prevent sparks from "piercing" the wire covering during the brief current surges induced by the collapsing magnetic field.

–3436–

To Alfred Tate

Orange, N.J. Nov 4—1889.[a]

Tate=

Put this Gentleman[1] on the payroll $300 per month he goes prospecting for me in NC & Va—[2] give him $300 advance for Expenses today

Edison

ALS, NjWOE, DF (*TAED* D8914ABF). Letterhead of Edison laboratory. [a]"*Orange, N.J.*" preprinted.

1. Identified by a docket note on this letter, Samuel G. Burn (1854–1927) was an Englishman later described as a mining engineer and "a traveler of wide experience." The editors have no information about how he came to the laboratory, but Edison employed him at least into 1898. U.S. Dept. of State n.d., roll M1372_924, Samuel G. Burn passport issued 23 Sept. 1919; "S. G. Burn," *El Paso Herald,* 26 July 1927, 11; Dickson and Dickson 1894a, 202; TAE to Herman Dick, 6 Apr. 1898, Lbk. 63:110 (*TAED* LB063110).

2. Burn was in the region around Charlotte, N.C., by the end of 1889. He was still sending back samples from there in May 1890. By September of that year, he had moved on to Ontario, Canada, where he reportedly looked into nickel deposits (Tate to Burn, 31 Dec. 1889 and 6 Sept. 1890; TAE to Burn, 21 May 1890; Lbk. 35:323, 43:450, 41:133 [*TAED* LB035323, LB043450, LB041133]; "Mr. Edison Exploiting Canadian Nickel Mines," *Electrical Engineer* 10 [5 Nov. 1890]: 524). In the first few days of January 1890, Edison began to fill a notebook with the names and locations of dozens of mines of various types, mostly in North Carolina with a few in New England. The book contains notes on North Carolina mines in a different hand, possibly that of Burn. Edison also wrote brief bibliographic references directed at Burn, Arthur Payne, and Charles Reed (N-01-04.2, Lab. [*TAED* NA032]).

–3437–

To Edward Dean Adams

[Orange,] Nov. 6, 1889.

My Dear Sir:—

I have received your various letters enclosing communications from Professors Rowland[1] and Morton.[2] I can only say in regard to these that you are wasting time in obtaining opinions from these gentlemen, neither of whom has more than a theoretical, school-boy knowledge of the subject which they attempt to discuss.[3] It would be quite useless for me to meet either of them, as both their time and mine would be consumed to no advantage.[4] Very truly yours,

Thos A Edison T[ate]

TL (letterpress copy), NjWOE, Lbk. 33:417 (*TAED* LB033417). Signed for Edison by Alfred Tate.

1. Henry Augustus Rowland (1848–1901) was the inaugural professor of physics at the Johns Hopkins University. An advocate for what he termed "pure science," Rowland nevertheless had served as an independent authority in validating some of Edison's claims for his lighting system, and he became heavily involved in the Niagara hydroelectric power project from about 1 October. He later asked Edison's advice about how much he should charge for that work. Doc. 2653 n. 1; Hounshell 1980; Adams 1927, 1:152–55; Rowland to TAE, 14 Apr. 1893, DF (*TAED* D9322AAB).

2. Henry Morton (1836–1902) was a professor of chemistry and, since 1870, the president of the Stevens Institute of Technology (Doc. 2422 n. 1). He and Edison had once been on friendly terms but Morton's disputed role in electric lighting tests in 1880 led Edison to disparage him privately. His involvement in the Niagara project predated Rowland's by at least a month (Docs. 1927, 2010, 2017, 2022 n. 1, and 2033; Adams 1927, 1:148–49).

3. Adams had written a number of times in recent weeks. In the last few days, he enclosed evaluations solicited from Rowland, Morton, and Coleman Sellers (a Philadelphia consulting engineer closely associated with both the Franklin Institute and the Stevens Institute) of the economic competitiveness—against local steam power—of distributing large amounts of electrical energy from Niagara Falls. Each expert noted the untried nature of transmitting large currents over distances like the fifteen or eighteen miles to Buffalo, N.Y., an obvious market for Niagara power, and the paucity of data on which to base calculations. Even so, Morton and Sellers saw merit in the idea and gave it some qualified support, Morton vouching for the possibility of transmitting 1,000 electrical horsepower (cf. Doc. 3434). Rowland thought Buffalo would be too far but the smaller town of Tonawanda, N.Y., might be close enough to be served by alternating current (AC), specifically the Westinghouse system. Adams apparently did not disclose that engineer Frank Sprague had declined to endorse or become involved in the Niagara project. Edison began to draft a response on Rowland's letter: "It appears to me The preliminary report of Mr Rowland is all you require a full report would dam the thing irretrievably." He crossed that out and instead instructed Alfred Tate to "Say to Adams he better get some more

professors to report I should like to see about a dozen professors set down to a Banquet of Boiled Crow." Edison also had Rowland's letter advising Adams that the Westinghouse company itself did not believe that either Buffalo or Tonawanda could be profitably served. Rowland, in his full report, ultimately recommended using Edison dynamos at the falls. Adams to TAE, 2 and 4 Nov. 1889; Rowland to Adams, 27 Oct. (with TAE marginalia) and 1 Nov. 1889; Morton to Adams, 27 Sept. 1889; Sellers to Adams, 5 Oct. 1889; all DF (*TAED* D8933ABZ, D8933ACC, D8933ACA, D8933ACB, D8933ACD, D8933ACE); TAE to Adams, 7 Nov. 1889, Lbk. 33:457 (*TAED* LB033457); Adams 1927, 1:150–55; *DAB,* s.v. "Sellers, Coleman."

4. Evidently under the impression that Edison planned to visit Niagara Falls himself, Adams suggested that he might wish to do so with Rowland. Adams to TAE, 4 Nov. 1889, DF (*TAED* D8933ACC).

–3438–

To Friedrich Krupp[1]

[Orange,] Nov. 7, 1889.

My Dear Sir:—

I have the esteemed letter of your Director under date October 23rd,[2] and in reply beg to say that the cylinder of the standard phonograph is not sufficiently long to take a continuous dictation for twenty-five minutes. It will take continuous speech for five minutes, which is equal to one thousand words or ten ordinary letters. It has been my intention, and I still desire to present you with one of these instruments as a personal gift from myself. I have given instructions for a special machine to be prepared for you, which I trust you will be kind enough to accept with my compliments. I will advise you when it is ready to go forward.[3] I regret very much not having had the pleasure of meeting you when I was in Germany.[4] My time was so limited that I failed to see a number of my friends whom I had hoped to meet. Very truly yours,

Thomas A. Edison

TLS (letterpress copy), NjWOE, Lbk. 33:456 (*TAED* LB033456).

1. Friedrich Krupp (1854–1902) inherited control of the Krupp family's famed steel and armaments enterprise in Essen, Germany, from his father in 1887. He ran the firm until his death. *DBE,* s.v. "Krupp, Alfred Friedrich"; "Did Herr Krupp Commit Suicide?" *St. Louis Post- Dispatch,* 23 Nov. 1902, 19.

2. Not found.

3. This same day, an order was sent in Edison's name to the Phonograph Works to "Get ready one of the latest water motor phonographs, put it in first class condition and make a plate for it as follows: 'This Phonograph is presented to Fried Krupp by its inventor Edison.'" (cf. Doc. 3456). Two hundred blank cylinders and several

dozen recordings were to be sent with it. The factory did not complete the order until the latter part of February, prompting Tate in the meantime to make inquiries and Edison to send several apologies to Krupp. TAE to John English, 7 Nov. 1889; Tate to Edison Phonograph Works, 21 Dec. 1889 and 19 Feb. 1890; TAE to Krupp, 13 Dec. 1889, 31 Jan., 25 Feb. 1890; all Lbk. 33:438, 35:208, 37:409, 35:280, 36:487, 38:11 (*TAED* LB033438, LB035208, LB037409, LB035280, LB036487, LB038011).

4. While Edison was in Paris, Henry Villard arranged for Deutsche Bank to give him a letter of introduction to Krupp. The bank also conveyed Krupp's open invitation to visit. Deutsche Bank to TAE, 10 and 26 Aug. 1889; Deutsche Bank to Krupp, 10 Aug. 1889; all DF (*TAED* D8905AEZ, D8905AFL, D8905AFA).

–3439–

Alfred Tate to Lewisohn Bros.[1]

[Orange,] Nov. 7, 1889.

Dear Sirs:—

Replying to your letter of 2nd instant,[2] inquiring as to the standing of the Edison Manufacturing Company,[3] Silver Lake, N. J., I beg to say that this concern has not yet been regularly incorporated. We call it the "Edison M'f'g. Co." for convenience of distinguishing it from the other interests centered here in Orange. It is Mr. Edison's personal enterprise, and will be incorporated some time in the future, but at present its credit can be rated by Mr. Edison's personal standing.[4] Yours truly,

A. O. Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 33:437 (*TAED* LB033437).

1. Lewisohn Brothers was by now the dominant producer, refiner, and seller of copper in the United States. The firm was founded in New York City in 1866 by Jewish immigrant brothers from a prominent merchant family of Hamburg, whose long-established business in hair, wool, feathers, and related manufactured goods had included a New York agency since 1858. In its early years, Lewisohn Brothers made innovative contracts with meat processors and investments in bristle-processing technologies and related factories, while also trading in metals. The firm's holding of a copper mine led it to form the Boston & Montana Consolidated Copper Co. in 1880. By 1889, Lewisohn Brothers had become independent of its European family and shed its non-copper businesses in the metal industries. The partners at this time were Adolph, Leonard, and Philip Lewisohn. Ingham 1983, 2:791–92, s.v. "Lewisohn, Adolph"; Albrecht 2011; "Mining Men of Note. Adolph Lewisohn," *Engineering and Mining Journal* 110 (9 Oct. 1920): 722; Trow 1889, 32, 153.

2. Not found.

3. The Edison Manufacturing Co. made and sold the Edison-Lalande battery for a variety of uses in addition to the phonograph,

including telephones, telegraphs, alarms, and medical instruments. The company name appeared during the summer of 1889, and in August, John Randolph explained that it had been started "under the management of the Edison Phonograph Works and since then it has been taken in charge of Mr Edison." Edison Mfg. Co., 1889, "Price List of the Phonograph Battery," PPC (*TAED* CA036A); Charles Batchelor price list, 12 Oct. 1889; Edison Mfg. Co. circular, 14 Dec. 1889; both DF (*TAED* D8932AAN, D8932AAQ1); Edison Mfg. Co. to John W. Quincy & Co., 9 July 1889; John Randolph to John W. Quigley & Co., 22 Aug. 1889; Lbk. 31:225, 32:127 (*TAED* LB031225, LB032127).

4. Docs. 2001 and 2097 are examples of reports on Edison's personal creditworthiness by the R. G. Dun & Co. agency; standing businesses, such as the Edison Lamp Co., were evaluated separately (see Docs. 2051 and 2394).

–3440–

To George Gouraud

[Orange,] Nov. 8, 89.

My Dear Sir:—

I mailed to you Wednesday last photographs of the improved phonograph[1] which I have gotten up since my return home, and which, when I am able to send you one, you will find to be as simple a machine as can possibly be wished for. By inspecting the photographs you will observe that I have removed the kick-back altogether.[2] The lever for raising the spectacle, which, in the shape of an angle rod is placed in front of the straight edge on the machines which you use, has also been removed, and the spectacle is now raised by an arm which protrudes beneath the lip of the former; when this lever is thrown up the spectacle is raised so that the recorder or reproducer point, as the case may be, is lifted off the phonogram and the travelling nut[3] thrown out of gear, and when lowered brings either of these points and the travelling nut back into position for recording or reproducing. I have cut the spectacle itself in two and thrown one side away, using one diaphragm for recording and reproducing. The receiver (which in the other type of phonograph we used to refer to as a recorder and reproducer, there being two of them), is let into the spectacle in the usual way. Extending from the right-hand side of this ~~reproducer~~ receiver[a] and attached to the same, is a small arm, which has a play up and down of about ~~half~~ a quarter of[b] an inch, and which when raised or lowered moves the receiver in a circle to the same extent.[4] Attached to the diaphragm of the receiver are the two points, one for recording and the other for reproducing. When this arm is up against the adjusting nut, the reproducer point[a] is in position, and when it is thrown down, the recording point is brought into play. In the photograph you will notice a wire bent over the top of the receiver and a shorter wire protruding upward to the left of this. This shorter wire is attached to the ~~reproducer~~ receiver[a] and moves with it. The other is stationary. It is, therefore, obvious that these wires will be closer together when the lever of the receiver[c] is thrown down than when it rests against the adjusting nut. The thimbles on the ends of the speaking tube and the listening tube have slots cut in them for these wires to enter and permit them to be set down over the thimble of the receiver. When the receiver is set for reproducing the speaking tube thimble cannot be placed over the receiver thimble owing to the wires not fitting its slot[d] and when the machine is set for recording the listening tubes cannot be used—or in other words, either of these tubes can be used only when the machine is set for the purpose for which the tube is intended. It forms a sort of yale lock combination[5] which prevents any mistake being made.

I have taken away the screw on the side of the machine employed to secure the swinging centre that secures the brass cylinder, and replaced the same by a short pendulum, which, when raised, clamps the swinging centre, holding it firm, and when lowered releases it. This motion is much more rapid than the screw motion.[6] The knife has been placed on the spectacle arm at the back, in a kind of steel box, which contains the movement that operates the knife. On the side of this box is a determining point which automatically adjusts the knife for the proper depth of chip. At the back of the box is a lever which works up and down. When this lever is [pulled?][e] pulled[a] down it lowers the determining point until the latter just touches the surface of the phonogram, and at the same time locks the knife in proper position for the cut. After the cut has been taken, and it is necessary to bring the spectacle back to position for recording, the spectacle arm is raised as usual, and this motion throws the knife back by raising the lever at the back of the knife box, thus eliminating the possibility of the cylinder being cut through thoughtlessness or carelessness. The arm which reaches from the sleeve on the backrod to the 100 thread screw ~~has~~ is[a] a split spring which carries two travelling nuts, one on each side of the split. Either one of these nuts will carry the spectacle along as well as the two together, which reinforces this part against accident. This machine possesses great advantage in the way of recording, for the following reason: The recording point is a fraction of an inch to the right of the reproducing point. When the record is being made and the speaker desires to listen to the context of his subject, it is only necessary to throw up the lever attached to the receiver, keeping the speaking tube in his hand; the receiver point now comes into position and being, as I have said, the fraction of an inch behind the recorder it will repeat about twenty-five words of the dictated matter without moving the spectacle at all. So far as recording and reproducing are concerned, all adjustments have been done away with. After the phonogram has been placed on the cylinder, the operation consists in simply dropping the spectacle and going ahead. As the phonogram is shaved off and its diameter reduced the difference is compensated for automatically by the recording and reproducing points which have an upward and downward movement that renders them at all times in position for the varying heights of standard phonograms, which latter will yield about twenty five surfaces.

When these instruments are placed in business offices, a clerk or office boy will shave off the phonogram and keep a supply ready for use in the drawers of the phonograph cabinet. The business man has only to slip one of these on the machine, close the swinging centre, throw up the clamp, drop the spectacle and go ahead. All adjustments are eliminated and the spectacle can be dropped anywhere on the phonogram surface—near either end or in the middle, with equally good results.

I have also designed a water motor, which works to perfection, and which I believe will be adopted universally in place of batteries. It runs on ordinary city pressure. At ordinary water rates, the cost of operating this motor will not exceed three and a half cents per ~~hour~~ day.[a] I have only completed one of these machines, and I have sent you photographs of the same.[7] We are going to get our factory in shape to substitute them for the instruments we are at present making. They can be run by water power or by an electric motor; also by foot power.

The North American Phonograph Company will very shortly discard the graphophone and furnish phonographs exclusively to its licensee companies. They having adopted Reason to that effect—[f] Very truly yours,

Edison

P.S. 1 gallon every 4 minutes 15 gallons hour— Key American price 15c per 1000 gallons. E[dison][g]

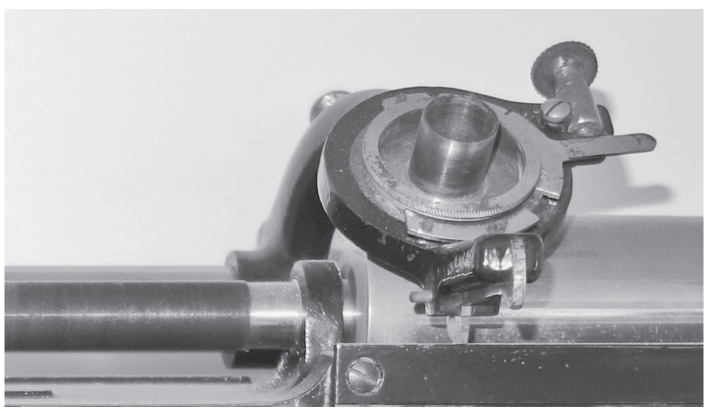
TLS (letterpress copy), NjWOE, Lbk. 33:484 (*TAED* LB033484). [a]Interlined above by hand. [b]"a quarter of" interlined above by hand. [c]Handwritten. [d]"Owing to the wires not fitting its slot" interlined above by hand. [e]Illegibly written by hand. [f]"They…effect" written by Edison. [g]Postscript written by Edison.

1. The photographs likely were taken by William K. L. Dickson. One, now at NjWOE, appears in Dickson and Dickson 1894a (147), and a detail from it is reproduced here (see also note 7). Three others were pasted into Charles Batchelor's journal on 5 December. Edison included many design features of the new phonograph in a patent application he completed on 14 November. Image 29.110.28, NjWOE; Cat. 1337:99–101, (item 619, n.d.), Batchelor (*TAED* MBJ004099); U.S. Pat. 465,972.

2. That is, the coarse screw thread used to return the spectacle rapidly to its initial position on the cylinder.

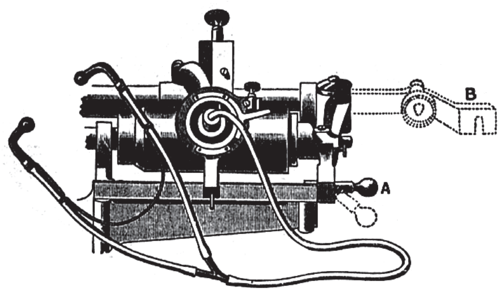
3. That is, a component to engage the threads on a screw shaft and be moved along the length of the shaft.

4. See also Doc. 3435 esp. figs. 56 and 59. In the photograph of the new "receiver" (below), the "arm" points to the right. Its range of motion is evident in the gap between the attached semicircular ring and the metal stop at about the ring's four o'clock position. As shown here, the reproducing point underneath would be engaged; sliding the arm down would put the recording point into place. The "wires" or pins described below are visible above the center of the new "receiver." Note that the main shaft for the mandril is no longer obscured by the coarse kick-back screw that had been in front of it. The operation of the receiver is described in a set of North American Phonograph Co. instructions from about this time (n.d. [1890], PPC [*TAED* CA028J]). Gouraud was in New York in December and, while there, he arranged to have 125 new receivers sent to Copenhagen, Amsterdam, and London for retrofitting machines not yet distributed to customers (Gouraud to TAE, 14 Dec. 1889, DF [*TAED* D8959AGM]; TAE to Edison Phonograph Works, 20 Dec. 1889, Lbk. 35:177 [*TAED* LB035177]).



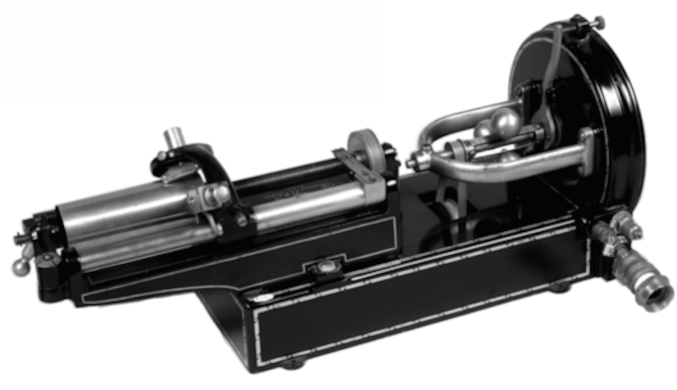
5. Edison probably referred to the signature product of the Yale Lock Manufacturing Co., the pin-tumbler "cylinder lock" for doors devised by Linus Yale, Jr., between 1860 and 1865 that was widely known simply as the Yale lock. During that same period, Yale also designed a heavy dial (keyless) lock for bank vaults, but it was produced in much smaller numbers. The cylinder lock required each pin (or tumbler) to be raised to its proper height by the key and to align both with a hole in the outer case and with a matching hole in the cylinder that rotated within. Giedion 1948, 62–71; *ANB,* s.v. "Yale, Linus, Jr."; *DAB,* s.v. "Yale, Linus."

6. This mechanism was illustrated in operating instructions published by the North American Phonograph Co. The "lock bolt" **A** (Edison's "pendulum," at right) swings down, freeing the "swing arm" **B** to pivot away from of the end of the cylinder (top right); the previous design used a thumbscrew to secure the latch holding the swing arm. These instructions also covered how to attach a listening or speaking tube and trim the cylinder. North American Phonograph Co. instruction, n.d. [1890?], PPC (*TAED* CA028I); U.S. Pat. 499,879; also cf. Doc. 3435 figs. 52–53.



7. One of the photographs is in Dickson and Dickson 1894a (151). The water motor was the subject of a patent application filed in December (U.S. Pat. 513,095). The North American Phonograph Co. published instructions for setting up and using the water motor. The instructions included a short chart of test results said to have been obtained by

Water-powered phonograph, viewed from the rear.



Edison in January 1890 showing the rate of water use. One gallon of water at "City Pressure" was said to be sufficient to run the phonograph at 125 rpm for five minutes (North American Phonograph Co. instructions, [11 Mar. 1890?] and n.d. [1890?]; both PPC [*TAED* CA028G, CA028H]). Water motors were patented in the 1870s and applied to sewing machines and similar light equipment. In a typical design, consistent with the shape of the one shown here, a stream (or several streams) of water was directed at an advantageous angle to the center of buckets arranged on a wheel. The phonograph motor was belted to the main shaft through an idler shaft in the base (*KNMD,* s.v. "Water Motor"; Acc. no. 14194.0009, NjWOE).

–3441–

To Edward Dean Adams

[Orange,] Nov. 11, 1889.

My Dear Mr. Adams,—

Your letter of 8th instant[1] has been duly received.

I cabled Siemens Bros. for appropriate estimate on sizes cabled.[2] The prices are rather high when 45% is added, and I think they can be made in this country. I am certain I can make as good cable of the character we want as the London people.

My Engineer[3] is now along the Niagara River, making preliminary survey inquiries about ice, anchoring &c., &c. I have two young men at Buffalo making a lighting survey.[4] A couple of weeks will finish it, and will show the position of every kerosene lamp, gas jet, electric and arc, and the hours of burning. This will give us within five per cent of every man's gas bill.[5] Very truly yours,

Thomas A Edison T[ate]

TL (letterpress copy), NjWOE, Lbk. 34:21 (*TAED* LB034021). Signed for Edison by Alfred Tate.

1. Adams wrote about the proposed Niagara Falls power project. He offered to solicit proposals from English cable manufacturers, despite the fact that a duty of 45 percent would be levied on imports to the United States He also noted that laying conductors under the Niagara River would require approvals from the United States government and nearby towns. Edison drafted a reply on the back of that letter, from which this typed response was taken almost verbatim. Adams to TAE (with TAE marginalia), 8 Nov. 1889, DF (*TAED* D8933ACL).

2. See Doc. 3434.

3. Cornelius J. Field (1863?–1915), a graduate of the Stevens Institute, was chief engineer of the Edison Electric Illuminating Co. of Brooklyn until about this time. He wired Edison from Buffalo on 8 November (in part): "American channel all right up to Buffalo Canadian channel three miles shorter and channel safe no traffic or trade from Erie river

runs six miles a hour good bottom this is the best right of way over grand Island can be secured cheap." In early December, Field declined a job offer from Edison and went into business for himself as a consulting engineer in New York City. Adams 1927, 1:146; "Cornelius J. Field Dead," *NYT,* 21 Sept. 1915, 11; Find A Grave memorial no. 152380920, online database accessed through Ancestry.com, 27 Sept. 2018; Field to TAE, 8 Nov. and 5 Dec. 1889, both DF (*TAED* D8933ACK, D8905AJC); Alfred Tate to Samuel Insull, 14 Jan. 1890, Lbk. 36:35 (*TAED* LB036035).

4. The editors have not learned who conducted this survey, but Edison seems to have had in mind a detailed canvas of power and light usage like the one he commissioned in New York City before building his first central station there (see Doc. 1995). The Buffalo inquiry was still underway in January. By late March, tracings representing power consumption (and perhaps incorporating information from fire insurance maps Edison had requested) were nearly complete; three months later, Edison had at least a summary of the possible aggregate demand for electricity there. TAE to Edison General Electric Co., 21 Jan. 1890; TAE to Winslow, Lanier & Co., 6 Feb. 1890; TAE to Francis Stetson, 17 June 1890; all Lbk. 36:209, 37:121, 41:450 (*TAED* LB036209, LB037121, LB041450); John Henderson to TAE, 17 Mar. 1890, DF (*TAED* D9038AAE).

5. Edison did not wait for the survey results to estimate the financial prospects for a Niagara power plant. On 14 November, he wrote out two itemized pages of construction and operating costs against projected revenues, along with several pages of rough notes. He envisioned providing 20,000 electrical horsepower to Buffalo (divided equally between lighting and power), 16,000 horsepower for local electric lighting around Niagara, and 16,000 mechanical horsepower within a small radius of the falls. Such a plant would cost $5.243 million to build and $457,000 yearly to operate, creating annual revenues of $1.402 million. Edison may have drawn on the detailed calculations of conductor costs and motor efficiency that Arthur Kennelly made in late October (TAE memorandum, 14 Nov. 1889, NMPC [*TAED* X507]; Adams 1927, 1:147; Kennelly Notebook #2:77–80 [*TAED* NM024077]). Edison wrote out several more detailed estimates and projections, all undated, for a system to deliver 20,000 electrical horsepower to Buffalo. One scheme called for wires on poles forty feet above ground to carry power to just outside the city, where they would go under the surface. Another version appears to use underground cables entirely. One estimate seems to be written in the hand of Mina Edison. With varying degrees of specificity, the plans called for generating a total of 36,000 electrical horsepower by a large number of high-voltage dynamos driven singly or in pairs by shafts or wire ropes from waterwheels. The current would be generated and transmitted at 6,000 volts. At Buffalo, motor-generator machines would reduce the pressure to 220 volts for lighting or to an unspecified level for dedicated motor circuits (TAE memoranda, n.d. [1889?], DF [*TAED* D8933ACT]).

–3442–

Alfred Tate to Harold Brown

[Orange,] Nov. 11, 89.

My Dear Sir:—

With reference to your letter of 7th instant and to the matter therein referred to,[1] Mr. Edison says by all means follow it up. Westinghouse has already started in England a fifteen thousand light station,[2] and is going to try and capture the whole English trade. Mr. Edison suggests that you try and arrange with some of the English newspapers to correspond with them occasionally on this subject, giving them list of deaths &c., &c., and thus educate the English people up to the dangers of high tension currents. Very truly yours,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 34:22 (*TAED* LB034022).

1. Brown enclosed with his letter the draft of a cable he sent to the *Daily News* of London. The paper had asked him to confirm the report of a New York incident in which a horse was killed and a police officer injured by indirect contact with an insulated overhead wire. Assuming his English readers would be incredulous, Brown explained how the accident happened and stated that "such occurrences have become very common since the introduction of the high-tension alternating current." He told Edison that the Westinghouse interests had attacked the original *Daily News* report, and he asked if it would be "worth while to follow up in that benighted land?" Separately from this incident, Brown had recently met Edison's request for a list of accidental electrocutions in the United States. He enumerated eighteen such cases from 1 July to late October, the most recent being New York City lineman John Feeks. In his covering note to Edison, he tabulated the fatalities attributed to alternating current as 10 in 1886, 19 in 1887, and 42 in 1888. Brown to TAE (with enclosures), 7 Nov. and 22 Oct. 1889, both DF (*TAED* D8933ACI, D8933ABR).

2. Edison probably had in mind the Sardinia St. station of the Metropolitan Electric Supply Co., one of several that he toured while in London. The company produced high-voltage alternating current from each of its three plants, but the one on Sardinia St., operating only since 21 September, was built with Westinghouse steam engines and dynamos. The ten main dynamos had a combined capacity of 1,250 kilowatts (enough for 20,000 standard 50-watt lamps) distributed at 1,050 volts. Fleming 1890b, 703–7; "The Electric Lighting of London.—No. III," *Daily News* (London), 25 Sept. 1889, 5; "The Electric Lighting of London.—No. IV," *Daily News* (London), 26 Sept. 1889, 5.

–3443–

Edward Johnson to Uriah Painter

N York Nov 15/89.

My Dr U.H.

The fight is On. V[illard] & E[dison] have given their Brokers Orders to buy Sprague from under me—[1] I have in turn started in to Corral my friends so they will Only part with it to me Please write me stating the No of shares you have And that you will hold them subject to my advice[2]

I have taken up my Loans at [r's?][3a] & am now in full possession of all my Sprague stock—so that with those who will act with me I am sure of a clear majority—

there is to be a meeting On monday to finally settle the question whether the Edison Co will buy Out[b] the Sprague or not.[4] the Old crowd is At work buying up & will make money on this deal as they did on the Other— Yours Truly

E. H. J[ohnson].

ALS, PHi, UHP (*TAED* X154A8DE). Letterhead of Sprague Electric Railway & Motor Co. [a]Illegible. [b]Obscured overwritten text.

1. Johnson's investment in the Sprague Electric Railway & Motor Co. (SERM) was tangled with his complex personal finances (see note 2). It is not clear what prompted the move for an outright takeover by Edison General Electric, though the Westinghouse company was just embarking on the development of its own direct current railway system. Closer to home, the Sprague company's manufacturing arrangement with the Edison Machine Works had led to some dispute (see Doc. 3431 n. 6). Johnson's role in the company, moreover, had become a source of personal conflict with Edison (see Doc. 3248). Johnson and Painter had been anticipating a takeover since at least September, and Johnson urged Edison in late October to "be personally present at the final discussion of the proposed contract bet. the Edison & the Sprague Cos— You are ignorant of many important facts. . . ." Charles Batchelor noted in his journal on 13 December that the Edison General Electric Co. "have decided to take up the Sprague E. R. W. & M. Co. at par" on terms like those which it had used to acquire the Edison manufacturing shops, with no cash involved. Passer 1972 [1953], 256–57; Painter to Johnson, 5 Sept. 1889, UHP (*TAED* X154A8CR); Johnson to TAE, 22 Oct. 1889, DF (*TAED* D8944AAF); Dalzell 2010, 104–5; Cat. 1337:102 (item 620, 13 Dec. 1889), Batchelor (*TAED* MBJ004102C).

2. Painter replied two days later from Washington, D.C., enclosing certificates for 100 SERM shares. He had other certificates in New York but could not recall at the moment which were in his name and which in Johnson's; he appears to have held some of Johnson's shares as collateral for a loan. Painter to Johnson, 17 Nov. 1889; Reiff to Painter, 22 Nov. 1889; John McClement to Johnson, 28 Dec. 1889; Painter to Johnson, 29 Dec. 1889; all UHP (*TAED* X154A8DF, X154A8DH, X154A8DR, X154A8DS); Charles Spofford to Samuel Insull, 31 July 1889, DF (*TAED* D8944AAE).

3. Johnson probably meant Josiah Reiff or his employer, the New York banking and brokerage house of Woerishoffer & Co.

4. Frank Sprague had been on an extended European trip until recently. A few days after the decisive meeting on 18 November, he explained that he had been unable to "make a counter proposition, backed by plenty of capital, to offset the proposition made us by the Edison Company; but the powers on the other side, Drexel, Morgan & Company, together with the uncertain element on which it be impossible

to count, have forced me, practically, to the necessity of accepting the proposition," a course recommended by Johnson. Sprague thought the Edison offer could have been "somewhat more liberal" but decided "to accept as gracefully as possible" on the condition that he be released from his contract with SERM and left free to pursue other projects. The consolidation was announced around the end of November, and Sprague soon left the company he had started. Johnson to Sprague, 7 Dec. 1889; Sprague to W. W. Gooch, 21 Nov. 1889; both Sprague (*TAED* X120CAW, X120CAU); "Consolidation of Edison and Sprague Interests," *Electrical World* 14 (7 Dec. 1889): 369; Dalzell 2010, 104–5, 116–19.

–3444–

To Samuel Ritchie[1]

[Orange,] Nov. 26, 1889.

Dear Sir:—

Replying to your letter of 21st instant,[2] in regard to refining iron ores in Canada by means of my Magnetic Ore Separator, I beg to answer your queries categorically as follows:

"FIRST. What would be the approximate cost per ton, of the ore as mined from the ground, for crushing and separating the iron contained in it from the silica or other foreign matter, by your process?"

A. Actual cost, 62 cents per crude ton.

"SECOND. How much iron will you be compelled to waste in the rocky matter which you separate from the iron?"

A. 1½ to 2 units of original ore.

"THIRD. How high a grade of ore can you produce from an ore carrying, as mined, say forty per cent. of metallic iron?"

A. Average 65%[a] by refining concentrates, cost 10 cents a ton, 68%.[a]

"FOURTH. What would be the difference per ton in cost of producing an ore that would yield sixty per cent. and one yielding sixty-eight per cent?"

A. Ten cents.

"FIFTH. To how low a grade of ore can you use the whole product of the mine, without throwing any portion of it into the waste heap, by sorting or separating it into second class piles?"

A. It will pay to use as low as 20 unit ore.

"SIXTH. Allowing, as is usually the case in all magnetic ores, that thirty per cent, of the ore mined is thrown into the waste heap, these heaps usually carrying about forty per cent. of iron, how much of the cost per ton for mining can you save by grinding up the whole amount mined and saving all the ore contained in it?"

A. Ordinarily, mining costs $1.00 per ton; if you take everything down to 20 unit, cost generally will be 50 to 60 cents.

"SEVENTH. Can you lower the phosphorous contained in magnetic ores?"

A. We can reduce the phosphorous 75 to 80 per cent.

"EIGHTH. Will the fine ore which is obtained by your crushing and separating process be worth as much per unit of iron, when delivered at the furnaces, as the Lake Superior Bessemer ores[3] containing an equally high percentage of iron?"

A. Yes, so the iron men say, and worth more if we go to 68 per cent.

"NINTH. Calling the mining of the Canadian magnetic ores One Dollar per ton, the Railway and Lake freights One Dollar and sixty cents per ton, the duty seventy-five cents per ton, seventy per cent. of the ores carrying fifty-five per cent. and thirty per cent carrying forty per cent. Can you deliver this ore in Cleveland at as low a price per unit of iron as the Lake Superior ores can be delivered at same place, the Lake Superior ores being subject to a royalty of Fifty cents per ton and the Canadian ores being free from royalty?"

A. About the same. Can on above assumption of costs deliver a 68 per cent. ore at Cleveland for $5 per ton, sure, against a 65 per cent. ore from Lake Superior.

"TENTH. On what terms will you erect, at your own expense, upon the line of the Central Ontario Railway[4] at the mines belonging to the Anglo-American Iron Company in Canada,[5] the plant for which you have now completed the plans, having a capacity for treating one thousand tons of ore per day?"

A. I will put up mill and refine for 70 cents per crude ton up to 65%, and refine concentrates at 10 cents per ton, to bring it up to 68%, capacity 1,000 tons daily—no less. You may purchase mill at end of two years on twenty per cent earnings, being capitalized at par.

"ELEVENTH. On what terms will you put up a similar plant having a capacity of two thousand tons per day?"

A. Sixty-seven cents.

"TWELFTH. How soon can you have this plan in condition to work?"

A. Beginning May 1st, 1890—90 working days.

"THIRTEENTH. Do you think it practicable and advisable to put up a blast furnace for smelting this ore, and a steel plant for the manufacture of steel, in Canada? If so, what measures are necessary to be adopted by the Dominion Government?"

A. Yes; Protective tariff and a bonus for eight years.

"FOURTEENTH. Are you willing to become interested in the smelting and manufacturing of iron and steel in Canada?"

A. Yes.

Very truly yours,

Thomas A Edison

TLS (letterpress copy), NjWOE, Lbk. 34:234 (*TAED* LB034234). [a]"%" added by hand.

1. A native and longtime resident of the Akron, Ohio, area, entrepreneur and manufacturer Samuel J. Ritchie (1838–1908) was introduced to the Edison orbit in July 1888 as a friend of Lewis Miller. Ritchie owned coal mines in West Virginia and had invested heavily in iron mines and an associated railroad along the Canadian side of Lake Ontario. Only after he and his partners started shipping ore to Cleveland did they learn, about 1887, that the iron was metallurgically unsuitable for steel. At about that time, Ritchie began to invest in northern Ontario copper deposits that also proved rich in nickel. Frank Hastings to Charles Batchelor, 14 July 1888, DF (*TAED* D8845ACC); *DCB,* s.v. "Samuel J. Ritchie"; see note 5.

2. Ritchie wrote from New York City. His 21 November letter consisted of a few introductory sentences and a series of numbered questions, which were transcribed fully into Edison's reply. Edison drafted his answers directly on Ritchie's letter, and these were also taken nearly verbatim for the typed reply (Ritchie to TAE, 21 Nov. 1889, DF [*TAED* D8952ACG]). Their exchange came after nearly a year of occasional correspondence. Amid Ritchie's frequent travels, he seems to have visited the laboratory in March, hoped to meet Edison in London in September, and planned to return to Orange on 24 November while moving between Washington and New York (Ritchie to TAE, 11 Mar., 31 July, 2 and 23 Nov. 1889; all DF [*TAED* D8952ABD, D8952ABT, D8952ACC, D8952ACH]; TAE to Ritchie, 23 Nov. 1889, Lbk. 34:210 [*TAED* LB034210]). Their initial correspondence was mostly about iron ores, and in February Edison made a rough cost estimate of a plant for concentrating 100 tons per day. Since then, however, a number of Ritchie's letters—and samples—concerned prospects for concentrating copper and nickel ores, and Reginald Fessenden, a laboratory experimenter and chemist, later recalled working on processes for refining nickel ores about the time Edison went to Paris. Edison initiated some research on that subject at the laboratory but was not willing to discuss commercial terms. He made detailed cost notes about such a project at some unspecified time and submitted a proposal after Ritchie visited again in December 1889 or January 1890 (N-90-01-04.6, Lab. [*TAED* NA036AAB, images 8–15]; TAE to Ritchie, 4 Feb. 1889; TAE to Canadian Copper Co., 29 Jan. 1890; Lbk. 28:99, 36:426 [*TAED* LB028099, LB036426]; Ritchie to TAE, 30 Jan., 11 Mar., 24 Dec. 1889; Canadian Copper Co. to TAE [with TAE marginalia], 10 Apr. 1889, all DF [*TAED* D8952AAN, D8952ABD, D8952ACN, D8952ABL];

Fessenden 1925, 158ff). During the autumn, laboratory project #276 ("Copper & Nickel Ore") became the subject of intensive research, with experimenters Reginald Fessenden, John Dorr, and J. J. Force devoting most of their time to it (Time Sheets, WOL; N-89-06-19, Lab. [*TAED* NB071021]).

3. Rich in iron and low in phosphorous, ores from the Lake Superior region (notably Michigan's Upper Peninsula) were highly valued for making Bessemer steel and accounted for a disproportionate share of all ore used in that process. Transporting the raw material to furnaces in Cleveland and elsewhere, however, remained a significant and costly challenge. Bowlus 2010, 108, 142.

4. Samuel Ritchie and his financial partners purchased a thirty-five-mile bridge line serving the lake port of Picton, Ontario, in 1881. With Ritchie as president, it was renamed the Central Ontario Railway and its reach extended to iron mines in the area. *DCB,* s.v. "Samuel J. Ritchie"; R. Brown 2011, 109.

5. Samuel Ritchie and his associates incorporated the Anglo-American Iron Co. in 1886, with Ritchie as vice president. It was intended to exploit the iron deposits along the north shore of Lake Ontario, but the local ore's high sulphur content and competition from Lake Superior put an end to its active life the next year. *DCB,* s.v. "Samuel J. Ritchie"; Newell 1986, 101–2.

–3445–

Alfred Tate to Benjamin Stevens

[Orange,] Nov. 29, 1889.

My Dear Mr. Stevens,—

I have your letter of 25th instant from Kansas City, and am very much obliged for the enclosures.[1]

In regard to the toy business, I had a very pleasant interview the other day with Mr. Yeomans,[2] being accompanied by Mr. Field[3] (who came on from Boston for the purpose)[a] and I do not think we could place our interests in better hands. I put some questions to Mr. Yeomans in regard to the matter of manufacture and royalty, asking him if he could handle the matter as well were Mr. Edison to retain his manufacturing rights and also his royalty. Mr. Yeomans said that it would be very difficult for him to make a sale in that manner; that royalties were distasteful to the English people, and that they would also desire to acquire the manufacturing rights. He was very positive on these points, and pressed me to the conclusion that an outright sale must be made without any drawbacks. Mr. Field and myself told Mr. Yeomans that matters would be arranged between Mr. Edison and the Toy Phonograph Co., so that when Mr. Yeomans obtained his authority he would have power to dispose of the entire business.[4]

In considering this sale, and in making any estimate for the division of the proceeds, there are three elements to be considered. First, the profits of the Toy Phono. Co. derived from merchandising the dolls. Second, the profits represented by Mr. Edison's royalty; and third, the profits of manufacture. The second and the third represent Mr. Edison's interest in the business, and the question is, to determine what relation they bear to the first. As you are aware, Mr. Edison has always looked forward to building up a large industry in connection with the manufacture of these movements, and has, in fact, installed machinery for a larger output than can be consumed in America, and the other countries left to us after Europe is disposed of. He has also been at considerable expense in arranging for facilities abroad, namely, in Antwerp,[5] to assemble the movements which he had intended to forward there for the European trade.

While the toy phonograph, commercially, has been separated from the phonograph proper, no such separation was made, or could have been made, as far as Mr. Edison's experimental work is concerned. The toy has grown out of the larger instrument, and represents a portion of the vast amount of labor Mr. Edison expended in perfecting the parent machine. Perhaps I can make this more clear by stating that the toy movement is protected under all Mr. Edison's patents on the phonograph itself, both here and abroad. These patents have been taken out in all the countries in the world which afford such protection, and the toy represents some fraction of the expense connected with the original machine.

I mention all these matters to you, so as to give you a clear idea of Mr. Edison's line of reasoning and to illustrate the extent to which his interest enters into the Toy Phonograph business.

It is more easy to arrive at a satisfactory conclusion when both sides of the question are thoroughly understood by all concerned.

We have now to decide in[b] what proportion the proceeds of the proposed sale of our European business should be divided between Mr. Edison and the Toy Phonograph Company. I have had some discussion with Mr. Edison upon this point, and he suggests that the Toy Phonograph Company should take sixty-eight per cent., and himself thirty-two per cent., and that the Company should make him an equitable allowance for the excess of machinery installed at the time it was considered that the whole of the manufacturing should be done by him. This latter amount would not be large.

I have been unable to discuss this matter with anyone representing the Toy Phonograph Company, as they all desire you to be present when the question is brought up. In order to save time I place the situation before you as well as I can in a letter, so that you may have an opportunity to give some thought to it during the next ten days. Perhaps you may be able to come to some definite conclusion early enough to write me. Meanwhile I will do all I can to facilitate matters, so that Mr. Yeomans can be equipped rapidly upon your return.[6] I am corresponding with him at the present time.[7]

Wishing you a pleasant and safe homeward journey I am, yours very truly,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 34:312 (*TAED* LB034312). [a]Parentheses added by hand. [b]Interlined above.

1. Stevens wrote that he hoped "something has been or will be done with the Toy Doll European matter. I will agree in advance to whatever you think fit to advise." He enclosed an unidentified clipping (not found) and invited Tate to reply to him in New Orleans, where he planned to be from 29 November to 3 December. Stevens to Tate, 25 Nov. 1889, DF (*TAED* D8964ADI).

2. David M. Yeomans (1838?–1895) made a written offer on 26 November to form a new company abroad to exploit the toy phonograph patents in Great Britain, the Channel Islands, and Europe, promising the Edison Phonograph Toy Mfg. Co. £100,000 cash and a share in the new firm. He was now preparing to cross the Atlantic for that purpose. Originally from Kinsman, Ohio, Yeomans was a former oil merchant in Boston who had managed Smith's Vacuum Brakes Co. in London until 1880, when he went to work for the Westinghouse Air Brake Co. in the United Kingdom and continental Europe. Yeomans was also associated with the New York and Atlantic Railroad, among other enterprises, and was based at this time at 35 Wall St. in New York. U.S. Census Bureau 1963? (1850), roll M432_733, p. 296B, image 397 (Kinsman, Trumbull, Ohio); Obituary, *Boston Daily Advertiser,* 25 July 1895, 8; Yeomans to Edison Phonograph Toy Mfg. Co., 26 Nov. 1889; Tate to Yeomans, 29 Nov. 1889; Daniel Weld to TAE, 29 Nov. 1889; Tate to Robert Field, 30 Nov. 1889; Lbk. 34:348, 327, 356, 347 (*TAED* LB034348, LB034327, LB034356, LB034347); "English Railways," *Boston Herald,* 25 July 1881, 3; "The Vacuum Brake," *Engineering* 29 (19 Mar. 1880): 231; "A New Line to Coney Island," *NYT,* 11 May 1882, 8.

3. A Boston native and former reporter for the *Boston Post,* Robert Montgomery Field (1834–1902) was manager of the Boston Museum since 1864 and founder of its stock theater company ("R. M. Field at Rest," *Boston Daily Globe,* 15 Nov. 1902, 15; Obituary, *NYT,* 12 Nov. 1902, 9). A personal friend of Yeomans, Field was also a stockholder (as was his wife) and director of Edison Phonograph Toy Manufacturing Co., which he had recently helped to reorganize. Tate notified him on 22 November that Edison would agree to sell the European doll

business on the condition that purchasers not risk the appearance of failure by trying to over-capitalize it (*Electrical Review* 14 [29 June 1889]: 5; Tate to Sherburne Eaton, 6 June 1890; TAE to Field, 22 Nov. 1889; Tate to Field, 22 Nov, 1889; Lbk. 41:319, 34:149, 171 [*TAED* LB041319, LB034149, LB034171]; Stevens to TAE, 7 Oct. 1889; Edison Phonograph Toy Manufacturing Co., list of stockholders, 1 Nov. 1889; both DF [*TAED* D8964ACS, D8964ACY]).

4. Alfred Tate summarized the course of these negotiations, including his 25 November meeting with Field and Yeomans and the latter's subsequent trip to Europe, in a long memorandum in June 1890. Tate recalled then that Yeomans planned to make a quick assessment of his prospects for selling the foreign rights, returning home if a deal was not imminent. If successful, he was to receive a ten percent commission. Tate to Eaton, 6 June 1890, Lbk. 41:319 (*TAED* LB041319).

5. Philip Dyer was still looking at properties in Antwerp on 16 November, when he suggested renting a floor in the Bell Telephone Manufacturing building "if you intend to do any thing in the 'Doll Phono' this coming year." Dyer to TAE, 16 Nov. 1889, DF (*TAED* D8905AIE).

6. The Edison Phonograph Toy Mfg. Co. formally requested on this date that Edison take out foreign patents covering all his improvements on the toy. Edison was also asked to provide copies of his foreign patents on the phonograph before Yeomans went to Europe to sell the rights. A complete portfolio could not be assembled because the specifications were in the London office of George Gouraud, who happened to be in New York at the time, and Yeomans was to have instead a complete set of Edison's U.S. phonograph patents before he sailed on 18 December. He also received a general letter of introduction from Edison and, presumably, the phonograph and blank cylinders requested on his behalf. Weld to TAE, 29 Nov. 1889; Field to Tate, 2 Dec. 1889; Edgar Allien to John English, 14 Dec. 1889; all DF (*TAED* D8964ADM, D8964ADR, D8964ADZ); TAE letter of introduction, 11 Dec. 1889; Tate to Stevens, both 12 Dec. 1889; TAE to Gouraud, 21 Dec. 1889; Lbk. 35:84, 93, 95, 224 (*TAED* LB035084, LB035093, LB035095, LB035224).

7. Tate wrote to Yeomans this day to clarify the offer to the Edison Phonograph Toy Mfg. Co. (see note 2), particularly the percentage which the company was to have in any new foreign enterprise. Tate to Yeomans, 29 Nov. 1889, Lbk. 34:327 (*TAED* LB034327).

–3446–

From Lewis Miller

Akron, Ohio Nov. 30th, 1889.[a]

Dear Mr. Edison:—

The boys[1] seem to have a good deal of trouble with the battery for the Phonograph. Just when we want it to work most nicely, the battery seems to trouble; otherwise the machine is doing splendidly and generally when we are alone in the house it works all right but when we have friends or some little gathering and want it to do first-class, it gives out. It has been rather annoying. It has brought us to think about other modes for driving it. Among the rest I have thought possibly that if we could do with the incandescent lamp what we did with the arc lights at the shop,[2] the power might be reduced so as to have the same amount of force that the battery has when it is in good condition. That is, take out one of the 16 Candle-power lamps and put in in its place 16 one-candle-power lamps; then take out say one of the 16 lamps and put the phonograph motor in its place. What say you?[3] The boys have been figuring on a weight a good deal. Could we not put the weight in the cellar and bring it up through the floor in the sitting room and thus make a motor pretty cheaply by some clock-work such as they have for gas machine work;[4] or could they not use a spring power such as is used in those music boxes? Would it not run steady enough with a power[5] such as your music box has?

Have you done anything with the decarbonizing of cast iron? such as we talked of when last at your place?[6] Yours resp'y,

Lewis Miller

TLS, NjWOE, DF (*TAED* D8905AIX). Letterhead of Aultman, Miller & Co. [a]"*Akron, Ohio*" preprinted.

1. Presumably teenaged John and Theodore Miller, though their two much older unmarried brothers, Edward and Lewis, still lived in the family home. Jeffrey 2008, 170–74.

2. The manufacturing firm of Aultman, Miller & Co. replaced at least some of its arc lights with Edison municipal lamps in early 1888 (Docs. 3106 and 3135 nn. 1–2). The editors have not learned details of the installation, but in general, the municipal system was, like arc lighting, wired in series and run at a relatively high voltage (Doc. 2877 n. 1).

3. Alfred Tate replied that "Mr. Edison says that he will shortly be able to send you a water motor, in the use of which you will experience none of the annoyances that you complain of." In the meantime, Miller had written again to ask if Edison had "anything like a 'DRY BATTERY' that would drive the Phonograph for special purposes or occasions? Or a strong battery of a single cell? The boys sometimes are called out to evening gatherings and the four-jar battery is rather inconvenient to transport." Tate separately relayed Edison's recommendation that "a half-gallon Grenet battery would answer your purpose" and be easy to carry. Miller to TAE, 4 Dec. 1889, DF (*TAED* D8905AJB); Tate to Miller, both 9 Dec. 1889, Lbk. 35:1–2 (*TAED* LB035001, LB035002).

4. Mechanisms like the Springfield gas machine were popular for producing illuminating gas for individual houses without municipal service. In the Springfield design, a weight-driven fan blew air across a reservoir of volatile fuel such gasoline or naptha, creating a flammable mixture that was fed through pipes into the house. Doc. 3108 n. 6.

5. This word was typed as "lower."

6. Miller probably had in mind the electrical process mentioned by Edison in Docs. 3129, 3144, and App. 2. His most recent visit to Orange may have been in early October, when the Edisons returned from Europe.

–3447–

Alfred Tate to Jeanie Spalding

[Orange,] Nov. 30, 1889.

Dear Miss Spalding:,—[1]

Mr. Edison desires me to thank you for the verses enclosed with your kind letter to him under date 27th inst.,[2] and to say that the former are excellent and will be of great assistance to us in "loading"[a] our dolls with speech. I am sending them this morning to our TEMPLE OF ELOCUTION, where we have a number of girls engaged in making phonograms for movements.

The business of the Toy Phonograph Company is now in excellent condition. We hope to get a number of dolls on the market for the Christmas trade.[3] Very truly yours,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 34:344 (*TAED* LB034344). [a]Quotation marks added by hand.

1. Jeanie Tileston Spalding (1836–1915), a native Bostonian, was a daughter of English-born sea captain Jeremiah Spalding and Jane W. Tileston Spalding (*Massachusetts, Death Records, 1841–1915,* online database accessed through Ancestry. com, 20 Feb. 2018; Find A Grave memorial no. 139478038, online database accessed through www.findagrave.com, 17 Apr. 2018; Obituary [J. J. Spalding], *Daily Boston Globe,* 27 Nov. 1928, 6; Bullard 1833–1834, OCLC acc. record). Spalding owned 300 shares in the Edison Phonograph Toy Manufacturing Co. and, in a visit to the laboratory in May, discussed her concerns about their value and Edison's role—or lack of it—in the company. Following that meeting, she seems to have maneuvered quietly to bring investors Benjamin Stevens, Robert Field, and Daniel Weld to Edison's attention and to the fore of the company's administration (Spalding to Tate, 20 May 1889; Spalding to TAE, 12 June and 15 July 1889; Spalding to Stevens, 15 June 1889; all DF [*TAED* D8964AAZ1, D8964ABH, D8964ACF, D8964ABP]; Tate to Spalding, 14 June 1889, Lbk. 30:355 [*TAED* LB030355]).

2. The editors have found neither the rhymes Spalding enclosed with her letter nor the revisions she sent with her reply to this document on 2 December (Spalding to TAE, 27 Nov. 1889; Spalding to Tate, 2 Dec. 1889; both DF [*TAED* D8964ADL, D8964ADQ]). Back in August, Charles Batchelor advised the company that

> We are now commencing to train small voices to talk on the cylinders for these phonograph toys, and should be glad to have from you a list

> of all the little verses that you would be likely to want put on them. It matters a great deal just how the thing is said in the phonograph. Therefore we should like to have them before hand to get our small voices well practiced in the art. [Batchelor to Edison Phonograph Toy Mfg. Co., 8 Aug. 1889, Lbk. 32:63 (*TAED* LB032063)]

The company also approached Emily L. Copland Fernandez (née Bradshaw), a New York talent agent known as the "Mother of Stage Children," to recommend children with appropriate training. She could not do so but offered suggestions for how the company might create a live-in stable of girls with voice training to make recordings in Orange. Local children may have been recorded at the laboratory during December ("Mrs. Fernandez's Good Luck," *Chicago Daily Tribune,* 5 Aug. 1887, 9; "Centennial Notes," *NYT,* 25 Apr 1889: 9; Fernandez to Edgar Allien, 16 Sept. 1889, DF [*TAED* D8964ACQ1]; "Talking Dolls," *Pittsburgh Dispatch,* 3 Jan. 1890, 4).

3. In her 2 December reply from Boston, Spalding noted that "people are going to the Toy stores here, asking for the Edison dolls, & being told 'they will not probably be on the market before Christmas'—then they buy the dolls already on hand, without waiting— I hope the Works will be able to send them dancing out into the world with voices to speak for themselves, very soon!" A handful of talking china dolls, described as the first completed at the factory, reportedly were sent to Europe as gifts before the end of the year. Spalding to Tate, 2 Dec. 1889, DF (*TAED* D8964ADQ); "Talking Dolls," *Pittsburgh Dispatch,* 3 Jan. 1890, 4.

–3448–

Everett Frazar to Alfred Tate

NEW YORK. Dec. 2nd, 1889.[a]

Dear Sir:

I would suggest you having prepared as soon as can be done 9 of the new phono. spectacle attachments for Yokohama and 3 for Shanghae.[1] I am confident that these would simplify the working of the phonos. out there to such an extent as would assist us in disposing of the stock now on hand. Please let me know how soon these can be packed in two boxes, one marked Frazar & Co., Yokohama E.P.W.[2] #1 with 9 inside and one Frazar & Co., Shanghae, E.P.W. #1 with 3 inside. As soon as ready for delivery we will notify you as to where to have them sent.

Also please say how soon the four phonos. for the King of Korea,[3] the Mikado,[4] Li Hung Chang[5] and Viceroy Tseng of Nanking,[6] bearing a silver plate and to be presented with Mr. Edison's compliments, will be ready.[7] These I understand, are to have the new attachment and I would ask you to use your discretion as to whether or not they should have the treadle instead of battery movement, as less liable to get out of order when worked by the natives.[b]

Please let me know whether Mr. Churchill should make use of the blue prints or the original numbers which he took out from the Works himself.[8] In his opinion, the treadle machines are preferable to the battery, for three principal reasons; 1st.—they will be used by those not at all acquainted with the battery or the manipulations necessary to make it efficient; 2nd.—trouble and inconvenience is often possible in obtaining chemicals in that part of the world, to say nothing of the expense; 3rd.—there is always a certain amount of dirt in changing the fluids or solution, which would be prejudicial to a great many, especially those not accustomed to their use. My Yokohama firm asks me to send them[c] out one of the treadle machines or such part or parts of it as can be attached to the machines they already possess. They also ask me to send them some musical cylinders containing pieces by a FULL BAND[d] and orchestra[e] of a high class of music, such as is heard at a Thomas concert;[9] also two or three classical piano forte[f] pieces—probably 3 dozen, altogether, will suffice.[10] Yours very truly,

Everett Frazar

<X also add for Shanghae one doz in all of these.[11] E.F.>[g]

TLS, NjWOE, DF (*TAED* D8960ABB). Letterhead of Everett Frazar. [a]"New York." preprinted. [b]Paragraph enclosed by handwritten brace at left. [c]Remainder of paragraph enclosed by handwritten brace at left. [d]"FULL BAND" marked by handwritten X interlined above. [e]Marked by handwritten X interlined above. [f]"piano forte" marked by a handwritten X interlined above. [g]Marginalia written by Frazar.

1. Tate answered the next day that Edison's order had been given to the Phonograph Works for the new spectacle devices as well as the phonographs and recordings of a "high class of music" discussed in this document. Tate to Frazar, 3 Dec. 1889; TAE to Edison Phonograph Works, 3 Dec. 1889; both Lbk. 34:384, 383 (*TAED* LB034384, LB034383).

2. The Edison Phonograph Works.

3. That is, King Gojong or Kojong (1852–1919) of the Joseon or Chosön dynasty (1392–1910). His residence at the Gyeongbokgung Palace in Seoul was partially outfitted with Edison electric lighting in 1887. Pai 2016, 360; Nam 2007, 192; Doc 2678 nn. 1, 5.

4. "Mikado" was a term of Japanese origin for the Emperor of Japan that became popular in European languages during the nineteenth century. The emperor at this time was Mutsuhito (1852–1912), known posthumously as the Emperor Meiji. *OED,* s.v. "Mikado"; *Encyclopedia of Modern Asia,* s.v. "Meiji Period."

5. Li Hung Chang (or Li Hongzhang, 1823–1901) became Governor-General of Zhili in 1870. He was also superintendent of northern China trade, an associate controller at the Naval Office, and China's most

experienced statesman in negotiating with foreigners. As commander in Kiangsu, he had been active in suppressing the Taiping Rebellion, and he remained influential in building up China's arsenals with western armaments. *Brit. Acad.,* s.v. "Li Hongzhang"; *EWB,* s.v. "Tsêng Kuo-fan"; Teng and Fairbank 1982, 68.

6. Tsêng Kuo chuan (or Zeng Guoquan, 1824–1890) was Viceroy of Liangguang since 1884 and the superintendent of commercial ports and trade in South China. He was a younger brother of Tsêng Kuo-fan (Zeng Guofan), under whose command he had been a leader of Hunan militia in suppressing the Taiping Rebellion. He was also an uncle of diplomat Tsêng Chi-tsê, the eldest son of Tsêng Kuo-fan. *Anti-Foreign Riots,* 84–85; Hummel 1943, s.vv. "Tsêng Kuo-ch'üan," "Tsêng Kuo-fan," "Tsêng Chi-tsê."

7. Frazar had been corresponding since at least April about phonographs to be sent to the Japanese emperor, the Korean king, and Li Hung Chang. Doc. 3382 n. 2.

8. Sometime before the end of October, Arthur Churchill got a numbered parts list from the Edison Phonograph Works but found that it did not correspond fully with the complete set of blueprints he also acquired. In his reply to Frazar (see note 1), Tate explained that the part numbers had been changed and promised to forward an updated list, but Frazar had not received it by 11 December. Frazar to Tate, 30 Oct. and 11 Dec. 1889, both DF (*TAED* D8960ABA, D8960ABC); Tate to Edison Phonograph Works, 12 Dec. 1889, Lbk. 35:86 (*TAED* LB035086).

9. That is, an program led by conductor Theodore Thomas.

10. Frazar seems to have inquired again about the recordings almost two weeks later. In Tate's absence, Thomas Maguire replied on 16 December that the Phonograph Works promised to ship the cylinders that very day. Maguire to Frazar, 16 Dec. 1889, Lbk. 35:126 (*TAED* LB035126).

11. That is, the recordings Frazar marked with an X: a full band, an orchestra, and a piano forte.

–3449–

Alfred Tate to Joseph Stewart

[Orange,] Dec. 2, 1889.

My Dear Stewart,—[1]

I have your letter of 29th instant, in regard to circular which you have received from the Edison Manufacturing Company, and which was forwarded to you by myself.[2] The new battery which we are putting out is one recently perfected by Mr. Edison. We call it the "Edison-Lalande." Mr. Edison commenced experiments on a primary battery for the purpose of getting a good reliable cell to run the phonograph.[3] When he had completed his experiments he found that he had a cell which would not only do the work required of it in connection with the phonograph, but was so perfect, as compared with all other open and closed circuit cells, that he determined to extend its use, and I am starting the business now. I enclose herewith a circular letter which has been addressed to the various electrical supply houses throughout the United States, through which it is our intention to market these cells to a certain extent.[4] This will give you all the data you require, excepting prices, and these I can quote for you as soon as I know the size of cell that you want to use. In operating your phantom block circuits,[5] you would of course use those cells on a coil, and they are exactly what you want. I sent some of our cells to Baltimore, to work the phonoplex on one of Mr. Selden's circuits.[6] They were installed on the 20th of August last and have been running ever since. The great advantage which they possess is that the internal resistance is extremely low (.025), and remains constant during the whole life of the battery. The work which you require to be done is practically open circuit work[7] and there is no battery in the market which can do it as well as ours. I think you would want the 150 ampere hour cells, but I can tell better when I know what coils you are going to use and the resistance of the primary. By the way, Mr. Edison has given us a new coil for the phonoplex,[8] which enables us to double up our circuits. We made a test the other day from Harrisburg to Jersey City, distance 200 miles, with seven offices in the circuit, and obtained perfect results.[9] Logue is now in Harrisburg making a series of tests, and I anticipate being able to run over 200 miles. Logue has just come in and reported on his tests in Harrisburg. He operated a circuit from Harrisburg to Pittsburg, a distance of 252 miles. There were no intermediate offices on this circuit, as we had no condensers west of Harrisburg, but the result shows us that we can now handle circuits double the length of those that we were formerly able to operate successfully. Upon opening my mail this morning I find a report from the B.&O.[10] people on the cells referred to above. I enclose herewith copies of the same for your information.[11] Yours very truly,

A O Tate

TLS (letterpress copy), NjWOE, Lbk. 34:359 (*TAED* LB034359).

1. Joseph B. Stewart (b. 1859) was a district superintendent of the Baltimore & Ohio Telegraph Co. in Baltimore until sometime in 1889, when he left to become telegraph and signals superintendent of the West Shore Railroad. Stewart started working as a telegraph operator at age twelve; he entered Western Union's main New York office in 1881 and joined the B&O two years later. "Personal Mention," *Railway Age* 33 (20 June 1902): 929; Reid 1886, 761.

2. Stewart's letter is not in the Edison Papers selective digital

edition but could be among the unselected correspondence at NjWOE related to the Edison Manufacturing Co. or the phonoplex telegraph (DF [D8932, D8966]). The circular to which Tate referred may have been the one written on Edison Manufacturing Co. letterhead from Orange promoting the new Edison-Lalande cell as "the most perfect commercial primary battery" for telegraph lines. Among the cell's advertised features were low resistance (.025 ohm), small losses due to internal "local action," and "absolutely no polarization" to affect the voltage. The circular listed neither prices nor the sizes available but did invite inquiries. Clearly directed at telegraph managers, it likely was not the one described below by Tate as having been written for electrical supply outlets (Edison Mfg. Co. circular, [14 Dec. 1889], DF [*TAED* D8932AAQ1]).

3. Charles Batchelor reported an endurance test of one such cell. It ran a phonograph at normal speed for a total of sixty-two hours from 6 October to 7 November. Cat. 1337:91 (item 608, 6 Nov. 1889), Batchelor (MBJ004091a).

4. The enclosure (not found) was evidently part of a determined marketing campaign by Tate to "try and displace all other forms of cell which are now used for telephone, telegraph, signalling and motor work." After Edison discovered in October that the battery's life could be extended by covering the solution with a layer of oil, he and Tate thought it might remain in service from six to twelve months. Tate to Jacob Lattig, 29 Oct. 1889, Lbk. 33:300 (*TAED* LB033300).

5. So-called phantom circuits allowed telegraph lines to carry more than one signal at a time, differentiated by their electrical characteristics. In Edison's phonoplex system, for example, a line carried signals from one end to the other, as well as on phantom circuits between intermediate stations. The term reportedly was coined by William Orton, the late president of Western Union. *Chambers's Ency.,* s.v. "Telegraph (Multiplex Telegraphy and 'Phantom' Circuits)."

6. Charles L. Selden (1849–1930), a veteran of Western Union (where he and Edison became acquainted) and the Bell telephone system, was the superintendent of telegraph operations for the Baltimore & Ohio Railroad. Doc. 2474 n. 8; "Charles Selden Dies at Age of 81," *Baltimore Sun,* 3 May 1930, 6; "Charles Selden," *Electrical Review and Western Electrician* 59 (2 Dec. 1911): 1117.

7. That is, a telegraph circuit that was open except when closed by a key to send a signal. Telegraph circuits in the United States commonly worked on the opposite principle: current flowed continuously between batteries at each end until interrupted to send a signal. Tate referred to the local batteries in Edison's phonoplex telegraph system. The transmitter in each station had its own battery but, by virtue of being in a shunt circuit, placed little electrical load on the cell. Lockwood 1883, 133–36; Doc. 2800 (headnote); U.S. Pat. 333,290.

8. Arthur Kennelly experimented in November with induction coils and magnets for the phonoplex, and in mid-December he gave Tate a sample coil "satisfactory in every respect except provision for insulation." Tate forwarded Kennelly's report and suggestions about insulation to Bergmann & Co. Kennelly Notebook #2:93–94 (*TAED* NM024092, images 103–6); Kennelly to Tate, 11 Dec. 1889, DF (*TAED*

D8968AAU); Tate to Bergmann & Co., 21 Dec. 1889, Lbk. 35:204 (*TAED* LB035204).

9. William Logue recently sent Tate highly favorable reports about using the new battery and new induction coil on copper wires and more difficult iron wires from Harrisburg to both Jersey City and Pittsburgh. Logue to Tate, all 29 Nov. 1889; Logue test report, 30 Nov. 1889; all DF (*TAED* D8966ADR, D8966ADS, D8966ADT, D8966ADW).

10. That is, the Baltimore & Ohio Railroad, which had recently sold control of the B&O Telegraph Co. (created in 1884 for commercial rather than railroad traffic) to Western Union. Hochfelder 2012, 66; Klein 1986, 381–85.

11. The reports are not in the selective digital edition but may be among unselected correspondence at NjWOE related to the phonoplex telegraph. DF D-89-66.

–3450–

From Mina Edison

Orange NJ. 6:25 p.m. Dec 5 1889[a]

Mr Thos A Edison

All well when do you expect to come home[1] baby[2] sends Love

Mina

L (telegram), NjWOE, DF (*TAED* D8915ABH). Message form of Western Union Telegraph Co. [a]"188" preprinted.

1. Charles Batchelor noted in his journal on 29 November that "Edison & [Frank] McGowan went to Dover to look over some mining properties in that district They have over 100 to inspect & expect to be gone about 10 days." Dover is located in Morris County, N.J., about twenty miles west-northwest of Orange; Edison narrowly missed meeting Henry Livor there. He returned ("unexpectedly," according to Alfred Tate) late on 6 December. Cat. 1337:97 (item 617, 29 Nov. 1889), Batchelor (*TAED* MBJ004096); Livor to TAE, 30 Nov. 1889, CR (*TAED* CJ001ABI); Tate to Francis Upton, 7 Dec. 1889, Lbk. 34:481 (*TAED* LB034481); *WGD*, s.v. "Dover."

2. Madeleine Edison.

–3451–

Draft Caveat: Miscellaneous

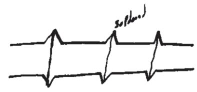
[Orange,] December 8 1889—

Caveat.[1]

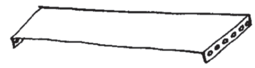
Listening tube—

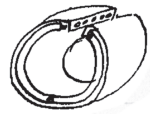
Braided over—& rubber elastic to pull together or Rubber tube over[2]

[A][3]



Rubber strip





Iron concentrating. Crush & seperate, run tailings through more powerful seperator, run concentrate from this through Crusher & reconcentrate. Now Sieve the 1st and second Concentrate through holes 50 pct Smaller than original Sieves & recrush & reseperate the product not passing through the 2nd Sieving—

To briquet.[4] Crush ~~ore to~~ concentrate to 30 @ 40[5] mesh crush Bituminous Coal to say 50 @ 80 mesh mix and put in iron pots holding say 20 lbs bring to red heat to Cake the whole

another method is to add small quantity coal tar in crude petroleum.

Another plan is to crush all to 100 mesh mixed proper quantity ~~burnt~~ Lime for flexing Silca and proper quantity of 100[a] mesh Bituminous Coal to reduce iron bake in flat iron receptiable or use a briquet machine & then bake=

Making Carbonado[6] by using arc carbons and a Carbonacious Compound—

No 1 foundry by using the moulding imprints over[a] a heated surface ie[b] in a place where the sand mould is red hot.

ADf, NjWOE, PS (*TAED* PT031AAT). [a]Obscured overwritten text. [b]Circled.

1. The editors have not found a finished caveat based on this draft.
2. Figure label is "Rubber Elastic."
3. Figure label is "Soldered."
4. Edison had been investigating ways to mold fine ore into bricks since at least early 1888, but it seems to have been a sporadic effort to this point. He did not obtain a patent on such a process until the end of 1891 and another in late 1892, both the result of applications filed in August 1891. See Docs. 3129 n. 21 and 3375; U.S. Pats. 485,840 and 465,251.

5. Edison sometimes used "@" to indicate a numerical range.

6. That is, a natural diamond-like material, black in color and formed of carbon crystals, found mainly in Brazil. *OED,* s.v. "carbonado."

–3452–

To Michael Messemer[1]

[Orange,] Dec. 11, 89.

My Dear Sir:—

I was very sorry not to have been able to comply with your request to testify at Feeks' inquest, but my engagements were such that it was impossible for me to get away.[2] I suggested sending my Assistant, Mr. Kennelly, and received a telegram from you this morning, inviting him to go, but when he reached New York the verdict had already been delivered.[3]

I understand that there is to be another inquest upon the body of the man Clausen, killed a day or so ago,[4] and if the Coroner in charge of this case would like Mr. Kennelly to appear before him, the former can go to New York at any time that he is notified. Of course he expects no compensation. Yours very truly,

Thomas A Edison T[ate]

TL (letterpress copy), NjWOE, Lbk. 35:81 (*TAED* LB035081). Signed for Edison by Alfred Tate.

1. After attending St. Francis Xavier's College in New York, Michael J. B. Messemer (1848?–1894) studied first law and then medicine, graduating from New-York Medical College in 1875. While practicing medicine, Messemer became involved in Tammany Hall politics and was appointed the city's deputy coroner. Elected to the coroner's office in 1884, he was reelected in 1887 (when he solicited Edison's support) and again in 1890. "Death of Ex-Coroner M. J. R. Messemer," *NYT,* 2 Mar. 1894, 1; Messemer to TAE, 4 Oct. 1887, DF (*TAED* D8704ADD).

2. The reference to John Feeks, the lineman accidentally electrocuted in October, was incorrect. Messemer asked Edison to appear in the case of Henry Harris, a store clerk killed on 30 November when the metal display case he was carrying on the sidewalk brushed a low-hanging arc-light wire. The Harris inquest was scheduled for 10 December. Edison telegraphed Messemer on 9 December that he could not appear but offered to send Arthur Kennelly instead. When the case was continued to the eleventh, Messemer wired for Kennelly to come (though advising that he had no funds to pay him) but was evidently too late. "Death in an Instant," *NYT,* 1 Dec. 1889, 1; Messemer to TAE, 5, 10, and 11 Dec. 1889; all DF (*TAED* D8933ACN, D8933ACP, D8933ACP1); TAE to Messemer, 9 Dec. 1889, Lbk. 35:3 (*TAED* LB035003).

3. The coroner's jury heard from several witnesses, including electrical expert Schuyler Wheeler and the Brush Electric Illuminating Co.'s superintendent of lamps, Charles Pierce. Both Wheeler and Pierce testified that the fatal wire hung less than the prescribed nine feet above the street, leading the jury to attribute Harris's death to company

negligence. Superintendent Pierce was later indicted on manslaughter charges, a fact celebrated by the *New York Times* as a measure of justice for recent electrocution victims whose deaths were not criminally prosecuted. (The Feeks case, for instance, went to a grand jury, which declined to bring charges.) "Death's Riot," *New York Evening World,* 10 Dec. 1889, 1; "The Company Responsible," *NYT,* 12 Dec. 1889, 5; "The Brush Company Blamed," *New York Evening World,* 11 Dec. 1889, 1; "An Indictment at Last," *NYT,* 28 Dec. 1889, 8; "The Indictment of Pierce," ibid., 4; "Deadly Electric Wires," *Chicago Daily Tribune,* 30 Nov. 1889, 7.

4. Peter Clausen (1861?–1889), a lineman for the North New York Electric Lighting Co., was killed on 9 December while working on a pole in Harlem. He reportedly touched a 2,000-volt line insulated with lead-soaked canvas that qualified as underwriter's wire but, as a newspaper pointed out, was "better known of late as an 'undertaker's' wire.'" As in the gruesome death of John Feeks in October, Clausen's body lay smoking across live wires for some time ("Clausen's Tragic Death," *NYT,* 11 Dec. 1889, 1; "One Martyr More," *New York Sun,* 10 Dec. 1889, 1). The Clausen case went to a grand jury two weeks later (during which time another New York fatality, that of a firefighter, occurred). Edison testified in the Clausen matter in favor of limiting electric light wires, above ground or below, to low voltage. By that time the city was pulling down arc lamps and miles of wire deemed unsafe or unauthorized ("Edison Testifies for Low Tension," *New York Sun,* 24 Dec. 1889, 4; "Victims of Deadly Wires," *New York Evening World,* 24 Feb. 1890, 1).

–3453–

From George English & Co.

Philadelphia, Pa. U.S.A. Dec. 11, 1889[a]

Dear Sir:—

In accordance with your request, we beg leave to submit to you herewith a Condensed Catalogue of the Mineral Collection[1] of Mr. Geo. F. Kunz,[2] to which we trust you will give due consideration. We also desire to call your attention to a few points in reference to the collection. In order to make it still better suited to your wants than when it was first offered to you, Mr. Kunz has since added to it a very considerable number of extra large massive specimens, principally of the metallic minerals, from which you could break off pieces for experiments.[3] We are authorized to offer you the entire collection, with these additions, at the same price which we previously quoted, viz. $8000. We will also pack and unpack the collection and arrange it for you, without charge. We shall be pleased to meet you in Orange at any time you may name, and accompany you to Mr. Kunz's house and show the collection to you.[4]

Trusting you will favor us with an early reply, we remain Very respectfully yours

Geo. L. English & Co.[5b]

(Dictated).

<O.K.>

TL, NjWOE, DF (*TAED* D8970ACB). Letterhead of George L. English & Co., dealers in minerals. [a]"Philadelphia, Pa. U.S.A." preprinted. [b]Company name written by hand.

1. This "Condensed Catalogue" is reproduced in Millard, Hay, and Grassick 1995 as Appendix A (2:625–28). Clearly intended for Edison's eyes (see note 3), its four closely written pages list well over one hundred specimens, plus smaller groupings of "Large Specimens" and "Gems and Gem Stones," all assembled by George Kunz. When the George L. English Co. offered to sell Kunz's collection in October 1889 (see note 2), Alfred Tate replied that Edison was too busy to think about it just then but would like "to receive a detailed description of it, which he would examine at the first opportunity." George English & Co. to TAE, 21 Oct. 1889, DF (*TAED* D8970ABU); Tate to George English & Co., 24 Oct. 1889, Lbk. 33:254 (*TAED* LB033254).

2. George Frederick Kunz (1856–1932) was born in New York City and studied mineralogy at Cooper Union. In 1879, he began working for Tiffany & Co., where he cultivated interests in both precious and semi-precious stones. Already a distinguished mineralogist by this time, Kunz eventually became a vice president and a director of Tiffany & Co. (*ANB* s.v. "Kunz, George Frederick"). Kunz visited the laboratory in October 1888, about the time that George English & Co. first offered his collection to Edison. Though no sale was made, he began to correspond often with Edison about specific items. A year later, in October 1889, English advised that Kunz was returning from the Exposition Universelle in Paris (where he represented his employer) and would again offer his collection, this time at a special price available only if Edison acted quickly (Kunz to TAE, n.d. [Oct. 1888], 3 Oct. 1888, and 2 Apr. 1889; George English & Co. to TAE, 1 Oct. 1888 and 21 Oct. 1889; all DF [*TAED* D8805AIL, D8805AHA, D8905ACN, D8805AGW, D8970ABU]).

3. The catalog listing of "Large Specimens" (see note 1) emphasized appearance more than utility: "If mounted in open cases, these large specimens could not fail to be a most attractive feature in your library" (p. 4).

4. Edison did accept the offer quickly, and within ten days arrangements were being made for the shipment and unpacking of the collection at the laboratory. George English promised to come out to arrange the specimens himself. Edison paid in full in March 1890. George English & Co. to TAE, 21 and 30 Dec. 1889 and 26 Mar. 1890; all DF (*TAED* D8970ACF, D8970ACI, D9064AAO).

5. George L. English & Co. were mineralogical dealers on Chestnut St. in downtown Philadelphia. The firm was formed in 1887 by George Letchworth English (1864–1944) and Edwin C. Atkinson, both 1881 graduates of the Philadelphia Friends Central School. English worked in insurance for several year after graduating while he became an active

collector. English and Atkinson took on a third partner, William Niven, in 1890 and moved to New York City. English took full control of the business from his partners a few years later. Vance 1945; "Closing Exercises of the Friends' Central School," *Philadelphia Inquirer,* 16 June 1881, 2.

–3454–

From Henry Villard

New York, Dec. 12, 1889.[a]

Dictated

Dear Mr. Edison:

I enclose herewith a translated abstract from a letter of Dr. Werner von Siemens to me just received. You will no doubt blush like a maiden. Yours truly,

H. Villard p[er] [-][b]

ENCLOSURE[c]

[Berlin, November 28, 1889][1]

"Edison's visit has delighted me very much. I found him to be a man of clear and sharp intellect, quick comprehension and far-reaching mind, who rapidly forms an opinion about the bearing of new discoveries, and who takes real delight in newly acquired knowledge. The fact that he does not work for gain only, but loves his inventions with an idealistic enthusiasm, makes him especially sympathetic to us. I am very much obliged to you for having introduced him to me.

Mr. Edison has probably told you that I have entered into an arrangement with him regarding the exploitation of my ore-process (production of copper). He will receive in a few days a special description of this process.[2]

The phonograph created quite a sensation here in all circles. It is to be regretted that no one here[d] is authorized to take orders for such instruments. I cable to Edison to-day that Minister Gossler[3] wants 50 machines for institutions of learning, and that he has requested me to help him to get them.[4] It would be desirable, in the interest of a general introduction of the phonograph, if this order were executed at an early date, and at a low figure. A department of State cannot enter into a contract for renting the instruments, as it is intended. It really seems to me that this method will not meet with public favor here.[5]

It was very agreeable to me to receive from Edison an explanation of the relation between the phonograph and graphophone, which I was able to use in his interest repeatedly.[6] As the latest competitor, the grammophone has now made its appearance, which was exhibited by the inventor Mr Berliner at the last meeting of the Electro-Technical Association.[7] At the same time an Edison phonograph was on exhibition, the speaking abilities of which proved to be far superior.

L, NjWOE, DF (*TAED* D8905AJT). Letterhead of the Mills Building. [a]"New York," and "18" preprinted. [b]Illegible. [c]Enclosure is an L (copy). [d]Interlined above.

1. The editors have supplied this date based on the cable from Siemens referred to below (see note 4).

2. Siemens promised to put a full description of the copper extraction process, improved since Edison's visit to Berlin, in the mail on 3 December. He also referred to unspecified "Negotiations" with the U.S. Patent Office about the most recent changes and urged Edison to send samples of his ore so the process could meanwhile be fine-tuned for his specific needs. (Siemens also took the opportunity to lament the inaction by Edison General Electric on the proposed manufacturing license for Siemens & Halske cables.) Alfred Tate acknowledged Edison's receipt of the description, but the editors have not found it. Siemens to TAE, 3 Dec. 1889, DF (*TAED* D8905AJA); Tate to Siemens, 23 Dec. 1889, Lbk. 35:228 (*TAED* LB035228).

3. Gustav von Gossler (1838–1902) served as Prussia's minister of public instruction and worship from 1881 to 1891. Albisetti 1983, 60; F. Leonard 1918, 7; *NDB,* s.v. "Gossler."

4. Siemens cabled on 28 November: "Government wants fifty phonographs for prussian schools give terms Electrolytic process mailed this week." The message was transcribed and forwarded to Samuel Insull the next day, and Siemens confirmed its text by postal letter. Siemens to TAE, 28 Nov. and 3 Dec. 1889, both DF (*TAED* D8905AIT, D8905AJA); Tate to Insull, 29 Nov. 1889, Lbk. 34:317 (*TAED* LB034317).

5. The portion of the Siemens cable about getting phonographs for German schools (see note 4) was also transcribed and forwarded to George Gouraud, who was in New York. Edison later offered to cover half the expense of doing so if Gouraud would bear the other half. Tate to Gouraud, 29 Nov. and 21 Dec. 1889, Lbk. 34:310; 35:221 (*TAED* LB034310, LB035221).

6. Siemens referred to Doc. 3428, for which he thanked Edison in similar terms a few days later. Siemens to TAE, 3 Dec. 1889, DF (*TAED* D8905AJA).

7. The Berlin Elektrotechnischer Verein (Electrotechnical Association), a prominent body cofounded by Siemens in 1879, hosted monthly meetings for demonstrations and the exchange of ideas and advocated as well for education in electrotechnical sciences. Its meeting on 26 November 1889 featured demonstrations of the phonograph and gramophone, the latter by inventor Emile Berliner, before a full house that included Siemens and a number of military officers. Berliner, though an American citizen, was a member of the Association. The phonograph reportedly gave clear but soft sounds while the gramophone produced much greater volume, a disparity which Berliner used to explain the advantages of his lateral recording process. The event was enthusiastically reported in the American press and came to be seen

as an important public presentation of the gramophone, though it did little for the machine's immediate commercial prospects in Berlin. W. Siemens 1966, 262–63; Morat 2014, 76–78; F. Wile 1926, 202–12.

–3455–

Alfred Tate to William Hibble[1]

[Orange,] Dec. 20, 89.

Dear Sir:—

Referring to your recent letter in regard to Mr. Gilliland's proposed visit to Ft. Myers,[2] I presume you are acquainted with the fact that Mr. Edison and Mr. Gilliland are no longer associated, and that Mr. Edison is suing the latter for the recovery of certain moneys. If Mr. Gilliland carries out his intention and goes to Ft. Myers, Mr. Edison wishes you not to permit him or any of his party to enter the Laboratory or to go about the premises belonging to Mr. Edison. Neither must any of Mr. Edison's property be used by them for any purpose whatsoever. It is unnecessary for me to go into details of instruction in this connection. You will understand from what I have said exactly what Mr. Edison's wishes are.

Thanking you for your letter, I am Yours very truly,

A O Tate Private Sec'y.

TLS (letterpress copy), NjWOE, Lbk. 35:192 (*TAED* LB035192).

1. William E. Hibble (1841?–1934) had been the caretaker of the Edison and Ezra Gilliland properties in Fort Myers since at least early 1888. He seems to have been born in England, come to the United States in 1866, worked for time in Illinois, and somehow made his way to Florida.Hibble to Gilliland, 8 Mar. 1888; Gilliland to Tate, 29 May 1888; both DF (TAED D8843A, D8843AAB); U.S. Census Bureau 1965 (1870), roll M593_219, p. 313B (Albion, Edwards, Ill.); U.S. Census Bureau 1992 (1920), roll T625_125, p. 6B (Riverside Ward 3, Riverside, Calif.); *California, Death Index, 1905–1939 (H–N, 3072),* online database accessed through Ancestry.com, 30 Oct. 2018.

2. Hibble advised Edison that Gilliland had written of his desire not to share in the cost of repairing the shared wharf, as he wished to build his own. Gilliland also gave Hibble notice that he intended to visit with unnamed guests in January. When Hibble acknowledged Tate's instructions, he expressed a preference to cut ties with Gilliland and work solely for Edison, to which Edison agreed. Tate and Hibble continued to correspond about the dividing line between the Edison and Gilliland parcels and the termination of Gilliland's fresh-water supply from Edison's pump. Hibble to TAE, 3 Dec. 1889; Hibble to Tate, 26 Dec. 1889 and 11 Jan. 1890, all DF (*TAED* D8947ABA, D8947ABB, D9041AAB); Tate to Hibble, 3 and 20 Jan. 1890; Lbk. 35:350, 36:170 (*TAED* LB035350, LB036170).

–3456–

Alfred Tate to Edison Phonograph Works

[Orange,] Dec. 21, 1889.

Dear Sirs:—

Mr. Edison desires you to prepare at once latest type phonographs (water motor) for presentation as follows:—

One (1) for Josef Hofmann,[1] with plate as follows: "This phonograph is presented to Josef Hofmann by its Inventor, Edison (insert date) 1889."

One (1) for the Czar of Russia, with plate as follows: "This phonograph is presented to His Imperial Majesty, Alexander III, Emperor of Russia, by its Inventor, Edison (fill in date) 1889."

Two (2) for the Postal Administration of Germany,[2] with plate as follows: "This phonograph is presented to the Imperial Postal Museum,[3] Berlin, Germany, by its Inventor, Edison, (Insert date) 1889." Plate on each machine.[4]

With the German Postal Administration machines, Mr. Edison wants you to send 50 first class musical cylinders, and 150 blank phonograms; also a supply of the necessary renewal parts.

With the machines for young Hofman and the Czar of Russia, you are to send with each two dozen first class musical phonograms and 50 blanks.

When these machines are ready for shipment, please inform us, and we will send you the necessary shipping instructions. Yours very truly,

A O Tate Private Secretary.

TLS (letterpress copy), NjWOE, Lbk. 35:209 (*TAED* LB035209).

1. Josef Hofmann (1876–1957), the Polish-born classical pianist, was a child prodigy who initially studied with his father, Kasimierz, himself a former child prodigy, and began concert performances in Europe at the age of seven. He made his first American tour in 1887–1888. Hofmann began studying with Anton Rubinstein in 1892 and reemerged on the concert stage two years later as a mature musician who became one of the foremost performers of his time. He later moved to the United States and became director of the Curtis Institute of Music in Philadelphia in 1926. *GMO,* s.v. "Hofmann, Josef."

Hofmann had recently written to Edison that after hearing phonograph recordings of an American singer and a clarinet solo at the Gesellschaft Urania in Berlin, he was seized by the idea "that in this same way, I could also listen to my own playing! How curious that would be, and how useful for my own musical education! Since that time, I could find no rest, till I decided to write a letter with the request, whether it would be possible to acquire such an instrument." Tate replied that Edison was "delighted to learn that you had made the acquaintance of the phonograph, and the fact that you like it so well caused him much gratification." Hofmann to TAE, 24 Nov. 1889, DF (*TAED*

D8905AIN1); Tate to Hofmann, 11 Dec 1889, Lbk. 35:72 (*TAED* LB035072).

In February 1890, Edison sent Hofmann a water-motor phonograph (number 5725), 24 musical cylinder recordings, and 50 blank phonograms. Hofmann cabled in reply: "Phonograph works wonderful" (TAE to Hofmann, 21 Feb., 21 Mar. 1890; Lbk. 37:444, 38:469 [*TAED* LB037444, LB038469]). Tate soon afterward provided a recording funnel and advice on best practices for recording the piano. During the course of 1890, Hofmann sent Edison several sets of recordings of him playing works by himself and others (Tate to Hofmann, 9 Apr., 11 Oct., and 27 Aug. 1890; Lbk. 39:387, 43:361, 44:395 [*TAED* LB039387, LB043361, LB044395]; Hofmann to TAE, 10 and 22 Mar., and 11 Nov. 1890; Hofmann to Tate, 4 July, 10 Sept. 1890; all DF [*TAED* D9148AAH, D9055AAM, D9055ABN, D9055ABA, D9055ABG]).

Tate claimed in his 1938 memoir that Hofmann had visited the laboratory as "a boy prodigy in his middle 'teens" and made some of "the earliest records of piano music" at that time. Hofmann, however, was just eleven and twelve years old on his first American tour, and he was manifestly unfamiliar with the phonograph when he encountered it in Berlin in late 1889. Tate's erroneous claims have been repeated in *The Encyclopedia of Recorded Sound* (Tate 1938, 163; *ERS,* s.v. "Hofmann, Josef."). In a *New York Times* interview in 1956, Hofmann stated that one of his prized possessions was a signed photograph of Edison with the inscription "To the genius Josef Hofmann from Thomas A. Edison." The *Times* stated the photo was dated 1888 but did not say by whom. In fact, extant correspondence suggests it likely dates from 1890, when Hofmann sent his own portrait to Edison and asked him to reply with a recording of his voice and "your likeness too, that I may be able to see you." Tate sent the photo, which Edison "dedicated" to Hofmann, in April 1890. In 1898, during his second U.S. tour, Hofmann tried to make an appointment to visit the laboratory, but it is not clear if he and Edison met then ("Hofmann at Fourscore," *NYT,* 15 Jan. 1956, X9; Hofmann to TAE, 22 Mar. 1890; Edward Thurnan to TAE, 10 Mar. 1898; both DF [*TAED* D9055AAM, D9812AAA]; Tate to Hofmann, 9 Apr. 1890, Lbk. 39:387 [*TAED* LB039387]).

2. The Postal Administration of Germany, or Deutsche Post, was created in 1867, the year after the initial unification of Germany, by the merger of the Prussian Post Office and the Holy Roman Imperial Post Office (the latter administered since the Middle Ages by the Thurn and Taxis family). After the incorporation of the final four German principalities into Germany in 1870, the Deutsche Post consolidated all of the formerly separate post offices of the German states. "The Greatest of All Post Office Men," *Postal Record* 6 (Apr. 1893): 79.

In January 1889, the Deutsche Post had asked the U.S. Post Office Department of Foreign Mails to procure the latest Edison phonograph for its Postal Museum in Berlin, along with recordings of prominent American scientists, artists, and politicians. Edison advised that the Deutsche Post should apply to George Gouraud, to whom he forwarded the request (TAE to U.S. Post Office Dept. Foreign Mails, 23 Jan. 1889, Lbk. 27:875 [*TAED* LB027875]). Edison did, however, offer to provide a phonoplex system for two stations (U.S. Post Office Dept. Foreign Mails to TAE, 30 Mar., 20 Apr., and 9 July 1889; all DF

[*TAED* D8966ABJ, D8966ABM, D8966ABY1]). Unsuccessful in making arrangements with Gouraud, the Deutsche Post again approached Edison through the U.S. postal authorities in November. This time Edison agreed to immediately send two phonographs, 50 musical cylinders, and 150 blank phonograms. The shipment went forward in mid-February with two water-power phonographs (U.S. Post Office Dept. Foreign Mails to TAE, 22 Jan., 10 and 23 Dec. 1889; all DF [*TAED* D8958AAA1, D8958ABA, D8958ABB]; Tate to U.S. Post Office Dept. Foreign Mails, 12 Dec. 1889; Tate to U.S. Post Office (New York City), 19 Feb. 1890; Lbk. 35:109, 37:397 [*TAE*D LB035109, LB037397]).

3. The German Imperial Postal Museum, the world's first telecommunications museum, opened in Berlin in 1872. Its exhibits included models of communications technologies from ancient times to the present, from chariots to steam locomotives. Other exhibits were devoted to the telegraph and telephone and to historical items connected to postal systems in Germany and other countries. Huurdeman 2003, 169; Baedeker 1905, 125.

4. A single phonograph for Czar Alexander III was shipped to Moscow on 22 February in care of Julius Block, who received it in early April. TAE to Block, 25 Feb. 1890, Lbk. 37:495 (*TAED* LB037495); Block to TAE, 11 Apr. 1890, DF (*TAED* D9055AAP).

–3457–

Article in the Orange Chronicle[1]

[Orange,] Saturday, December 21, 1889

Experiments in electric traction by Thomas A. Edison are progressing. Track from the stables along Washington Street to Valley Road has been prepared under the superintendence of Mr. A. E. Kennelly of the electric department of the laboratory.[2] At each joint a hole was dug and the web of the rail cleaned both inside and outside.[3] A dozen pieces of No. 6 copper wire were placed against the rail, a lump of clay applied for a mould, and hot solder poured. By this means a perfect electric circuit is formed the entire length of the line. A pole line from the laboratory to the road has been constructed.

Car No. 6 of the Crosstown Line[4] is at the laboratory being fitted with a new motor invented by Mr. Edison.[5] The system is one of direct current from the laboratory through one rail of the track, crossing over through the motor, and returning through the other rail.[6]

The motor car will be finished in a week or ten days and experimental runs will begin.[7]

TD (copy), NjWOE, Clippings (*TAED* SC89188B).

1. The independent weekly *Orange (N.J.) Chronicle* was established in 1869 by editor and publisher Frank Baldwin. It became the *Daily Chronicle* in 1908 (*Rowell's American Newspaper* 1887, 43). The editors have not discovered the origin of the typed copies of either this article

or an earlier one from the same paper about Edison's efforts to electrify the city's horse railway ("Edison Electric Railway Experiments," *Orange [N.J.] Chronicle,* 2 Nov. 1889, Clippings [*TAED* SC89188A]).

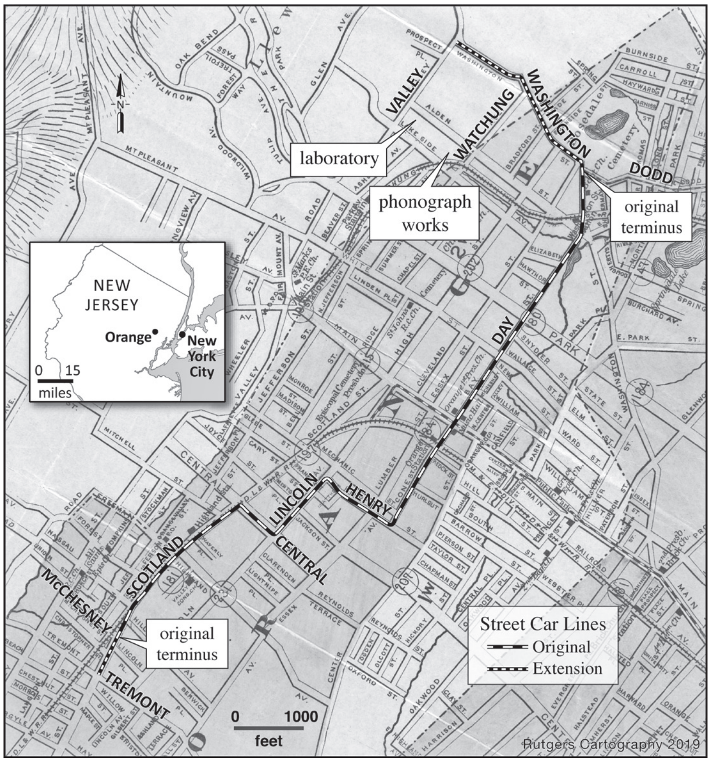
2. In the week after Edison returned from Paris, Arthur Kennelly began planning how to electrify the Orange Crosstown horse-car line. His work included comparing the "Transformer and Direct Systems of Street Car Railroad Operation on the specimen Orange Route," but it is unclear if he started before or after Edison made arrangements with F. M. Eppley, president and general manager of the Orange Crosstown and Bloomfield Railway. He worked on transformer and car motor designs for the system later in the month and in late November he calculated the "size of copper wires for rail connections on car track" (Kennelly Notebook #2:66–67, 69–70, 82–85, 87, 103 [*TAED* NM024065 (images 73–74, 76–77, 115); NM024081 (images 90–94), NM024103 (image 115)]; "Applications of Power," *Electrical World* 14 [16 Nov. 1889]: 331). At the end of October, William Burlingham also began working on "Street Car System Sketches" for the Orange Crosstown line (N-89-10-29, Lab. [*TAED* NB079]). Kennelly's plans encompassed the entire Orange Crosstown line (see note 4), including the 1888 extension of the northeastern end. Edison seems to have electrified only that northeastern extension by running a power line on telegraph poles from the eastern corner of the Edison Phonograph Works property along Watchung Ave. to tracks on Washington St. (TAE to George Hartford, 7 Nov. 1889, LM 2:162 [*TAED* LM112162]).

Work on electrifying that section of the rail line began at the end of October, when a laborer was hired to bring one of the horse cars from the car barn to the laboratory. Draftsman E. Kolben came on at the same time to work on plans for motors; he joined William Burlingham, who began helping Charles Batchelor and Kennelly with motor design a few weeks earlier. After Kolben was discharged on 23 November, draftsman P. C. Stuart was assigned to motors in addition to his other duties. Two pattern makers, J. S. Birney and John Hopkins, also began working on motors at the end of October, along with five others who spent part of their time on the same project in November and December. Experimenters Samuel Blau and Joseph W. Harris spent significant time in early November on motors and construction work, and A. J. Thompson worked with Kennelly on transformers at the end of December. All told, twenty-seven laboratory machinists devoted part of their time to motors or line construction in November and December. Edison hired five additional machinists specifically for the electrification project, although only one was still there at the end of the year. Eight of the laboratory's full-time staff worked at least part time on constructing the system during November and December, and two of them also assisted with motors. Nearly half of the men working on the electrification project were laborers, only seven of them full-time staff members. As work intensified in December, Edison hired an additional forty-five laborers. They stayed from a few days to several weeks and worked exclusively on construction, except for one man who also assisted with motors. Edison also employed one rail worker and two pavers. Finally, two boys were brought on to help with winding motors and transformers. According to laboratory time sheets for the last three months of 1889, Edison had one hundred fifteen men, including

Kennelly and Batchelor, on the Crosstown Railway project, of whom fifty-seven worked exclusively on it.

A "Statement of Experimental Accounts to January 1st 1890" indicates that Edison and Henry Villard shared the expenses for this project. By that date, construction costs amounted to $4,338 and work on the motors totaled $10,498. An additional $527 was spent on transformers. The alteration of the Sprague motor was paid for by the Edison Machine Works, amounting to $597 by the end of 1889. DF [*TAED* D9064AAA).

3. Laboratory experimenter Reginald Fessenden recalled years later that, at Edison's request, he developed a two-step chemical process that cleaned the rail ends much faster than could be done by hand. Fessenden 1925, 158.



Orange Street Car Railway.

4. The Orange Crosstown and Orange Valley Street Railway was chartered in May 1886 and renamed the Orange Crosstown and Bloomfield Railway when it expanded to the latter city in 1888. The original 2.25 mile line was a single-track horse car line that jogged southwesterly from a car barn and stable east of the laboratory, at the corner of Washington and Dodd Sts., to a terminus at Scotland and McChesney Sts. The line was extended in both directions in 1888: on the southern end, a few blocks more on Scotland St. to Tremont St. and, on the other side, northwest up Washington St. (paralleling the laboratory property a few blocks away) to a point on Valley Rd. almost due north of Edison's laboratory. *The Revised Charter of the Town of*

Orange 1886, 158–63; *Street Railway Journal* 4 (Jan., Feb., Apr., July 1888): 29, 57, 109, 187; Eid and Barker 2007, 50.

The Orange railway had experimented with Leo Daft's overhead electric system from April to September 1887 while the original line was still under construction. Car number five was equipped with a motor while the others continued to be drawn by horses. The experiment apparently ended due to a failure to obtain a franchise for electrification, but the company retained ownership of two Daft electric motors. "The Daft Electric Railway, Orange, N.J.," *Electrical World* 9 (23 Apr. 1887): 191; Eid and Barker 2007, 50–51; *Poor's Directory* 1890, 1212.

5. Before leaving for Paris, Edison had instructed his staff to design a new streetcar motor (see Doc. 3391).

6. On 30 November, Charles Batchelor described "the method of connecting rails for conductivity on the Valley road branch." He noted on 5 December that they were "making 15 joints a day on the railroad" and laying a light third rail in the tracks. He also produced a table showing the energy delivered to their experimental car. Time Sheets, WOL; Cat. 1337:85, 98, 102 (items 615, 618, and 620; 30 Nov., 2 and 5 Dec. 1889), Batchelor (*TAED* MBJ004095C, MBJ004098, MBJ004102A).

7. It is unclear if the motor utilized for the Orange Crosstown line was Edison's new design or a Sprague motor modified for the purpose at the end of December and beginning of January (Time Sheets for weeks ending 26 Dec. 1889, 2 and 9 Jan. 1890, WOL; Kennelly Notebook #2:137, Lab. [*TAED* NM024122, image 148]; Cat. 1337:98, 107, 109, 112 [items 618, 632, 635, 640, 648; 2 Dec. 1889, 3, 9, and 19 Jan. 1890], Batchelor [*TAED* MBJ004098, MBJ004107, MBJ004109, MBJ004112A]). Three weeks into the new year, Edison apprised John Vail of the Sprague Electric Railway and Motor Co. (by then a subsidiary of Edison General Electric) that "We have just about completed our experiments on the street car motor, and when we are ready to make our first practical test in public, I will be very glad to have you come over, witness the failure and help us out." Three days later, Arthur Kennelly recorded a "Test of the Transformer #1 after placing it in its box beneath the track," as well as a "Test of Car Track resistance when Transformer #1 running"; the first transformer tests took place in early December (TAE to Vail, 21 Jan. 1890, Lbk. 36:231 [*TAED* LB036231]; Kennelly Notebook #2:104, 147, Lab. [*TAED* NM024104, NM024104A, NM024147]).

–3458–

From Sherburne Eaton

New York December 27, 1889[a]

Dear Sir:

Re Edison United Phonograph Company.[1] Reporting progress in this matter, I hand you enclosed a copy of a letter[2] written the Seligman law firm[3] today. Gouraud went over the contracts yesterday.[4] He thinks the Seligmans will object to certain parts of them, but I will not trouble you with the details until the objections are made.

Please present my compliments to Mrs. Edison, and wishing you both the Compliments of the Season, I remain, Sincerely yours,

S. B. Eaton

TLS, NjWOE, Miller (*TAED* HM89ACB). Letterhead of Eaton & Lewis. [a]"*New York*" preprinted.

1. When incorporated in New Jersey on 24 February 1890, the Edison United Phonograph Co. assumed the worldwide rights to Edison's phonograph patents beyond the United States and Canada, as well as the rights of the International Graphophone Co. Eaton was gathering copies of Edison's prior contracts and preparing a proposal for the company's governance and management structure. It was to have nine board members: four affiliated with Edison (including Edison, Eaton, and George Gouraud), four with the International Graphophone Co. (including Jesse Seligman) and one "neutral" member (Darius Ogden Mills). Edison was to be vice president. Edison United Phonograph Co. certificate of incorporation, 24 Feb. 1890; Eaton memorandum, 25 Feb. 1890; both Misc. Legal (*TAED* HX90062, HX90063).

2. The enclosure to Seligman & Seligman summarized a thick dossier of agreements and proposed contracts governing the current and projected disposition of rights (including manufacturing rights) to Edison's phonograph patents. Copies of a number of those documents were to be enclosed with Eaton's letter to Seligman & Seligman. The editors have not attempted to reassemble those records, some of which Eaton had not yet found. Others were not ready, including a "Statement of the Business of Edison Phonograph Works" that Insull was asked to write only that day. One proposed agreement would "transfer back to Mr. Edison all that he originally assigned to Col. Gouraud"; another allowed the Edison Phonograph Works to take over the Hartford factory formerly used by the International Graphophone Co. Eaton expressly stated that allusions elsewhere to more than one October 1887 contract between Edison and Gouraud were mistaken; only one agreement had been made, and the intention to divide it between Great Britain and the rest of the world was never carried out. Eaton to Seligman & Seligman, 27 Dec. 1889, Miller (*TAED* HM89ACC).

3. Seligman & Seligman, founded in 1882, was located in the Mills Building at 15 Broad St. in New York City. The partners (Theodore, Eugene, and George W. Seligman) were cousins and specialists in corporate and financial law. *Gould's Lawyers' Diary* 1889, 339; *Martindale's American Law Directory* 1885, 333; Obituary [Eugene Seligman], *NYT,* 29 Nov. 1936, N9; *NCAB* 30: 264 [George Seligman].

4. Gouraud had been in New York for about six weeks, having sailed (with Stephen Moriarity) on 9 November aboard the *Umbria*. Jonathan Young to Tate, 9 Nov. 1889, DF (*TAED* D8959AGC).

Appendix 1

Edison's Autobiographical Notes

From 1907 to 1909 Edison wrote a series of autobiographical notes to assist Frank L. Dyer and Thomas C. Martin in their preparation of his authorized biography.[1] Edison produced Document D, including notes on queries posed by Martin, probably about October 1907.[2] Those recollections were followed by those in books A and G, made in September and October of 1908. This material was incorporated into the initial chapters of the biography, which were complete by February 1909; Martin then requested additional personal reminiscences from Edison in order to flesh out the remaining chapters.[3] William Meadowcroft, who was coordinating the project, acknowledged in May 1909 that the continuing lack of Edison's additional material was a "very serious affair," and the next month Edison produced the notes in books E and F.[4] Some of these formed the basis for oral interviews with Martin, the typed transcripts of which became documents B and C; together, these four documents served as the basis for anecdotes related in later chapters of the published biography.

Three of the documents contain sections related to events in the period of Volume Nine; those sections are published here.[5] Edison sometimes referred in the same paragraph to events in periods covered by more than a single volume; these paragraphs will be reprinted as appropriate. Each document has been designated by a letter and each paragraph has been sequentially numbered. A few individual items that were inadvertently omitted from previous volumes are presented here. Items that are either solely by the interlocutor or completely indistinct as to time have not been transcribed.

1. Dyer and Martin 1910. The designations A through F were assigned to these documents in Volume One, which also contains a general editorial discussion of them. See *TAEB* 1 App. 1; document G was discovered later.

2. An Edison notebook entry from that time reads "Martins book take Lab note bk 4, 1 Extra…answer Martins immediate notes." PN-07-09-15, Lab. (*TAED* NP077).

3. Martin to TAE, 23 Feb. 1909, Meadowcroft (*TAED* MM001BAP).

4. Meadowcroft to Martin, 24 May 1909, Meadowcroft (*TAED* MM001BAQ).

5. The autobiographical documents designated A, C, E, and G do not refer to the period of this volume. The sections from A published in Volumes One and Four were drawn from a typed version of Edison's notes prepared by William Meadowcroft. However, a copy of Edison's original manuscript, in a notebook labeled "Book No. 1 September 1, 1908 Mr. Edison's notes re. Biography," was published in Part IV of the microfilm edition. Meadowcroft (*TAED* MM002).

B. FIRST BATCH

The following is a transcription of a typescript that Edison revised. At the top of the first page is a handwritten note: "First Batch Notes dictated by Mr Edison to T. C. Martin June, 1909.— Pencil indicates Mr. Edison's revision." Thirteen of its eighty-one paragraphs likely pertain to the period covered by this volume. Many of them concern Edison's visit to the Exposition Universelle and his travels in Europe, and these overlap closely with volume two (chap. 29) of the authorized Dyer and Martin biography. Section sixty refers to work that occurred during the period of either *TAEB* 7 or 8.

Visiting the Paris Exposition of '89.

[38] At the Universal Exposition at Paris in 1889 I made a personal exhibit covering about an acre. As I had no interest in offering to sell anything I was showing, and no companies I was pushing, the whole exhibition was made for honor and without any hope of profit. But the Paris newspapers came around and wanted pay for notices, which we promptly refused; whereupon there was rather a stormy time for a while; but nothing was published. While at the Paris Exposition I visited the Opera House. The President of France sent me his private box. The Opera House was one of the first to be lighted by the incandescent lamp and the managers took great pleasure in showing me down through the labyrinth containing the wiring, dynamos, etc. When I came into the box, the or-

chestra played "the Star Spangled Banner" and all the people in the house arose; whereupon I was very much embarassed. After I had been an hour at the play, the manager came around and asked me to go down underneath the stage, as they were putting on a ballet of 300 girls, the finest ballet in Europe. It seems there is a little hole through the stage, with a hood over it, in which the prompter sits when opera is given. In this instance it was not occupied, and I was given the position in the prompter's seat and saw the whole ballet at close range.

[39] The city of Paris gave me a dinner at the new Hotel de Ville, which was also lighted with the Edison light. They had a very fine installation of machinery. As I could not understand or speak a word of French, I went down to see our minister, Mr. Reid, and got him to send a deputy to answer for me, which he did, with my grateful thanks. Then the telephone company gave me a dinner, and the engineers of France; and I attended the dinner celebrating the fiftieth anniversary of the discovery of photography. Then they sent to Reid my decoration, and they tried to put a sash on me, but I could not stand for that. ~~When I had~~ My wife had me wear[a] the little red button ~~on and~~ but when I[b] saw Americans coming I would slip it out of my lapel, as I thought they would jolly me for wearing it.

Visiting the Eiffel Tower.

[40] I visited the Eiffel Tower at the invitation of Mr. Eiffel. We went to the top, and then there is an extension and a small place in which was Eiffel's private office. In this was a piano. When my wife and I arrived at the top, we found that Gounod, the composer was there. We stayed a couple of hours and Gounod sang and played extempore for us. We spent a day at Meudon, an old palace given by the Government to Jensen, the astronomer. He occupied three rooms and there were 300. He had the grand dining room for his laboratory. He showed to me a gyroscope which he had got up, which made the incredible number of 4,000 revolutions in a second. A modification of this was afterwards used on the French Atlantic lines for making an artificial horizon to take observations for position at sea.

[41] In connection with this a gentleman came to me a number of years afterwards, and I got out part of the plans. He wanted to make a gigantic gyroscope weighing several tons to be run by an electric motor and put on a sailing ship. He wanted this gyroscope to keep a platform perfectly horizontal

no matter how rough the sea was. Upon this platform he was going to mount a telescope to observe an eclipse off the Gold Coast of Africa. But for some reason it was never completed.

Sights at the Paris Exposition.

[42] I spent several days in the Exposition at Paris. I remember going to the exhibit of the Kimberly Diamond Mines, and they kindly permitted me to take diamonds from some of the blue earth which they were then washing by machinery to exhibit the mine operations. I found several beautiful diamonds but they seemed a little light weight to me when I was picking them out. They were diamonds for exhibition purposes—probably glass.

A Visit to Pasteur.

[43] Pasteur invited me to come down to the Institute, and I went and had quite a chat with him. I saw a large number of persons being inoculated and also the whole modus operandi, which was very interesting. I saw one beautiful boy about 10 years, the son of an English lord. His father was with him. He had been bitten on the face and was taking the treatment. I said to Pasteur: "Will he live?" "No" he said "the boy will be dead in 6 days." He was bitten too near the top of the spinal column, and came too late!"

Old Masters.

[44] Of course, I visited the Louvre and saw the Old Masters, which I could not enjoy. And I attended the Luxembourg with modern masters, which I greatly enjoyed. To my mind[c] ~~T~~the Old Masters are not art; ~~they are~~ [~~notions~~?].[d] ~~t~~Their value is ~~in the curiosity~~ their scarcity,[e] and vanity of men with lots of money.

Joking with Pender.

[45] Sir John Pender, the master of the cable system of the world at that time, I met in Paris. I think he must have lived among a lot of people who were rather solemn, because I went out riding with him in the Bois de Boulogne and started in to tell him American stories. Although he was a Scotchman he laughed immoderately. He had the faculty of understanding it and quickly seeing the point and wit of the stories, and for three days after I could not get rid of him. Finally I made him a promise that I would go to his country house at Foot's Cray,

in England. So I went there and spent two or three days telling him stories.

[46] While at Foot's Cray I met some of the backers of Ferranti, then putting up a gigantic alternating current dynamo near London, to send ten or fifteen thousand volts up into the main district of the city for electric lighting. I think Pender was interested. At any rate the people invited to dinner were very much interested and they questioned me as to what I thought of the proposition. I said I hadn't any thought about it, and could not give any opinion until I saw it. So I was taken up to London to see the dynamo in course of construction and the methods employed, and they insisted I should give them some expression. While I reluctantly gave them my opinion, I did not want to do so. I thought that commercially the thing was too ambitious, that Ferranti's ideas were too big, just then: that he ought to have started a little smaller, until he was sure. I understand that this installation was not commercially successful, as there were a great many troubles. But Ferranti had good ideas and he was no small man.

Terrors of the English Channel.

[47] When I crossed over to England I had heard a good deal about the terrors of the English Channel as regards sea sickness. I had been over the ocean three times and did not know what seasickness was so far as I was concerned myself. I was told that while a man might not get seasick on the ocean, if he met a good storm on the channel, it would do for him. When we arrived at Calais to cross over, everybody made for the restaurant. I did not care about eating, and did not go in the restaurant, but my family did. I walked out and tried to find the boat. Going along the dock I saw two little smoke stacks sticking up, and looking down saw a little boat, "Where is the steamer that goes across the Channel?" "This is the boat" There had been a storm on the North Sea that had carried away some of the boats on the German steamer and it certainly looked awful tough outside. I said to the man: "Will that boat live in that sea?" "Oh yes," he said "but we've had a bad storm." So I made up my mind that perhaps I would get sick this time. The managing director of the English railroad owning this line, ~~and~~ Forbes, who heard I was coming over ~~and~~ placed the private saloon at my disposal. The moment my family got in the room with the French lady's maid and the rest, they commenced to get sick, so I felt pretty sure I was in for it. We started out of that little inlet and got into the

channel, and that boat went in 17 different directions simultaneously. A whole lot of waiters came along with paper bowls which they dealt out like a deck of cards and everybody took a bowl. I waited a while to see what was going to occur and then went into the smoking department. Nobody was there. By and by the fun commenced. Sounds of all kinds and varieties were heard in every direction. They were all sick. There must have been 100 people aboard. I didn't see a single exception but the waiters. I asked one of the waiters about the boat itself and was taken to see the engineer and went down to look at the engines, and saw the captain. But I kept mostly in the smoking room. I was smoking a big cigar and when a man looked in I would give a big puff; and everytime they saw that they would go away and begin again. The English Channel is a holy terror, all right, but it didn't affect me. I must be out of balance.

A Visit to Berlin.

[48] After leaving Paris we went to Berlin. The French papers came out and attacked me because I went to Germany, and said now I was going over to the enemy. I visited all the things in Berlin of interest, and then on my way home I went with Helmholtz and Siemens in a private compartment to the meeting of the German Association of Science at Heidelberg, and spent two days there. When I started from Berlin on the trip I commenced to tell American stories. Siemens was very fond of those stories and would laugh immensely at them and could see the point [--][d] and ~~the~~ humor by his imagination; but Helmholtz could not see one of them. Siemens would quickly explain in German the point, but Helmholtz could not see the humor, although he understood English and Siemens could speak it. Still the explanations were made in German. I always wished I could have heard the Siemens explanations of the point of the story. At Heidelberg, my assistant, Mr. Wangemann showed the phonograph before the Association.

Iron Ore Separation.

[56] In the early days at Menlo Park I had a method of separating iron ore from the worthless rock, and got it very perfect. After I got through with the electric light, I took this matter up, to see whether the large bodies of low grade magnetic ore in New Jersey could not be utilised. I sent out surveyors with magnetic needles and located bodies of low grade ore miles in length and of enormous widths running from the Delaware River to the New York State boundary—probably

more iron in those mountains if it could be extracted by magnetic concentration than would supply the world for 10,000 years. I tried first the deposits down in Berks County, Pennsylvania, but found that the ore there had too much titanium and was objectionable to the blast furnace managers. I then started works for concentrating at the terminus of the New Jersey Central branch of the Lake Hopatcong railroad. After 8 years of personal experimenting of the hardest kind I had reached a point where I was near commercial success, when the Mesaba Range ore and the panic came along together and reduced the price of ore 200 per cent, giving me no margin, and making it hopeless. I had a great struggle financially to carry the thing out and had spent upwards of $2,000,000, but the company did not fail. It is still in existence and it does not owe a cent except to myself.[f] The insurance companies when I shut down canceled my insurance. I asked the reason why. "Oh" they said, "this thing is a failure. The moral risk is too great." All right, I am glad to hear it. I will now construct buildings that won't have any moral risk." I determined to go into the Portland Cement business. I organized a company and started cement works, with my cheapening machinery, at New Village, N.J., which have now been running successfully for several years. I had so perfected the machinery in trying to get my ore costs down that the making of cheap Portland cement was an easy matter for me. I built these works entirely of concrete and steel, so that there is not a wagon load of lumber in it and so that the insurance companies would not have any possibility of having any moral risk. Since that time I have put up numerous factory buildings all of steel and concrete, without any combustible whatever about them—to avoid this moral risk. I am carrying further the application of this idea in building private houses for poor people in which there will be no moral risk at all—nothing whatever to burn, not even by lightning!

Breaking a Snow Blockade.

[60] One time when they had a snow blockade in New York I started to build a machine with Batchelor—a big truck with a steam engine and compressor on it. We would run along the street, gather all the snow up in front of us, pass it into the compressor, and deliver little blocks of ice behind us in the gutter taking one tenth the room of the snow, and not inconveniencing anybody. We could thus take care of a snow storm by diminishing the bulk of material to be handled. The preliminary experiment we made was dropped because we went into

other things. The machine would go as fast as a horse could walk.

TD (typescript), NjWOE, Meadowcroft (*TAED* MM004). [a]"My wife had me wear" interlined above in pencil. [b]"but when I" interlined above in pencil. [c]"To my mind" interlined above in pencil. [d]Canceled. [e]"their scarcity" interlined above in pencil. [f]"except to myself" interlined above in pencil.

D. BOOK NO. 2

This undated notebook, labeled "Book No. 2," contains a mix of narrative passages, questions, and notes in Edison's hand. The first two pages are a memo by Meadowcroft, dated 9 January 1920, recounting the preparation and use made of this material between 1907 and 1910. The next sixty-six pages alternately present narrative passages and brief references to various anecdotes. The next nine-page section is labeled "Martin's Questions." The remaining twenty-one pages contain only notes. Twenty sections may pertain to the period of this volume. Sections relating to Paris and Edison's travels in Europe correspond with chapter twenty-nine of the authorized biography by Dyer and Martin. Section 339 refers to work that occurred during the period of either *TAEB* 7 or 8.

[110] Trip to Chicago Poker—Bergman thought it was phila—[a]

[307] Exhibit Paris Expstn & No profit. refused pay for notice Pender funny stories followed me 3 days—[b]

[308] Visit to Opera House played star Spang banner. presdts box & son attended state Dinner— also visited the presdt & academy Sciences—Reed giving me commandeur uneasy wearing button—[b]

[309] Old Masters Louvre Dinner by the City— Reids asst to answer for me between 2 frenchmen— Couldnt understand[c]

[310] Eiffel Tower— Gounod.[d]

[311] Meudon— Jensen[d]

[312] Mascart. dinner— pipes. Kelvin[d]

[313] Picked fake diamonds, Kimberly Exhibit.

[314] Berlin— dinner Siemens, phono— Dubois Reymond finger move. Potsdam—to Heidelberg Helmholz & Siemens jokes Helmholz cldnt understand—

[315] Vist. Foots Cray— Pender Farranti stockholders

afraid of it, visit station. Duke Marlboro— wife didnt want me go   invitation about Duke visit Lab—[e]

[316] Voyage not sick—[f]

[318] Villards Edison Genl— money recd— 500 000[g] in bank safe full bonds gal uneasy.

[336] Invention of Kinetoscope & occurances— film industry

[339] Phono— North Amer Co— Thomlinson & Gilland Litigation. North Amer—[h] International Co. poor management   they took Cash I cash & notes. Loaned International Co money took notes. worded so never need pay it

[340] Compessing snow ny to block ice

[361] Invented seperate motor each coil[g] principle[g]— afterwards words worked up by sprague & now employed Elevated—[f]

[371] ~~Mc~~[i] Board unanimous nothing in ~~El~~ Trolly Except Villard[f]

[380] Lelande Battery

[381] Phono wks

AD (photocopy), NjWOE, Meadowcroft (*TAED* MM005). [a]Paragraph overwritten with a large "X" and followed by dividing mark. [b]Paragraph overwritten with a checkmark and followed by dividing mark. [c]Paragraph overwritten with a checkmark and four slashes. [d]Paragraph overwritten with a checkmark. [e]"about Duke visit Lab—" interlined above. [f]Paragraph overwritten with an "X." [g]Obscured overwritten text. [h]"North Amer—" interlined below. [i]"~~Mc~~" interlined above.

F. NOTES (JUNE 1909)

This notebook includes sixteen pages in an unlabeled section in Edison's hand relating to the Dyer and Martin biography. These pages are preceded by a memo to Edison from William Meadowcroft dated "June 28/09" stating that these notes had been copied. There is a typed version of the notes in the William H. Meadowcroft Collection at the Edison National Historic Site. Three of its twenty-four items pertain specifically to the period covered by this volume.

[18][1] Meadowcroft find the photogh where I was testing first phono for Gouraud—had Ear Tubes— This photo was

made at end of 5 days work without sleep the longest seige I ever had, some interesting details about this E

[21] ~~B~~ In— Bergmann sold out the factory at ave B & 17th st to the Edison General Electric Co, & finally he went to Berlin Germany & Established our ~~large~~ Electrical Works run on the American plan & with American tool makers. This works is now one of the largest in Germany Employing 10 000 men & pay 18% dividends[a] yearly on a large Capitalization

[23] One time there was to be a convention of the managers of Edison Illuminating Cos at[a] Chicago. There was a large lot of representatives from the East so a private car was hired. At Jersey City a poker game was started by one of the delegates Bergmann was induced to enter the game This was played right through to Chicago without any sleep ~~as~~ The boys didnt mind this I had gotten them immune to it. Bergmann had ~~worn~~ won all the money & when the Porter came in & said Chicago, Bergmann jumped up & said What!! Chicago, I thought it was only philadelphia—

AD (photocopy), NjWOE, Meadowcroft (TAED MM007). aObscured overwritten text.

1. This item is variously numbered 16.

Appendix 2

Edison's Draft List of Inventions for Henry Villard

Two versions of this list are presented under headings A and B below. One is in Edison's hand; the other consists of typed headings with additional handwritten notes by Edison.[1] Both versions are undated, but Edison probably worked on them in connection with his proposal to Henry Villard in mid-January 1888 about financing the expenses of the Orange laboratory (Doc. 3144).[2] An undated draft contract with Villard toward that end included the laboratory expenses itemized below and also referred to a list of experimental projects on which Edison had started making experiments.[3] The editors have not transcribed sets of numbers and calculations with no obvious bearing on the contents of these lists.

1. A third version, also undated but with typed explanatory notes based on Edison's handwritten comments in the second version, is in Misc. Legal (*TAED* HX88036A).
2. See also Doc. 3129.
3. Articles five and six of draft contract, n.d. [Jan. 1888?], Misc. Legal (*TAED* HX88036).

A.

All ~~p~~ inventions where.

.P

Atlantic Cable process whereby 500 w[ords] a minute might be done. The Cable Co might willingly pay 200 000 for exclusive right yet the~~se~~ apparatus required to be mfd could be made in a week by one man.[a]

A Cotton Picker which is a self contained machine would be all mfg. The profits & biz would in this case not be based on the patent right but on the selling of the machine itself[a]

process for desilverizing ingot copper electrolytically. The essential feature here is the process worked in a mill or factory. There is not value to the patent except it protects the factory. The sale of the patent right for Illinois would only result in the establishment of another factory ~~theref~~ & as this is diametrically opposed to the Cos policy the whole patent would cover the factory process—[a]

Invention whereby electricity could be obtained direct from coal, being merely an attachment of a small device already mfd to a stove. The thing attached being generally mfd & is so very small in proportion to the whole ~~That no separate~~ this cannot be considered an invention Capable of mfr in the sense of the contract But if the ~~machine~~ stove attachments are entirely new novel & different & it is essential to introduce the invention that the whole should be mfd then it wld be covered

[Selt? 8 gms—?][b]

Cast iron—[c] ~~by exhaustion~~—[~~vac~~?][d]

small articles are cast & then have to be malliabized to prevent their being brittle—

Metallic battery cloth used in US in flowing [indirectly?]—[b] silk is now used

new process for manuf window[e] [plan?][b] glass tubing by machinery— less cost—

artificial Mother of Pearl—

India ink— almost done—as good & very dark working on a long time[f]

Ink for blind— letters swell— can do it now but letters are [porous?][b]

butter from milk— & factory machinery for it

Coal sorting machine— to [brick?][b] slate out of coal—

Artificial Ivory

Rail road automatic signal by induction—

E from coal dozen methods— very promising

Decarbonizing of pig iron electrically will admit of making mallieable castings [try luck?]—[b]

1— Cotton Picker

2— Ice Machine or Street Cleaning Machine

3— New System of depositing metals—

4— Apparatus for deaf people

5— ~~Electr~~ Direct conversion—

6— Drawing fine[g] wires &

7— Manufacture of fine bolting cloth & sewing—
[–][b]

Villiard to decide—
60 for inventors— half & half—
40 for Capital—
If sell— even—
right to take regular experiment as payment of expenses—

Expenses to date about	$20,000
Weekly expenses—	600—

Will[h] not want to build a factory for 4 months—
He to put up money for factory & he have 60 of profits of Manufacture & Edison—he to decide it—[a]

Interest on investment	9200—
Insurance	1100—[h]
Taxes	1200—
Depreciation	9200—
Supplies	7000—
Labor	<u>62 400—</u>
Cost of Materials for Experiments	90,100

AD, NjWOE, DF (*TAED* D8805AAJ1, images 1–4). [a]Followed by dividing mark. [b]Illegible. [c]"Cast iron—" connected by line to "small articles" below. [d]Canceled. [e]"n" interlined above. [f]"working on a long time" interlined below. [g]Interlined above. [h]Obscured overwritten text.

B.

Following are the things I propose working:

1. A cotton picker to do for cotton what the mowing machine has done for cereals. <a great many experiments have been made on this— There is a great demand for such a machine— I believe I can accomplish it— Will build small Experimental one this summer>

2. Apparatus for deaf people to increase Audition, (enormous demand). <Have been working on this for 8 years I have not less than 10 000 inquiries filed during this period requesting prices etc due to squibs in newspapers stating I was working on it—>

3. Improved Battery for general service (nothing in the market is satisfactory, the demand enormous). <Am working on this. The sales of battery in this Country is over a million

dollars annually & would be three times that amount if a good battery Could be obtained—>

4. Increasing the speed for signall'g on sub-marine cables to permit of the use of a cable direct from New York to London at 1/3 present cost. <Experiments are going on with this— All the Conditions are known of Cable signalling accurately.[a] ~~and~~ & they point to a certain direction to work on[b]>

5. Electro deposit in high vacuo for commercial use to replace the present Electrotype system. <There is a great future in this process results so far are Excellent. am Experimenting on arriving at practical apparatus to carry it out. plating industry in this Country probably represent Capital of 5 million>

6. Artificial silk. <Have been working on this about 8 years. The strength of the fibres eludes me. I believe it can be done but will take time. The value would be enormous[b]>

7. Malleabilizing cast iron cheaply. <Could the time be reduced from 1 week to a few hours, The saving effected in this Country alone would Exceed 10 million dollars— I have got very good results & am continuing Expmts—>

8. Drawing fine sizes of Brass wire and sizes where there are 40 per cent duty. <Making an apparatus now ~~$40,000~~ 40,000 lbs are used in US weekly. from experiments I have made I am sure this new process can be made a success>

9. Snow compressing machine for cleaning streets. <We have tried the preliminary Experiments and have complete working drawing Costs NY City alone 75 000. to clear the principal streets after each[b] snow storm of 6 inches fall— Machine drawn by 6 horses simply sweeps up snow & compresses it to Square blox of Ice as fast as horses walk— This enables the carts to carry 4 times the load they do now & still only be a 2/3ds Load— also the blox can temporarily be piled up in gutter as paving blox are now done>

10. Refining copper Electrically. <Experiments undertaken for the Parrott Copper & Silver Co.— yearly output 3 million dollars, $65 per ton silver in each ton Copper.>

11. Cutting Ice and Wood by electricity. <This is an old Idea but I am trying to make it practical for rough work. I believe under proper conditions pine lumber Trees[b] and other large standing trees can be cut for less money by this process than any other.>

12. Manufacture of cheap bolting cloth. <present price $3 @ 4 per yard made out silk— I have a method of cheapening it>

13. Manufacture of sheet glass and tubes. <This is something quite original if successful will entirely change present methods of making window glass>

14. Artificial Mother of Pearl. <Still working on this— fair results, have & can[c] produce~~d~~ Surfaces on metallic foil ~~for~~as cheap as newspapers can be printed ie[d] a mother pearl surface can be given to a sheet of metallic foil as cheap as a Sheet of paper can be printed from a block of type>

15. Cheap India Ink. <Got this very near— can be made cheap from Lampblack obtained by burning natural gas in a peculiar way[e]— [~~manufa~~?][f] demand very considerable in this Country & would increase if cheapened>

16. Ink for the blind. <This is an ink which on contact with paper causes it to swell up Enormously & harden— Ink is too poisonous as yet. This is <u>sentimental</u>>

17. Regenerative Kerosine burner. <got some results>

18. ~~Defractive surface for Ornamental uses~~.

19. Coal sorting machine. <Experimenting on it— rather difficult but very valuable if it can be done practically>

20. Butter direct from the Milk. <The Large Butter making Machine Cos have been after me repeatedly to take this matter up— They say the ~~milk~~ Dairy industry represents 650 000 000 annually & that the present processes used in the great Creamery[b] Establishments is very bad I have been trying some modern Ideas on the subject & believe I can bring out something valuable—>

21. Artificial Ivory. <Been working on this 13 years Havnt got it—but live in hope>

22. Magneto R.R. Signal System. <Working this up now>

23. Electricity direct from coal. <Have 12 men on this got some results in every direction— a practical Solution will change the motive power & Lighting of the world & be worth a large sum—>

24. Decarbonizing pig iron electrically. <propose working on this>

TD, NjWOE, DF (*TAED* D8805AAJ1, images 6–18). [a]"of Cable signalling" added in right margin. [b]Obscured overwritten text. [c]"& can" Interlined above. [d]Circled. [e]"from Lampblack…way" interlined above. [f]Canceled.

Appendix 3

List of Edison's "Dead Experiments for 1888"

This list, created by bookkeeper John Randolph in a laboratory account book in December 1888, represents an unusual administrative culling of Edison's lines of research. Randolph preceded each entry with its associated account number and followed it with a dollar amount; the items came to a total of \$6,308.42. He noted at the bottom that these were "Sundry Experiments, conducted in 1888 transferred to an Account to be called 'Dead Experiments.'"

Some of the projects listed here, like mimeograph ink, were active lines of research in 1888 and appear elsewhere in this volume; others, like the pyro magnetic dynamo, were of greater concern in earlier years. Some, notably the typewriter, disappeared briefly and returned under new project numbers that presumably represented fresh lines of work.[1] The "New Force" and "Etheric Force" stand out because, far from being "dead," they would show up repeatedly in Edison's notebooks and idea books for years to come.

Pearl Experiment
Type Writer Ex
Incandescent Gas Lamp Ex
New Force Ex
Pyro Magnetic Dynamo
Plating Gauze
Magic Lantern
Anvil Ex
Primary Battery
Etheric Force
Silk Fibre
Experiments on Light

Induction on Glass
Substitute for Rubber
Rotating Thermo Ex
Thermo Battery
Mimeograph Ink
Pyro Carbon Cells
Condenser Ex
Snow Compressor
Cotton Picker Ex
Chemical Disturbance
Storage Battery
Deaf Instrument
Metal Test
Tobacco Ex
Flying Machine
Volcanite Solvent
New Street Car Motor

AD, NjWOE, Journal #5:147, Accts. (*TAED* NL016A1, image 75). Written by John Randolph.

1. Laboratory project numbers are listed in N-87-24, Lab. (*TAED* NL002).

Appendix 4

Orange Laboratory Experimental Staff, 1888–1889

We present the following list of experimental staff as a way of providing an overview of work at the laboratory during the period of Volume 9. The information below comes primarily from time sheets and from documents and annotation in this volume (see index). Citations are provided for other sources of information.

Aylsworth, Jonas Walter (Fall 1887–). At the beginning of 1888 he became the primary researcher on wax cylinders. He subsequently set up wax cylinder manufacture at the Edison Phonograph Works and later at Silver Lake.

Badgley, Fred (6 Mar. 1888–2 June 1889). Began as a boy helping in the store room and then running the elevator. At the end of June 1888, he was listed as a machinist helper but the following week he was transferred to the lamp test room where he assisted until he left the laboratory.

Batchelor, Charles (1873–). Edison's long-time principal experimental assistant, he was involved in equipping the laboratory and hiring members of the staff. When Edison was out of town he had charge of the laboratory. He also served as general manager of the Edison Phonograph Works. He worked on a number of important experimental projects and played a major role in the development of the talking doll.

Bergh, F. P. (22 June 1888–6 June 1889). Worked in the galvanometer room on experiments related to electromagnetism, electric light and power, ore milling, batteries, the phonograph, bug killing, and the flying machine.

Blan, Samuel (14 Oct. 1889–). Worked on carbon filament experiments and the electrification of the Orange Crosstown Railway.

Boynton, E. C. (27 July 1888–3 Dec. 1888). Worked in the galvanometer room on experiments related to non-magnetic watches, transformers and dynamos, electric meters, electrocution, batteries, and bug killing.

Braun, Dr. Johannes (10 Jan. 1888–12 Apr. 1888). Worked on hydrocarbon experiments for lamps. Laid off when experiments completed.

Brigham, Alexander F. (23 Aug. 1888–24 Dec. 1889). Apparently began working as a machinist on transformers and dynamos and became an experimenter in late October when he began working on phonographs. He also worked on experiments related to the phonoplex, electric lamps, insulation, ore milling, and copper and nickel ores. Sometime in 1889 he became an assistant to Reginald Fessenden in the chemical laboratory. For his work with Fessenden in 1889, see N-89-06-21.2, Lab. (*TAED* NB072AAA).

Brown, Charles A. (31 Dec. 1887–). Worked in the lamp pump room until October 1888, when he became William Dickson's primary assistant on ore milling and motion pictures.

Bushong, Frank W. (2 Oct. 1888–10 Nov. 1888). A chemist who worked on lamp experiments, ore milling, and mailing cylinders before being laid off in November 1888.

Colgate, Arthur Eastman (30 Dec. 1887–23 July 1888). Worked in the galvanometer room, where he experimented on ore milling, the phonograph, batteries, rock drills, the multiple dynamo, and other electrical apparatus. He also assisted in the physiological experiments.

Cornice, Dr. L. (6 Feb. 1888–12 Apr. 1888). Worked on hydrocarbon experiments for lamps. Laid off when experiments completed.

Cousens, A. E. (30 Dec. 1887–12 Apr. 1888). Worked on insulation, the typewriter, and recording pressure indicator before he was laid off.

Cuntz, Johannes H. (19 Jan. 1888–14 July 1888). Worked with Kennelly in the galvanometer room on magnetism and later on the permeability of iron. TAE letter of recommendation, 31 Aug. 1888, DF (*TAED* D8815ABZ).

Deems, Dr. Frank Melville (4 Jan. 1888–). Trained as a physician, he worked on several projects in 1888, including deriving carbon from different materials, the typewriter, the phonograph, and insulation. In the fall of 1888, he had primary responsibility for bug-killing experiments that continued into December 1889. He also conducted experiments on beef preservation and electro-medical treatment in the fall of 1889.

Degnan, John (8–25 July 1888). Worked on peroxide plates for storage batteries.

Deshler, Charles (30 Jan. 1888–). Reassigned from the Edison Lamp Works in Harrison, N.J., to the lamp test room at the laboratory, where he was involved in lamp and vacuum experiments. Deshler to TAE, 11 Nov. 1887; Francis Upton to TAE, 18 Apr. 1888; Alfred Tate to Edison Lamp Co., 20 Apr. 1888; William Meadowcroft to Tate, 26 July 1889; all DF (*TAED* D8734AAY, D8833ABE, D8815ABC, D8939ABS).

Devonald, Fred (3 Sept. 1888–). Although listed as a laborer who cleaned rooms on the second floor, he also apparently functioned as a laboratory assistant, helping with experiments on peroxide plates and the water contact ore milling machine.

Dickson, William K. L. (1887–). The primary experimenter on ore milling and motion pictures. He also served as the laboratory photographer.

Dorr, John Van Nostrand (Mar.? 1888–). Although he does not appear in the time sheets until August 1888, Dorr later claimed that he started work as a boy in the chemical laboratory under Erwin von Wilmowsky and became an experimenter after Reginald Fessenden took over the chemical lab. His work included insulation experiments, lamp experiments (including filaments in Edison's Special Room 3), ore milling, and copper and nickel ores. Pioneers Bio.

Dunham, George H. (1 June 1888–12 Oct. 1888). Worked on the phonograph and was also sent to exhibit the phonograph in Canada.

Engle, H. M. (21 Oct. 1889–). Worked on the electric car brake and ore milling.

Fell, Lawrence (2 Mar. 1888–12 Apr. 1888?). Assisted with ore milling experiments. He may be the boy L. Fell who worked at the laboratory in Room 3 during the second half of January 1888.

Fessenden, Reginald Aubrey (1887–). Edison placed him in charge of the chemical laboratory after discharging Erwin von Wilmowsky in May 1888. The main projects Fessenden worked on were insulation, carbon filaments (including in

Edison's Special Room 3), copper and nickel ore, and other miscellaneous experiments.

Force, John Joseph (30 Jan. 1888–). A glassblower and experimenter who worked primarily on lamp and pump experiments, including on filaments in Edison's Special Room 3, but also assisted with ore milling, the phonograph, copper and nickel ore, and miscellaneous other experiments.

Force, Martin (1876–29 Nov. 1888). Conducted lamp experiments and managed the work of five other experimenters connected with the lamp factory.

Gladstone, James W. (16 Jan. 1888–25 July 1889). Assisted in the galvanometer room, where he worked on battery and other electrical experiments. He also worked on phonographs and filaments experiments, including in Edison's Special Room 3, and was Edison's primary assistant on the tobacco bleaching experiments.

Griffin, J. P. (24 May 1888–5 Sept. 1888). Worked on insulation and lamp experiments, the production of chemically pure zinc, and the phonograph.

Hagan, Henry J. (7 Mar. 1889–). Worked on phonograph and musical cylinder experiments and briefly on the typewriter.

Hamilton, Hugh de Coursey (1882–14 June 1888). Hamilton was on the experimental staff at Menlo Park and later at the Lamp Factory laboratory. He began work at the Orange laboratory at the beginning of January 1888. During 1888, he worked on phonograph experiments and then brought the phonograph to London and worked with George Gouraud to introduce it there.

Harris, Joseph W. (4 Nov. 1889–). Began as an assistant to Arthur Kennelly in the galvanometer room, where he worked on electrical mains, cast wrought iron, the etheric force, and iron-ore prospecting instruments. He was also involved in work on electrification of the Orange Crosstown Railway.

Hugenin, Alfred (c. 17 Aug. 1888–). Worked on tools for mailing cylinders, molds for wax cylinders, and a press for molding cylinders for the toy doll.

Kennelly, Arthur (30 Dec. 1887–). Headed the galvanometer room and conducted or supervised all electrical experiments and tests.

Kenny, Patrick (1878–). Worked on artificial pearl experiments, carbon filaments, and the typewriter; also worked on preparations for the Paris Exposition.

Lawrence, T. F. (14 Sept. 1888–3 Jan. 1889). Worked in the galvanometer room on a variety of experiments, including bug killing, electric meters, batteries, the multiple dynamo, transformers, and the phonograph. He also assisted with the 5 December electrocution experiments.

Lehmann, Theodore (2 Apr. 1888–). One of the primary assistants to Kennelly in the galvanometer room, he worked on insulation, batteries, electric meters, chemically pure zinc, electrical distribution, etheric force, the phonograph, and miscellaneous other experiments. He also assisted with the physiological experiments and the Orange Crosstown Railway electrification.

Lozier, Robert Ten Eyck (30 Dec. 1887–28 Dec. 1888). Worked for the Edison Electric Light Co. before transferring to the laboratory at the end of 1887. Worked in the galvanometer room on the pyro carbon cell, the thermo battery, insulation, the Lalande battery, multiple dynamo, and transformers. He also worked on the Llewellyn Park electrical system. Pioneers bio.

Marshall, David Trumbull (Fall 1887–). Worked on carbon filaments, lamp and vacuum experiments, incandescent gas burners, and insulation.

Marshall, John Trumbull (1887–). Had been employed by the Edison Lamp Works since 1881 and joined Edison's laboratory there in 1887. He then transferred to the Orange laboratory in fall 1887, where worked on lamp and vacuum experiments. Doc. 3039 n. 6.

Menzel, C. (8–25 July 1889). Worked on peroxide plates.

Miller, Walter H. (30 Dec. 1887–). Began as a shop boy but soon became a machinist and was an experimenter by June 1888. He worked chiefly on the phonograph and musical cylinders. He was also involved in phonograph exhibitions and was sent as phonograph expert to Milwaukee in May and June 1889.

Murray, G. G. (16 Jan. 1888–5 Apr. 1888). Began as a boy in the chemical laboratory and in early February became an experimenter doing general laboratory work.

Osmann, Frank (30 Dec. 1887–1 Nov. 1888). Began work in the store room, but in late February 1888 graduated to experimenter. Early on he assisted with lamp experiments and then chiefly worked on the phonograph.

Ott, John (1875–). Edison's long-time model and instrument maker and experimental assistant. He was superintendent of experimenters at the Orange Laboratory.

Payne, Arthur Coyle (May 1887–15 May 1889). An experimenter at Edison's lamp factory laboratory in 1887, he conducted a search for filament materials in Mexico before joining the staff of the Orange laboratory on 12 January 1888. He worked mostly on phonograph cylinders and seems to have been involved in cylinder manufacture at the Phonograph Works.

Preston, G. B. (21 Aug. 1888–17 Nov. 1888). Worked as an experimenter in the galvanometer room where he assisted with non-magnetic watch tests, multiple-dynamo experiments, tests of electric meters, storage battery experiments, experiments on chemically pure zinc, and transformer tests.

Read, Herbert (30 Dec. 1887–). Began as a store room boy and by mid-March 1888 was working as an experimenter in the lamp test room.

Reed, Charles J. (25 Nov. 1889–). Performed work for the New Jersey and Pennsylvania Concentrating Works.

Roninger, Edmund (30 Dec. 1887–). Began as a laborer assisting W. K. L. Dickson with ore-milling experiments in the chemical room but seems to have acted at times as a laboratory assistant; also worked on the phonograph and made cylinder tools.

Sawai, Kiyoshi (3 May 1888–9 Aug. 1888). A physics graduate from Imperial University in Tokyo, he worked on electromagnetism and telephone experiments.

Schulze-Berge, Dr. Franz (30 Dec. 1888–). Worked primarily on electro vacuum deposition and electroplating experiments related to wax cylinder duplicaton. He also worked on battery and pressure indicator experiments and had charge of the library.

Sheehan, Matthew (1 May 1888–). Began as a store room and errand boy before becoming an experimenter in late May 1889, working on the production of musical cylinders.

Sullivan, John (22 Nov. 1888–24 June 1888). Worked chiefly on lamp experiments, including filaments in Edison's Special Room 3, and also assisted with experiments on copper and nickel ore.

Tait, Harold (16 Aug. 1888–29 Sept. 1888). Worked on insulation.

Thompson, A. J. (16 Dec. 1889–). Worked in the galvanometer room on quartz ball experiments and the transformer for the Orange Crosstown Railway.

Thorp, R. C. (21 Sept. 1888–10 Nov. 1888). Worked primarily on phonograph experiments.

Tyng, F. E. (25 Jan.–21 July 1888). Worked on phonograph experiments.

Van Buren, Frank P. (19 Oct. 1888–7 Mar. 1889). Worked on insulation.

Wangemann, Adelbert Theodor Edward (1 June 1888–). Worked on phonograph experiments, particularly recording; went to Paris in June 1889 to exhibit the phonograph in conjunction with the Paris Exposition and remained in Europe exhibiting the phonograph well into 1890.

Washer, George P. (3 June 1889–). Worked on lamp regulation experiments.

Wheeler, John (27 June 1889–26 July 1889). Worked on musical cylinders.

White, C. (11 July 1888–6 Aug. 1888). Worked on electroplating, phonograph, electric drill, Porter engine, multiple dynamo, and insulation experiments. He also worked as a machinist on phonographs and the magnetic bridge.

Wiley, Osgood (16 Jan. 1888–20 Sept. 1888). Worked on magnet experiments, copper and zinc plating, the pyromagnetic dynamo, and ore milling. He was sent to London to exhibit Edison's ore separator.

Wilmowsky, Erwin von (Fall 1887–16 May 1889). Head of the chemical laboratory until discharged by Edison. He conducted or oversaw a variety of chemical experiments related to insulation, carbon filaments, ore analysis, batteries, meters, and other projects.

Wurth, Charles (2 Nov. 1888–). Worked on and off as a machinist and experimenter for Edison since 1875. He joined the Orange laboratory as a superintendent of machinists but also undertook experimental work himself, notably assisting Dr. Franz Schulze-Berge on duplicating records. Wurth's testimony, *Edison v. Lambert*, 255–56, Lit. (*TAED* QP009255).

Wurtz, Dr. Henry (11 Oct. 1888–28 Mar. 1889). Worked on insulation until discharged by Edison.

Zahn, Frederick (22 Oct. 1888–16 Nov. 1888). Worked on mailing cylinders for the phonograph.

Appendix 5

Edison's U.S. Patent Applications, 1888–1889

The following list of U.S. patent applications completed by Edison in 1888 and 1889 is an extension of *TAEB* 8 Appendix 2.A and a companion to lists of successful applications in preceding volumes.[1] Not every application resulted in a patent, and the editors give such information as they have been able to learn about those that did not.[2] The list is arranged by the case number assigned by Edison's patent attorneys, Richard Dyer and Henry Seely. The cases fall largely in chronological order by the date on which Edison executed (signed) the application; the six execution dates that lie out of sequence are shown in bold type. Edison's drafts of applications (where known) are identified in the notes, and those selected for publication in this volume are indicated by document number. Drafts that did not result in completed applications are not included in the list. In cases where the title of an application changed during the examination process, the title listed below is that of the patent as it was issued.

Edison's patenting activity is one indicator of his inventive efforts. This list accordingly reflects his concentration on developing market-ready phonograph instruments and their allied appliances and processes of manufacturing and recording. Edison also began to avail himself again of the legal protections afforded by caveats, a sort of proto-patent document filed with the Patent Office, and the caveats he drafted in these years are a related gauge of inventive work (see Caveat Files, PS [*TAED* PT041]). Neither his patents nor caveats, however, mesh as closely with notebooks and other daily records of laboratory work as in years past, simply because of the relative paucity of dated laboratory records at this time. In 1889, Edison proposed to use caveat filings as a partial substitute, at least, for documenting his work in laboratory notebooks.[3]

This appendix, unlike the corresponding ones in *TAEB* 6–8, does not list patents taken out by Edison's employees or associates because of the limited scope of such activity in this period.[4]

Case	*Exec. Date*	*Appl. Date*	*Issue Date*	*Pat. No.*	*Title*
750[5]	01/09/88	01/16/88	Abandoned		Making Phonogram Blanks
751	01/17/88	01/30/88	10/18/92	484,582	Duplicating Phonograms
752	01/21/88	01/30/88	08/19/90	434,586	Electric Generator
753	01/21/88	01/30/88	08/19/90	434,587	Thermo-Electric Battery
754[6]	01/21/88	01/30/88	Abandoned		Preparing Phonogram Blanks
755[7]		01/30/88			Phonogram Blanks
756[8]	01/24/88	01/30/88	Abandoned		Making Phonogram Blanks
757	Missing				
758	01/30/88	02/04/88	05/08/88	382,417	Process of Making Phonogram-Blanks
759	02/02/88	02/06/88	09/11/88	389,369	Incandescing Electric Lamp
760[9]	02/20/88	03/02/88	12/04/88	394,105	Phonograph-Recorder
761[10]	02/20/88	03/02/88	12/04/88	394,106	Phonograph-Reproducer
762[11]	02/20/88	03/02/88	05/08/88	382,418	Phonogram-Blank
763[12]	02/20/88	03/02/88	Abandoned		Phonogram Blanks
764[13]	02/20/88	03/02/88	10/02/88	390,462	Process of Making Carbon Filaments
765	03/03/88	03/08/88	05/08/88	382,419	Process of Duplicating Phonograms
766	03/03/88	03/08/88	04/15/90	425,762	Cut-Out for Incandescent Electric Lamps
767	03/19/88	03/29/88	01/15/89	396,356	Magnetic Separator
768	04/28/88	05/07/88	11/27/88	393,462	Process of Making Phonogram-Blanks
769	04/28/88	05/07/88	11/27/88	393,463	Machine for Making Phonogram-Blanks
770	04/28/88	05/07/88	11/27/88	393,464	Machine for Making Phonogram-Blanks
771	05/09/88	05/21/88	06/14/92	476,991	Method of and Apparatus for Separating Ores
772	**05/07/88**	05/21/88	02/12/95	534,208	Induction-Converter
773[14]	05/14/88	05/21/88	Abandoned		Separating Metals from their Ores
774	05/22/88	06/07/88	12/20/92	488,190	Phonograph-Reproducer
775	05/22/88	06/07/88	04/02/89	400,646	Phonograph Recorder and Reproducer

776	05/26/88	05/29/88	12/20/92	488,189	Phonograph
777[15]	05/26/88	05/29/88	Abandoned		Duplicating Stencils
778[16]	05/29/88	06/07/88	Abandoned		Gas Incandescents
779	Missing				
780[17]	06/21/88	07/02/88	03/15/92	470,925	Manufacture of Filaments for Incandescent Lamps
781	Missing				
782	06/30/88	07/07/88	04/02/89	400,647	Phonograph
783[18]	06/30/88	07/07/88	Abandoned		Phonographs
784	06/30/88	07/07/88	03/24/91	448,780	Device for Turning Off Phonogram-Blanks
785	06/30/88	07/07/88	11/27/88	393,465	Method of Preparing Phonograph Recording Surfaces
786	07/14/88	07/17/88	12/04/88	393,966	Method of Recording and Reproducing Sounds
787	07/14/88	07/17/88	04/21/91	450,740	Phonograph-Recorder
788	07/14/88	07/17/88	11/08/92	485,617	Incandescent-Lamp Filament
789	07/14/88	07/17/88	11/27/88	393,466	Phonograph-Recorder
790	07/14/88	07/17/88	09/30/90	437,423	Phonograph
791	07/14/88	07/17/88	12/04/88	393,967	Method of Recording and Reproducing Sounds
792	07/27/88	07/30/88	06/20/93	499,879	Phonograph
793	**07/14/88**	07/30/88	06/17/90	430,274	Phonogram-Blank
794	**07/16/88**	07/30/88	03/24/91	448,781	Turning-Off Device for Phonographs
795[19]	07/27/88	07/30/88	Abandoned		Phonogram Blanks
796	07/27/88	07/30/88	04/02/89	400,648	Phonogram-Blank
797[20]	07/00/88				Phonogram Boxes
798	08/31/88	09/15/88	02/12/89	397,705	Method of Winding Field-Magnets
799	09/12/88	09/20/88	06/17/90	430,275	Magnetic Separator
800	**08/31/88**	09/15/88	09/02/90	435,690	Method of Making Armatures for Dynamo-Electric Machines
801[21]	09/12/88	09/20/88	05/10/92	474,591	Process of Extracting Gold from Sulphide Ores

802	Missing				
803[22]	09/17/88	09/19/88	Abandoned		Phonogram Cylinders
804[23]	09/19/88	09/27/88	02/05/89	397,280	Phonograph Recorder and Reproducer
805[24]	09/29/88	10/11/88	Abandoned		Envelopes for Mailing Phonograms
806[25]	09/29/88	10/11/88	Abandoned		Duplicating Phonograms
807	09/29/88	10/11/88	04/02/89	400,649	Method of Making Phonogram-Blanks
808	09/29/88	10/11/88	02/12/89	397,706	Phonograph
809	10/15/88	10/17/88	04/02/89	400,650	Method of Making Phonogram-Blanks
810[26]	10/15/88	10/17/88	09/30/90	437,424	Phonograph
811	10/15/88	10/17/88	07/09/89	406,568	Phonograph
812[27]	**01/10/89**	01/19/89	12/20/92	488,191	Phonogram-Blank
813	10/31/88	11/05/88	12/04/88	393,968	Phonograph-Recorder
814[28]	01/10/89	01/19/89	Abandoned		Making Phonogram Blanks
815	01/10/89	01/19/89	07/09/89	406,569	Phonogram-Blank
816[29]	01/10/89	01/19/88	Abandoned		Extracting Iron from its Ores
817[30]	01/10/89	01/19/88	Abandoned		Methods of Coating Objects with Liquid Material
818	01/12/89	01/15/89	06/17/90	430,276	Phonograph
819[31]	**02/09/89**	02/13/89	Abandoned		Phonographs
820	02/01/89	02/11/89	07/09/89	406,570	Phonograph
821[32]	02/01/89	02/11/89	Abandoned		Phonographs
822	02/01/89	02/11/89	07/09/89	406,571	Process of Treating Phonogram-Blanks
823[33]	02/01/89	02/11/89	09/30/90	437,425	Phonograph-Recorder
824	02/01/89	02/11/89	07/09/89	406,572	Automatic Determining Device for Phonographs
825	02/01/89	02/11/89	06/17/90	430,277	Automatic Determining Device for Phonographs
826	02/01/89	02/11/89	07/09/89	406,573	Automatic Determining Device for Phonographs
827	02/01/89	02/11/89	07/09/89	406,574	Automatic Determining Device for Phonographs
828	02/01/89	02/11/89	07/09/89	406,575	Automatic Determining Device for Phonographs

829[34]	02/01/89	02/16/89	07/09/89	406,576	Phonogram-Blank
830[35]	03/22/89	03/25/89	11/12/89	414,759	Phonogram-Blank
831	03/22/89	03/25/89	11/03/91	462,540	Incandescent Electric Lamp
832	03/22/89	03/30/89	11/12/89	414,760	Phonograph
833[36]	04/08/89	04/10/89	06/17/90	430,278	Phonograph
834[37]	04/25/89	05/11/89	10/14/90	438,309	Method of Insulating Electrical Conductors
835	06/15/89	07/02/89	04/29/90	426,527	Automatic Determining Device for Phonographs
836	06/15/89	07/02/89	03/11/90	423,039	Phonograph for Dolls or other Toys
837	06/15/89	07/02/89	06/17/90	430,279	Voltaic Battery
838[38]	06/29/89	07/02/89	10/10/93	506,216	Apparatus for Making Glass
839	Missing				
840	07/16/89	08/10/89	11/12/89	414,761	Phonogram-Blank
841[39]	07/16/89	08/10/89	Abandoned		Electric Motor for Phonograph
842	07/20/89	08/10/89	09/30/90	437,426	Phonograph
843	07/20/89	07/29/89	06/17/90	430,280	Magnetic Separator
844[40]	07/29/89				Phonographs
845[41]	07/29/89	08/01/89			Magnetic Separation
846[42]	08/01/89	08/07/89	Forfeited		Magnetic Separation
847	11/14/89	11/18/89	12/29/91	465,972	Phonograph
848	12/11/89	12/27/89	12/30/90	443,507	Phonograph
849	12/11/89	12/27/89	03/23/94	513,095	Phonograph

1. This list begins with Case 750; the previous one in *TAEB* 8 ends with Case 747, executed on 5 December 1887. The missing Cases 748 and 749 presumably were executed in December or the first days of January 1888.

2. The editors have compiled the information in this chart mainly from the list of Edison's patents on the Thomas Edison Papers website (edison.rutgers.edu), where many of the case numbers and dates appear in the published specifications, and from the patent application files at NjWOE (PS [*TAED* PT032]). There are also limited descriptions of applications in a brief list filed with other undated laboratory notes (Unbound Notes and Drawings, c. 1887–1898, Lab. [*TAED* NSUN14, image 183]).

3. See Doc. 3365.

4. The editors have identified only a few such patents. One was issued to Ezra Gilliland in November 1888 (and assigned to the Edison Phonograph Co.) for mechanical modifications to the phonograph, including a key mechanism for lifting the recording or reproducing point (U.S. Pat. 393,640). Another was issued to Charles Batchelor in April 1889 for the miniature phonograph mechanism in the talking doll (U.S. Pat. 400,629). A third was issued to Arthur Kennelly in January 1890 (and assigned to Edison) for the meter manufacturing process discussed in Doc. 3220 (U.S. Pat. 419,264).

5. PS (*TAED* PT032AAP).

6. PS (*TAED* PT032AAR).

7. *Edison v. Hardin,* schedule W, Lit. (*TAED* QP009A001).

8. PS (*TAED* PT032AAS).

9. This application resulted from a division by the Patent Office of Edison's Case 741, executed and filed in November 1887.

10. This case resulted from a division of Case 741 (see note 8).

11 This case resulted from a division of Case 741 (see note 8).

12. PS (*TAED* PT032AAU).

13. This application resulted from a division of Case 510, filed in late 1882, which apparently was not issued as a patent in its own right.

14. Doc. 3181.

15. PS (*TAED* PT032AAZ).

16. PS (*TAED* PT032ABA).

17. This application resulted from a division of Case 210, filed in 1880, which apparently was not issued as a patent in its own right.

18. Doc. 3219.

19. Doc. 3223.

20. Edison seems not to have signed this application. The draft of the petition, a standard form accompanying every patent application, was dated only July 1888. PS (*TAED* PT032ABD).

21. PS (*TAED* PT032ABE).

22. Doc. 3252.

23. Doc. 3259.

24. PS (*TAED* PT032ABH).

25. PS (*TAED* PT032ABI).

26. One sheet of Edison sketches related to this application is in PS (*TAED* PT032ABJ).

27. PS (*TAED* PT032ABK).

28. PS (*TAED* PT032ABL).

29. Doc. 3268.
30. PS (*TAED* PT032ABN).
31. PS (*TAED* PT032ABR).
32. PS (*TAED* PT032ABO).
33. Two pages of Edison sketches related to this application are in PS (*TAED* PT032ABP).
34. Doc. 3312.
35. Doc. 3316.
36. Doc. 3333.
37. Doc. 3342.
38. This application resulted from a division of Edison's Case 736, executed and filed in November 1887.
39. PS (*TAED* PT032ABW).
40. PS (*TAED* PT032ABY).
41. Doc. 3386.
42. A notation by John Randolph on the last page in the application's file (an undated memorandum on the status of its claims) states "Mr Edison says to abandon this." The file wrapper indicates "forfeited." PS (*TAED* PT032ACA).

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