SCIENTIFIC AMERICAN AS A MID-NINETEENTH CENTURY MIDDLEMAN:

THE PERIODICAL'S ROLE AS A LIAISON BETWEEN THE PUBLIC AND INVENTORS

Interactive Qualifying Project Report completed in partial fulfillment

of the Bachelor of Science degree at

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Abstract

This project, sponsored by the American Antiquarian Society, continued the work of improving and adding additional entries to the database of engravings and images from the early issues of *Scientific American* magazine. This is the sixth year of the project, and continuing from past groups, the current group has managed to finish the indexing of images from 1859 through 1865, bringing the database to contain a full twenty years of engravings. As a historical research topic, the team considered *Scientific American* as a "middleman" between various stakeholders such as the readers, editors, and inventors, and how the periodical's publishing was ahead of the time in terms of advertising, promotion, and business sense.

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Authorship

Acknowledgments

Our group would like to acknowledge our advisor Professor M. David Samson for helping us over the course of the project. He provided help on research, the direction of our paper, and the methods we used to approach our research. We would also like to acknowledge Molly Hardy, of the American Antiquarian Society, for providing helpful advice and sparking the idea to market the project through Twitter. We would also like to thank the American Antiquarian Society in general for their willingness to open their doors to our project and research. We would also like to acknowledge the WPI Helpdesk for providing technical solutions to our problems, and *The Towers* newspaper for allowing our project to appear in their publication.

Our group would not have been able to successfully complete this project without this guidance and assistance. We would like to offer our sincerest thanks to all those who have aided us in the project and allowed us to accomplish what we have.

Executive Summary

The current IQP team project added more content to the online database created and improved upon by the previous IQP teams. We found some areas of improvement and fixed some of the minor things we could, and we added a couple of features, but there is considerable work remaining in regards to the database's interface and functionality. Several volumes have broken links, and since new subjects were added, if time permitted, the team would have liked to have updated database entries prior to 1860 as well. The current team furthered previous IQP work by inputting over five years of entries of the New Series, approximately ten volumes, into the database. This brings the total database to twenty years' worth of publication data. Due to the lack of technological skills in this year's IQP team, we have left for future, more technically-oriented groups some suggestions for improvement with the website overall.

In conjunction with work on the website, we began to expand the database's public promotion with a Twitter account and opening up access to the database to interested fellows and researchers who inquire about it at the American Antiquarian Society. In this way the current IQP teams hopes to receive constructive feedback for future groups to be able to use and act upon.

For research, the team identified *Scientific American* as a "middleman" between various parties involved with the magazine, such as the reader and inventor. We explored this topic by looking at related areas of research, including patent practices, credibility, and visual marketing. We proposed that *Scientific American* was not only a "middleman", but an innovator that had business talent and entrepreneurial insight that many institutions would not learn to embrace for many years.

Introduction

This project continued work in the effort to document and catalog nineteenth century American magazines and periodicals, as the sixth project team of a sequence of Interactive Qualifying Projects (IQPs). It was sponsored by the American Antiquarian Society (AAS), a "national research library of American history, literature, and culture through 1876". The AAS wanted a list of images from early periodicals that could be easily searched by specific information, such as subject, creator, date, or keywords. In particular, the project focused on the magazine *Scientific American*, created in 1845, which published reports of patented inventions as well as features on science and technology.

Our team added Volumes 3-13 of the New Series to the database, covering the publication years of 1860 through 1865. In agreement with personnel from the AAS, we chose to input up through 1865, because this final year of the Civil War marks a solid boundary line in American history. With our team's additions, there are now twenty years of images cataloged in the database.

Our research focused on the role of *Scientific American* as a middleman between inventors and consumers. For the purposes of this paper, we take consumers to mean those readers who are interested in starting a manufacturing enterprise for such inventions that *Scientific American* determined would be useful and successful. Once the magazine came under ownership of Munn and Co., a patent law firm, *Scientific American* earned a large amount of credibility in a short time, allowing it to become a generally accepted source of opinion on new inventions and patents. Over the years, more and more inventors sought out *Scientific American*'s patent agency to submit and publish patents for their inventions. *Scientific American* was then able to educate its readers on many useful inventions and provide contact information

for the inventors' shops and factories. *Scientific American*'s reviews and information on inventions gave readers ample knowledge to decide which inventions would be worthwhile to pursue for manufacturing ventures. Its coverage of invention also coincided with the general upwards trend of advertising caused by the increased presence of corporations after the Civil War. We also studied the visual layout of *Scientific American* as a means to develop theories on how the editors chose to display certain inventions they felt would best benefit society. By these means, *Scientific American* acted as a middleman between inventors and readers who were interested in entering into manufacturing of inventions that were sure to be successful.

Our team also made some additions on the database's website itself; however, these additions were limited to text via the HTML code, due to limited technical knowledge on the part of the group.

Outreach

Use of the current database has been mainly limited to past project teams, advisors, and a few personnel from the AAS. Our team decided, now that the database had reached the watershed year of 1865, that it was appropriate to begin publication of the project beyond that of project reports. We chose to accomplish this in a few ways.

When we met with the American Antiquarian Society representatives, we learned that many historians and historical societies utilize Twitter to share information. With this information, we created a Twitter account for the project under the name SCIAM Database, a nod to the previous abbreviation used by past project teams. Under this Twitter account, we began posting various facts and inventions found while cataloging the patent images, as well as updates on our progress. For example, the team tweeted on December 10th, "We're halfway

done cataloging issues from 1864! Have you been following along with us?" We also used a URL shortening service to link to inventions found in Cornell's *Making of America* without exceeding the character limit imposed by Twitter. We have also worked to "follow" various historical accounts, in hopes that the SCIAM Database account will gain more followers. The Twitter account, we believe, will act as a good introduction to public knowledge of the project.

In addition to the Twitter account, this year's IQP team reached out to WPI's local school newspaper, *The Towers*. After an interview with one of the editors in chief, we were featured on the front page of the February 11, 2014 issue of the newspaper. Our hope is that this article will garner interest in the project so that it will be somewhat known once it is ready for the public. A copy of the article is available in *Appendix C* of this paper. Through the Twitter account and the *Towers* article, this IQP team has started to build a foundation of recognition so that a larger pool of potential users will exist when the database is officially launched.

Indexing *Scientific American* Illustrations

Indexing entries from *Scientific American* is a manual task undertaken by the indexers, performed by the use of the input form found on the database website. This input form is accessed by logging on with the user's WPI Windows username and password, once access permission is given. Another method of indexing entries is to use an Excel spreadsheet and SQL queries, as reiterated in the previous project[1]; however, this process was beyond the technical capabilities of the current group. Thus, the method chosen for this project involved use of the

[1] Roberts, D., Thomson, S., and Wolff, Andrew. (2013). *Online index of illustrations from Scientific American, 1859-1860, and the geography of American invention*. Interactive Qualifying Project, Worcester Polytechnic Institute (WPI).

input form. The character limit has been greatly improved since past iterations of this project. It is now 5000 characters, which provides ample room for the indexer to record sufficient information in all fields. The title is taken from the article itself, or from a title printed either above or below the engraving. The image description is often provided in the article itself, but at other times, the indexer must make an educated guess as to what the engraving shows. An example of this field could be "perspective of front of plow". The artist, or engraver in most cases, is usually absent from the engraving, but sometimes their name will be signed at the bottom of the work. When the engraving is signed, but the name illegible, the entry will read as "present but illegible".

The article summary is a brief summary of the machine or invention, including if it is a unique improvement to some preexisting invention patent. In the articles, the inventor is most often noted at the end of the article, but sometimes appears elsewhere. The indexing table also provides a field for author, but there is rarely an author listed, except in cases of correspondence from readers. The patent date field contains the date the invention was patented. In the case that the patent has been filed for, but not yet issued, when the issue was published, it has become the practice of this current group to insert "patent pending as of publication" into this field. If the article does not mention a patent application, this field is left blank.

The subject fields provide three different places for the indexer to assign under what subject the article, invention, or machine falls. There are twenty-five subjects to choose from, including a miscellaneous category for those entries that do not correspond to one or more of the other twenty-four subjects. The indexer then places keywords of their choosing into the keywords section, to help identify the engraving, title, and article. The publication field is currently limited to *Scientific American Old Series* and *Scientific American New Series*. This

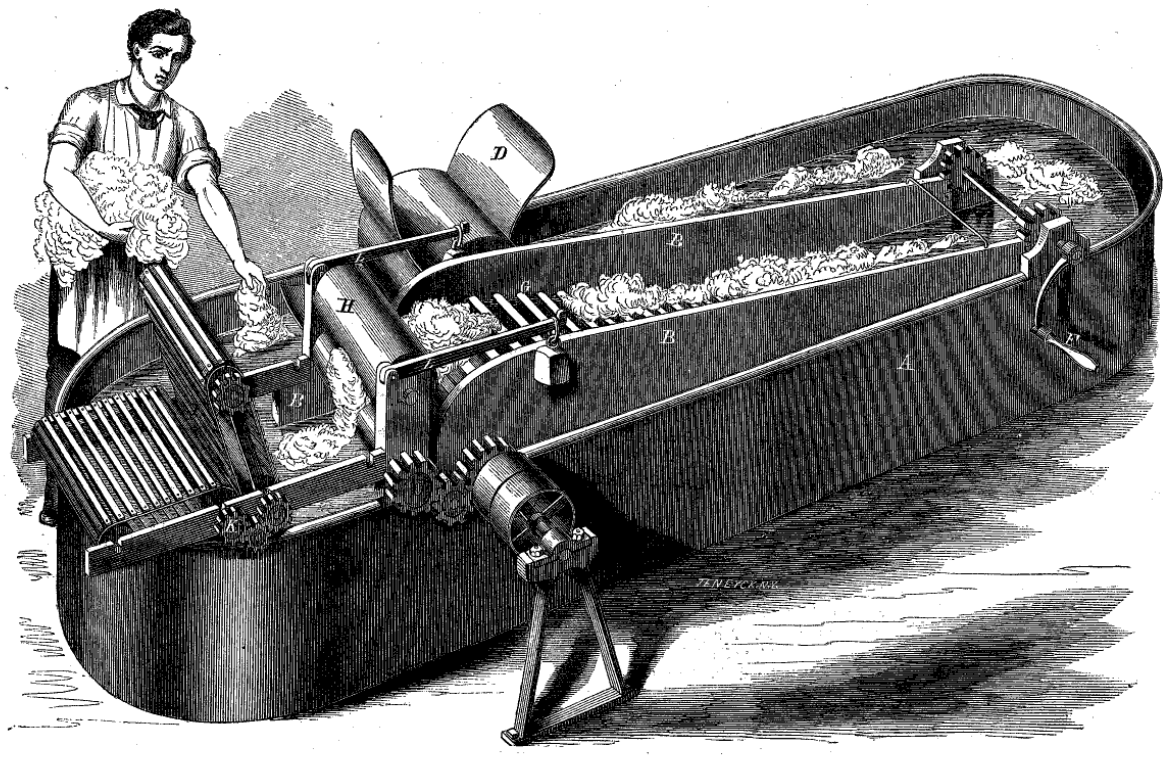
corresponds to the first series and second series of the periodical, which changed in 1859. Three fields correspond to the year, month, and day of the issue in which the engraving is found was published. The indexer then indicates the volume, issue, and page number on which the engraving is found. The "people involved" field holds any of those who are mentioned in the article who are not listed in any of the previously mentioned fields. Finally, the URL of the image on Cornell's "Making of America" is placed into the final field. The following table was modified from that of the previous group (2012-2013), and illustrates the above mentioned fields of indexing for each entry.

Table 1. Column Names for Indexing and their Respective Content

Column	Content
Title	The title of the image as it appears in *Scientific American.* If there is none, then the title of the accompanying article, or the indexer's best educated guess.
Image Description	Description of the viewpoint of the image (e.g. sectional or isometric) and/or the general shape, orientation or function of the device (i.e. what it actually is) when part of a series.
Artist	The engraver who worked on the image.
Article Summary	A summary of the article accompanying the image. This is a relatively brief description of how the machine or device operates.
Inventor	The individual(s) who invented the object illustrated.
Author	Author of the article. If no one is explicitly credited, no credit is given within the database.
Patent Date	The date the invention was patented; this is as specific or vague as the information given article itself. (Ex. If the patent date were given as June 18, 1847, the index field should contain 1847-06-18)
Subject 1	Selected from the 25 predetermined values presented in Appendix B.
Subject 2	Same guideline as Subject for 2nd applicable subject, if any.
Subject 3	Same guideline as Subject, for 3rd applicable subject, if any.
Keywords	Any number of relevant words or phrases, determined by the submitter.
Publication	What publication the image is found in. (The two current options are *Scientific American Old Series* or *Scientific American New Series*, but this column allows for other periodicals to be eventually included in the database).
Date	The date on which the issue containing the image was published.
Volume	The volume in which the image was published.
Issue	The issue in which the image was published.
Page	The page on which the image appeared in its respective issue.

Series of Images	When an invention contains multiple figures (listed at Fig.1,Fig.2, etc), this field will contain the invention title corresponding to all figures. This field will remain blank if an invention does not contain multiple listed figures in the article.
People Involved	Any person(s) not included in the above fields who was related to the invention in some way. Examples include assignees and manufacturers.
URL	A link to the issue containing the image on Cornell's "Making of America" website, if available.

To further illustrate the aforementioned process, an example of an engraving found in *Scientific American* and its resulting index is shown below.



TURNER AND ROBINSON'S WOOL-WASHING APPARATUS.

Figure 1. Engraving of an invention entitled "Turner and Robinson's Wool-Washing Apparatus" found from the January 11, 1862 issue of *Scientific American*.[2]

[2] Improved wool-washing apparatus. (1862). *Scientific American, 6*(2), 17.

Table 2. An Example of an Indexed Entry

Column	Content
Title	Turner and Robinson's Wool-Washing Apparatus
Image Description	Perspective
Artist	Ten Eyck
Article Summary	A method for washing wool that can be performed by water or steam power, leaving the wool much more thoroughly washed than by hand
Inventor	R.G. Turner and S.B. Robinson
Author	None
Patent Date	1861-10-01
Subject 1	Agricultural Implements and Operations
Subject 2	None
Subject 3	None
Keywords	wool, washing, water, steam, power
Publication	*Scientific American* New Series
Date	1862-01-11
Volume	6
Issue	2
Page	17
Series of Images	None
People Involved	None
URL	http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia;cc=scia;rgn=full%20text;idno=scia1006-2;didno=scia1006-2;view=image;seq=0021;node=scia1006-2%3A1

The above table is an example of how information would be input into the provided fields for a given object, invention, or engraving. Below are a couple of screenshots of what this information will actually look like once it is input into the database and called for on the website.

Field	Value
Title	Turner and Robinson's Wool-Washing Apparatus
Image Description	Perspective
Artist	Ten Eyck
Article Summary	A method for washing wool that can be performed by water or steam power, leaving the wool much more thoroughly washed than by hand
Inventor	R.G. Turner and S.B. Robinson
Author	None
Patented	1861-10-01
Subject 1	Agricultural Implements and Operations
Subject 2	None
Subject 3	None
Keywords	wool, washing, water, steam, power
Publication	Scientific American New Series
Date	1862-01-11
Volume	6
Issue	2
Page	17
Series	None
People Involved	None
URL	http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia;cc=scia;rgn=full%20text;idno=scia1006-2;didno=scia1006-2;view=image;seq=0021;node=scia1006-2%3A1

Figure 2. An entry on the website depicting Turner and Robinson's Wool-Washing Apparatus, from *Scientific American*.

This year's project team set out to input entries of *Scientific American* though the year of 1865. We began with entries in 1860 and have successfully input all issues through 1865. These have all been issues of *Scientific American's* "New Series". To date, there are now twenty years of *Scientific American* in the database.

Our project team also made various important changes to the database and the process of indexing overall. Although the group had limited technical knowledge, we were able to change some aspects of the website in HTML to improve the website for both the indexer and the user. Previously, entries were listed as two publications: "Sciam" and "Sciam2", which left no explanation to the database user as to which publication this referred. It was overall an unsightly oversight in the database. Now, the publication field contains the options of "*Scientific American* Old Series" and "*Scientific American* New Series", which is a much clearer definition of in what publication the entry resides. This will alleviate any possible confusion in the future, both on the parts of the indexer and the user. Also, this change will make it easier to add new publications to the database in the future. Additionally, the help page makes a note of the difference between the two series in its list of Frequently Asked Questions.

A second change to the process of indexing was an update to the subjects and their corresponding definitions that are used in the database. The previous subject definitions, found on the shared drive for the project, were lengthy, poorly worded, and impractical for use and placement on the website. For example, the definition for the subject of "Arts – Fine, Polite, and Ornamental" contained the less-than-helpful suggestion, "When searching for information on the topic, nothing was found. The phrase 'your guess is as good as mine' comes to mind." Therefore, we needed to redefine the subjects in a way that was more practical for real users, rather than those who were building the database. We have also added three news subjects: Pedagogical,

Communication Instruments and Operations, and Printing and Writing Implements, which brings the number of possible subjects to twenty-five, as previously mentioned. These subjects better facilitate such inventions as telegraphs and printing presses that otherwise had been cataloged under "Miscellaneous". It also helps to group together illustrations in *Scientific American* that are not patent related but rather included to provide knowledge to the reader, again without placing them under "Miscellaneous". In order to facilitate the user's understanding of what subject a certain entry might fall under, the list of subjects and definitions has been placed on the "Help" page of the website, below the Frequently Asked Questions. In addition, a number of letter links – A, C, F, G, H, L, M, N, P, S, W – at the top of the table point to specific anchors in the list that correspond to subjects starting with that particular letter. This was accomplished using simple HTML additions to the *sciam.cgi* file of the website, under the Public HTML folder of the shared drive. This allows the user to quickly navigate to a certain letter of the alphabet in the subjects list, without having to scroll down to the letter itself. This will help to expedite and improve the user's experience with the "Help" page and the website overall. The updated list of subjects and their new definitions can be found in Appendix A.

Scientific American as a Middleman

Our research focused on the role of *Scientific American* as a middleman between its readers and contributors - mainly inventors and scientists. We focused on the time period after the Civil War's conclusion, entering into Reconstruction. This time period coincides with the beginnings of the Gilded Age in American history, a period of rapid economic growth and advancement. We researched sources of technical information available to Americans during this time. However, we came to think that the methods which made the journal successful in the post-

war period had been developed earlier in its history. Accordingly, we studied various issues of *Scientific American* to learn the approaches taken by the publishers, first by Rufus Porter (1845-1846) and then by Munn & Company (1846-1948), to bring information to the reader. We were interested in how the journal came to seem particularly trustworthy and reliable to its readers, which we considered necessary in order to be a successful middleman in any sense. Since visual appeal through illustrations seemed to be a large part of the journal's success, we compared it to the development of physical marketing in store windows, to analyze the similarities between window layouts and the magazine layout. We chose to define a "middleman" as an entity that acts as a liaison of information and communication between two bodies of people.

Scientific American offered pages of information concerning patented inventions, science, mechanics, and technology. The maturation of the Industrial Revolution in the United States brought a further focus on interchangeable manufacturing as well as the increasing presence of the corporation over small business. Additionally, the Civil War boosted the manufacturing economy which fostered further industrialization, encouraging a trend which accelerated after the war. This only helped to drive the spirit of invention and advancement in science and technology. *Scientific American's* publication under Munn & Co. became a leading source on this specialized knowledge.

In addition, Munn & Co. ran an accomplished patent agency that filed a remarkably large number of patent applications with the United States Patent Office. Successful, and sometimes not-so-successful, inventions, for which Munn and Co. submitted patents, would appear in the periodical, on the front page and throughout the magazine, to educate readers on inventions that were being patented at the time. In our research, we focused on readers who were interested in the prospects of manufacturing inventions that might be successful. *Scientific American's*

specialized reviews of the inventions provided a valuable resource to readers who might want to manufacture a certain invention, like the circular saw or sewing machine. Munn & Co.'s operation of *Scientific American* allowed the magazine to act as a middleman between its readers and its inventors, by providing eye-catching engravings and credible reviews on inventions and other scientific discoveries, often before other entities would be privy to such information.

Other Sources of Technical Information

To give a perspective of the times, various sources of information relating to science, technology, and industrialization existed in addition to *Scientific American*, in the forms of periodicals, exhibitions, and educational institutions. Shortly before the creation of *Scientific American*, Rufus Porter started publication of the *New York Mechanic* in 1841, subtitled "The Advocate of Industry and Enterprise, and Journal of Mechanical and Other Scientific Improvement".[3] The *New York Mechanic* is considered the "first scientific newspaper" to be published in the United States, and contained inventions and other news similar to that of *Scientific American*, but it folded approximately a year later.[4] Porter would later leave *Scientific American* for similar reasons to those of his departure from *New York Mechanic*. Another periodical, *The Manufacturer and Builder*, started publication in 1869, following the Civil War's boost to industrialization and the economy. A "practical journal of industrial progress", the periodical featured similar contents to *Scientific American*, such as articles on inventions and scientific discoveries; however, its publication only lasted until 1897.[5]

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[3] Lipman, J. (1968). *Rufus Porter: Yankee Pioneer*. New York: Clarkson N. Potter, 50-51.
[4] Ibid, 51.
[5] Serial archive listing for: The Manufacturer and Builder. Retrieved from: http://onlinebooks.library.upenn.edu/webbin/serial?id=manbuilder.

Outside of the United States, a remarkably similar magazine to *Scientific American*, *The Engineer*, was started in London in 1856. In the first issue of publication, they offered to their readers the following goal:

> "In furnishing a record of the patents in which so much inventive talent is now embodied, we shall describe all those which promise to be really useful, or which seem to possess positive merit; at the same time, we will not hesitate freely to expose the fallacy and want of utility of others."[6]

This statement is almost identical to information published by Munn and Co. in their running history. Additionally, *The Engineer* featured large engravings of inventions, accompanied by articles that described the workings on the invention. It also included the inventor and patent date, when available, within the article.[7] However, *The Engineer* was more specialized in mechanics and offered less general coverage of science than that of *Scientific American*.

Trade shows and exhibitions occurred worldwide as early as the middle eighteenth century, but none were hosted in the United States until the middle nineteenth century. An American exhibition first appeared in 1853.[8] The Exhibition of the Industry of all Nations, held in New York, featured four thousand exhibitors of "industrial wares, consumer goods, and artworks".[9] However, the United States was not host to any other exhibitions until 1876, with the Centennial Exposition in Philadelphia. Countless other fairs were held in Europe, Africa, and Asia between the dates of the American expositions, but their locations were most likely infeasible for many Americans to attend. Data concerning the demographics of the near ten million attendees[10] to one exhibition is unknown to the present IQP group, although it surely

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[6] To our readers. (1856). *The Engineer*. *1*(1), 3.
[7] Improvement in windlasses. (1856). *The Engineer. 1*(2), 12.
[8] Harris, N. (1990). *Cultural excursions*. Chicago: University of Chicago, 58.
[9] Bryant Park. *Early history*. Retrieved from http://www.bryantpark.org/about-us/history.html.
[10] Daniels, M. Paris national and international exhibitions from 1798 to 1900: A finding-list of British library holdings. (2013). *Electronic British Library Journal*.

exists somewhere. Regardless, to place American participation into perspective, of the 50,226 exhibitors at the International Exposition of 1867 in France, approximately 1% of exhibitors hailed from the United States.[11] News of the exhibition, nonetheless, reached the United States. *Scientific American* published an article noting the planned American contributions to the exhibits of the International Exhibition of 1867 in their second issue of that year.[12]

Following the Civil War, higher level technical schools became more prominent in the United States. Scientific schools such as Rensselaer Polytechnic Institute (1824), Harvard's Lawrence Science School (1847), and Yale's Sheffield Scientific School (1847) were founded and gained prominence in the following years. Additional schools began to appear in the years during and after the Civil War. For example, Worcester Polytechnic Institute (WPI), first founded as the Worcester County Free Institute of Science in 1865, established an environment in which students both learned and worked, incorporating both parts of the motto "theory and practice". Students applied learned knowledge to work in WPI's Washburn Shops, producing various items such as drafting tables and other wares, under professional mechanics. In tune with the establishment of this and other colleges, higher level education started to make more of an impact in inventions and advancement. One particular journal article, published in *The American Economic Review*, focusing in on a sample of "great inventors" as determined by the authors, offered a rising trend in educational background throughout the decades of the 1800s.[13] Patents produced by this sample jumped from 27.8% college degree holding or postgraduate inventors,

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[11] Gilman, D. C., Thurston, H. T., and Moore, F., eds. (1905). *New International Encyclopedia* (1st ed.). New York: Dodd, 364.
[12] The Paris International Exhibition. (1867). *Scientific American, 16*(2), 26.
[13] Market trade in patents and the rise of a class of specialized inventors in the 19th-century United States. (2001). *The American Economic Review, 91*(2), 43.

in the 1860s, to over 90% in the 1870s.[14] Similarly, the education of the inventors overall jumped from 44% college degree holding or postgraduate to over 70%.[15] Based on this information, higher level technical education seems to have played a role in the knowledge and successful production of inventions.

Early American Patent Practices

Operation of patents in the beginning of the nineteenth century descended from the Patent Laws of 1790 and 1793. The latter law had created a system that would lessen the load on the officials, thus making it easier to obtain a patent. In 1836 the patent system was overhauled; the application process was reformed, which re-instated the requirement for a comprehensive examination.[16] The number of patent applications rose, and the small staff became overwhelmed. Consequently, applications spilled over to independent examiners and small offices.[17] Patent lawyers worked at small firms and had the rights to grant patents if the application followed the law correctly. With this, different offices handling patents would pose an issue of fairness in the patents granted, due to not having enough third party reviewers overseeing the process[18]. Munn and Co, founded by Alfred Ely Beach and Orson Desaix Munn had bought in with the stressed patent system. The company was capable of handling an astounding three and a half percent of all patent applications up until its close in 1960.[19] While being an office that managed the demand in patents, Munn and Co. also published the *Scientific*

[14] Ibid.
[15] Ibid.
[16] Barton, S., Chouinard, C., and Hogeboom, F. (2009). *Cataloging 19th century periodical images*. Interactive Qualifying Project, Worcester Polytechnic Institute (WPI), 8.
[17] Ibid, 9.
[18] Ibid, 9.
[19] Ibid, 10.

American periodical. The periodical was very widespread and was able to serve as a means of spreading knowledge of the patents that they issued.

Credibility of Scientific American *under Munn and Co.*

A valuable aspect of Munn and Co.'s *Scientific American* that allowed it to act effectively as a middleman between inventors and readers was its credibility, both of the periodical itself and of the patent agency. The magazine was initially produced in a "jack of all trades" manner, containing poems, religious articles, and other pieces that were relatively unrelated to the periodical's main objective. When publication was taken over by Munn and Co., the periodical had a stronger focus on science, inventions, and technology. Scholar Michael Borut states that Munn and Co. acted fairly and honestly towards inventors, allowing them to dramatically increase both the number of patent applications in the United States and the technical knowledge of its readers.

Scientific American had first appeared in 1845 as a publication subtitled "The Advocate of Industry and Enterprise, and Journal of Mechanical and Other Improvements". Rufus Porter's establishment of *Scientific American* brought forth a range of topics to the public, including poetry, articles on inventions, and miscellaneous news stories. However, Porter discredited himself rather quickly through the inclusion of his own inventions in the periodical, often centered on the front page of the issues.[20] Although inventor names were often missing, a common hint seems to be the use of "we" when describing the workings or successes of the invention, particularly those with large photos in the center of the paper.

[20] Michael Borut, *The Scientific American in nineteenth century America* (doctoral dissertation, New York University, 1977), 18.

Perhaps the most infamous example of Porter's self-promoting comes in the form of a travelling air balloon, similar in respects to the modern day blimp, in the September 18, 1845 issue of *Scientific American*.[21]

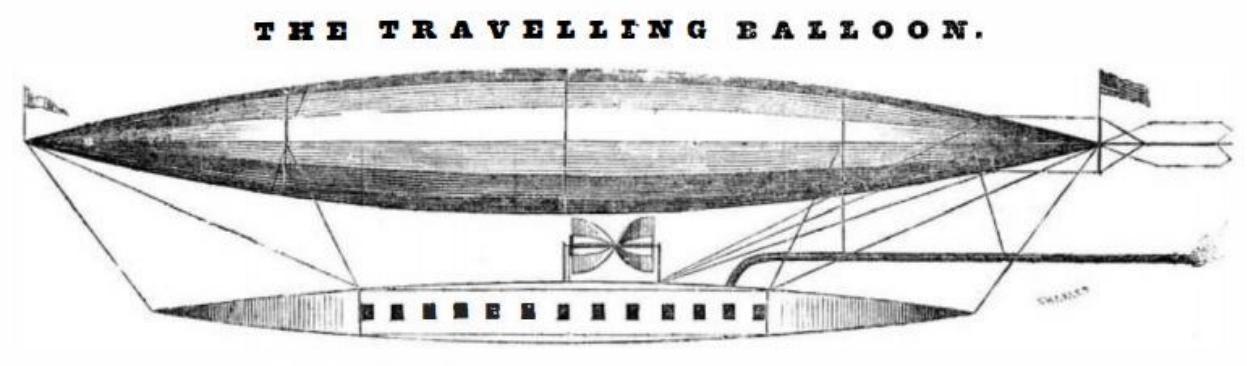

Figure 3. Engraving of the "Travelling Balloon" as published by Porter in fourth issue of *Scientific American.*[22]

Porter, ever the ambitious inventor, published his invention on the front page of the fourth issue of *Scientific American* "a full three years in advance of its proven feasibility".[23] Its exact position in the magazine and its use of a rather large portion of the page can be seen in Appendix B. The periodical's readers acted unkindly to the invention's promotion and existence in general, as shown in Porter's address: "we find such a rank and bitter prejudice against the project, that we might expect a large part of our present patronage to fail, if we were known to be actually engaged on the subject".[24] Perhaps another hint at the public's displeasure comes from the fact that Porter had difficulty raising funds for the project. In an address to his shareholders in the

[21] Porter, R. (1845). The travelling balloon. *Scientific American, 1*(4), 1.
[22] Ibid, 1.
[23] Borut, 20.
[24] Porter, R. (1845). The travelling balloon. *Scientific American, 1*(4), 1.

New York Times, Porter states: the anticipation of disappointment with regard to [affording the filling of the balloon with hydrogen] induced me to sell more shares than was at first intended".[25] He was eventually forced to drop the project due to lack of funding for development.[26]

Porter also included religious topics in the early issues of *Scientific American*. He opened the periodical to the public in the first issue, stating that the paper "shall advocate the pure Christian religion",[27] which may seem too little to be significant, until readers encounter an article entitled "Religious Intelligence" on the third page of the second issue. The article, written by Thomas Erskine, a Scottish theologian, talks of the overall religious apathy and "total indifference to the subject" by "all sects and denominations… for the last forty years".[28] Porter also expressed a particular interest in the Millerite followers and included multiple articles on their beliefs.[29] This pertinent interest contradicts Porter's initial statement to not favor "any particular sect".[30] Additionally, the inclusion of religious topics in the periodical does not follow *Scientific American*'s original purpose, as outlined by its subtitle, to advocate industry, enterprise, and mechanical improvements. Although its readers' reaction to Porter's religious publicity is unknown, it is highly possible that these topics discredited *Scientific American* under Rufus Porter, simply because the information was not relevant to the periodical or the aim of the majority of its contents.

Porter sold *Scientific American* to Munn and Co. in 1846. At this point, Munn and Co. needed desperately to rebuild credibility in the periodical. Based on the judgment of Michael

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[25] Porter, R. (1852, September 8th). The flying ship. *The New York Times.*
[26] The future of aeronautics. (1919). *The Journal of the Society of Automotive Engineers, 5*(3), 271.
[27] Porter, R. (1845). To the American public, patrons and friends. *Scientific American, 1*(1), 2.
[28] Erskine, T. (1845). Religious intelligence. *Scientific American, 1*(2), 3.
[29] *Free enterprise forever!: Scientific American in the 19th century* (1977). In Shenton J. (Ed.), (1st ed.). New York, New York: Images Graphiques, 5.
[30] Porter, R. (1845).

Borut, as previously mentioned, Munn and Co. established this credibility with honest answers, fair judgment, and expertise in the patent system. In comparison to newspapers and other technical journals, which often completely lacked scientific background, *Scientific American* employed real technical knowledge in its reviews of inventions and other findings.[31] Munn and Beach also sought to rid the magazine of the religious overtones set by Porter in the early issues, and stayed politically neutral in most affairs.[32]

In comparison to the magazine under Porter, the middle years of Munn and Co. establish the layout of the magazine that we consider to be the standard of publication under Munn and Co. An engraving of an invention graces the cover, followed by other inventions, articles on science, correspondence from readers, lists of patent applications, and weekly instructions to readers on how to submit inventions to the office. Visibly missing are the poems, religious articles, and miscellany of Porter's *Scientific American*.

Munn and Co.'s technical prowess originated directly from the editors themselves. Beach, an inventor as well, actively worked to obtain his own credible patents, which encouraged other inventors to submit their inventions to the office. In fact, Beach would "personally attend to the applications pending in the Patent Office [in Washington], which had been filed by Munn and Company as a firm" once every two weeks.[33] His extensive background knowledge and tireless work effort further increased *Scientific American*'s credibility.

In the April 16, 1859 issue of *Scientific American*, Munn and Co. published a running history of the magazine under Munn and Beach. The editors sought to constantly persuade their

[31] Borut, 101.
[32] Free Enterprise, 5.
[33] Alfred Ely Beach (obituary). (1896). *Scientific American, 74*(2), 18.

readers of their scientific, mechanic, and patent knowledge. In a direct comparison between a proficient scientific journalist and the editors of *Scientific American*, Munn and Co. stated:

> "[If a] scientific journalist is industrious and … competent to the discharge of his duties, his researches into the various fields of scientific literature and of mechanical art and invention are necessarily more extended than those of any other person; and hence his greater familiarity with 'things new and old' in these branches." [34]

The most important change Munn and Co. made to *Scientific American* was to bring a smaller focus and specialization to the magazine, rather than the old-fashioned, personal approach that Porter took for the magazine. This increased specialization on inventions, science, and technology changed *Scientific American* into a periodical that provided specific knowledge to its readers.

Munn and Co.'s publication of *Scientific American* remained a credible and helpful source of knowledge on inventions, scientific advancements, and other technology. Their information and advice helped to produce a "six-fold increase" in patents filed over a course of twelve years alone.[35] The editors accepted and reviewed patent applications in a fair and impartial manner. In an address to inventors, Munn and Co. declares "No case is… permitted to leave the office until it has passed the ordeal of our criticism. This is perhaps one of the principal reasons of our great successes in obtaining Letters Patents for new inventions".[36] Seemingly in contrast to other publications, they promised *Scientific American* to be a "publication which dare speak out and expose humbugs, inconsistencies, and false theories, of which the present age is remarkable".[37] Even in addition to these reviews, *Scientific American*'s publication of "obscure"

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[34] The rise, progress and influence of the "*Scientific American*". (1859). *Scientific American, 14*(32), 257.
[35] The Rise, 258.
[36] Inventors - the *Scientific American*. (1853). *Scientific American, 8*(41), 322.
[37] Ibid.

or "unsuccessful" inventions relayed helpful information to readers in terms of the "trend of experimentation".[38] Through the periodical, readers could learn what was being attempted, what had succeeded, what had failed, and what could be improved. Indeed, Munn and Co. proved themselves and *Scientific American* to be credible and worthy sources of knowledge in science and technology, which effectively allowed *Scientific American* to act as a middleman between inventors, scientists, and readers.

Perspectives on American Business 1850-1900

The mid-nineteenth century was a turning point in business and consumerism. While the country consisted mostly of an agricultural economy, industry was slowly gaining ground. Before the Civil War, small American businesses were able to keep up with demand and produce enough goods to supply their respective regions. The implementation of interstate and international railway systems and steamships increased, thus it became apparent that commerce would develop as well. Products could now be transported at a much lower cost and considerably quicker than ever. This requirement for high volume distribution, production, and capital could no longer be supported by the small business outlook.[39]

Big business had come into being in the 1840s, but it was not the preferred method of conducting business, as production of products was generally not very large-scale at the time. Small scale businesses with simple organizations were able to manage the demand set by consumers in their respective regions. After the Civil War ended, the age of the corporation truly

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[38] Mott, F.L. (1967). *A history of American magazines: 1850-1865.* Cambridge, MA: University of Harvard, 318.

[39] Carey, C. W. *Corporations and big business.* Retrieved February 19, 2014, from Gale Digital Collections: http://www.gale.cengage.com/pdf/whitepapers/gdc/Corporations_whtppr.pdf.

began. The induction of the 14th Amendment to the Constitution rendered it possible that a corporation could be classified as a legal person, with guaranteed protection under the Constitution.

The progression of the industrial economy due to the Civil War, matched with advancements in the technology of transportation, had allowed many of the corporations to become established and successful. Economies of scale in war production encouraged larger business enterprises due to the larger output. The Civil War created a need for mass production; mass production makes goods that are produced at a lower cost but at a level of homogeneity.[40] Corporations were able to benefit from the economies of scale due to having the ability to mass produce, in factories, which positively affects the prices of goods for consumers. These corporations would compete with the small scale businesses, who would pride themselves in individuality of their products. These two types of businesses would go on to become fierce competitors, with the need to "win over" their customers with their products. This battle would be fought largely with advertising. The meat packing industry of the 1800s can be used as an example. The improvements in transportation and artificial refrigeration aided the increase of slaughterhouses in America.[41] The use of slaughterhouses yielded large amounts of meat being packaged, which would lower the cost for consumers. Quicker transportation allowed for the meat to still be sold with the adjective "fresh". The newly instated meat packing industry would challenge local farmers who provided meats for the local area. Consequently, the local butcher shop would have more costly products due to preparation time of the meat at their location. The

[40] Schmid, A. A. (1987). Property, power, and public choice. Retrieved from https://www.msu.edu/course/aec/810/pppc-4.htm.

[41] Azzam, A. M., & Anderson, D. G. (1996). *Assessing competition in meatpacking: Economic history, theroy, and evidence.* Retrieved March 3, 2014, from http://prodweb.gipsa.usda.gov/Publications/psp/con_tech%20report/rr96-6.pdf.

shops that retailed the meat from the meat packing industry were capable of selling the meats for less than the local butchering firm.

Scientific American, as a magazine, featured patents that were granted to individuals who created them. While there were many independent inventors, there were also inventors who were connected to businesses. *Scientific American* had always incorporated advertisements in the magazine to accrue revenue, but the patent information itself can be viewed as an advertisement as well. The advertisement in Figure 4 below is an example from a corporation that purchased an advertisement in *Scientific American* magazine. The American Saw Company was incorporated in 1867, and served all of the United States and parts of Canada.[42] The advertisement shows the company's use of buying and securing patents to use for mass production. The American Saw Company used many patents over their forty years of business, mostly from James E. Emerson and William B. Ridson.[43] Emerson had many patents in the field of saw improvements. Emerson's Patent Perforated Saw Plates[44], an invention by James E. Emerson, was assigned to Emerson himself, but The American Saw Company heavily promoted the innovation.[45] Corporations like the American Saw Company used *Scientific American* as a means of communicating innovations and as a means of buying and securing patents to manufacture or promote for profit.

[42] Dover. (1887). Quarter-century's progress of New Jersey's leading manufacturing centres. 272. New York.
[43] Patents for American Saw Co. Retrieved from Directory of American Tool and Machinery Patents: http://www.datamp.org/patents/search/xrefCompany.php?id=343.
[44] Improvement in circular saws. (1868, February 1). Scientific American, *18*(5), p. 69.
[45] *James E. Emerson*. Retrieved from Vintage Machinery: http://vintagemachinery.org/mfgindex/detail.aspx?id=1579&tab=7

Figure 4. Advertisement for Circular Saws from an 1868 *Scientific American* magazine.[46]

Patents, like in the case for Emerson, in *Scientific American* were often published as a means of advertisement. Many inventions showcased by the magazine were created by independent inventors who were possibly looking for investors to buy the patent for production rights. The sewing machine is an example of this occurrence. Allen Wilson, who patented many iterations of the sewing machine, was a sole inventor who did not profit from his invention at all. His sewing machine was very successful, as the versions frequently appeared in *Scientific American*, and his patents were used for manufacturing. Wheeler & Wilson, manufacturers of the Wilson sewing machine, profited greatly and were the leading sewing machine producers of their

[46] Circular saws with Emerson's patent. (1868, February 22). Scientific American, *18*(8), p. 128.

time.[47] By this method, *Scientific American* was a source of advertisement for the inventor, who was then able to get investors to make the invention into a household item.

Scientific American conveyed general knowledge about various inventions, patents, and science, but it was also a means of spreading business and aiding inventors in contracting investors to support their products. The rise in economy and big business encouraged more manufacture of products, as it was now viewed as profitable. Corporations and other big businesses wanted to be the apex of their trade, which often required manufacturing cutting edge technology of the time. *Scientific American's* publishing of information on patents allowed companies to view new inventions and consider them for manufacturability, like in the case of the Wheeler & Wilson Sewing Machine.

Scientific American *and Late Nineteenth Century Advertisement Methods*

In the late nineteenth and early twentieth century, a struggle was taking place for the control of power to shape and help define culture. The seriousness, and to some degree the open-endedness, of this struggle have been demonstrated by Neil Harris's account of the rival strategies of museums, fairs, and department stores in the years around 1900.[48] Set-up, display arrangement, interactivity, and organization were all areas of study in all three of these industries. Each wanted to make sure the people coming in were enthralled by its offerings and would tell their friends about it and come back for more. Scholar Neil Harris states "Influencing

[47] Mehrtens, K. and Montague, E. (2011). *Mid-19th century Scientific American illustrations*. Interactive Qualifying Project, Worcester Polytechnic Institute (WPI).
[48] Harris.

public taste, therefore, means increasing knowledge, expanding experience, and shaping preference for all or some of these groups [producers, consumers, and sellers]".[49]

Museums, like the things they housed, were considered artifacts. They had rows upon rows of various items for one to view, lined up and down hallways or close together in exhibits, which did not provide adequate user experience. Department stores and fairs, however, at least at first, were masters of user experience. At fairs, the attendees were invited to be a part of demonstrations of various inventions and machines in action and were able to interact with and ask questions of the people operating them. Also, at fairs there were usually relatively few main attractions and around those would be a variety of smaller attractions; however, the fair organizers made sure visitors always came for the main attractions. Similarly, department stores during this time spent large sums of money and time to create the "perfect" shopping experience. Original sculptures and pieces of art would be displayed around department stores, and there could be areas where there was an elaborate set up to grab the shopper's attention and take note of certain products. This was a very intriguing and innovative herding method to get the consumer to buy what the store wanted. Museums, in contrast, were cluttered. There were no real "main attractions", and they often lacked the pomp and activity of fairs and department stores. Slowly into the twentieth century, however, museums would end up taking their role back as the leader in bringing to the common folk ideas of culture and history.

Decades earlier than all of this, the *Scientific American* magazine was already on the cutting edge of presentation and user experience, even though its publishers might not have known it at the time. When *Scientific American* presented all of this information in the magazine, it brought with it the scientific authority of museums with pure knowledge in the general topics it

[49] Ibid, 57.

discussed, but it also presented the opportunity of venture, especially with visual appeal in regards to its inventions. In the middle of the nineteenth century, one could walk from their home and go into town to buy goods. There would be local specialty stores, general stores, and merchants selling differing goods.[50] However, most of the items one could purchase were relatively limited to one's immediate location, due to transportation issues. Even with the mass use of railways and faster and larger steam boats, the American postal service at the time and the transfer and delivery of goods was still not as fast as or accommodating as it is today. If one were looking for industrial items, heavy agricultural tools, or a better way to light one's lamp, one would usually be out of luck unless of course one lived in or near a large industrial city. At the time, in the middle nineteenth century, there was no mail order catalog with which one could sit down and look through a wide selection of products, pick what was desired, send in an order, and receive the product. The first truly mail order catalogs would not be seen until 1872, with Aaron Montgomery Ward's invention of mail order. [51]

Although not a mail order catalog, the *Scientific American* magazine in many striking ways could be compared to one. It may be more helpful to consider it as a middleman, something that the mail order catalog would later try to eliminate. If one can look beyond the broad scope of what *Scientific American* was as a magazine, largely for showcasing patents and other general scientific knowledge, it can be seen as analogous to a virtual store. It has descriptions of the items (patented inventions), and it often provided addresses of where one would write in order to purchase such a device, either from the inventor, assignee, or manufacturer. However, like any quality-run store, it show-cased its more prominent or noteworthy items through engravings

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[50] Carden, A. Retail innovations in American economic history: The rise of mass-market merchandisers. (2011). *The Handbook of Major Events in Economic History*.
[51] *Welcome to Montgomery Ward*. Retrieved from http://www.wards.com/custserv/custserv.jsp?pageName=About_Us.

present throughout the magazine. These engravings were highly detailed and masterfully produced, making the invention that much more attractive than with an article alone.

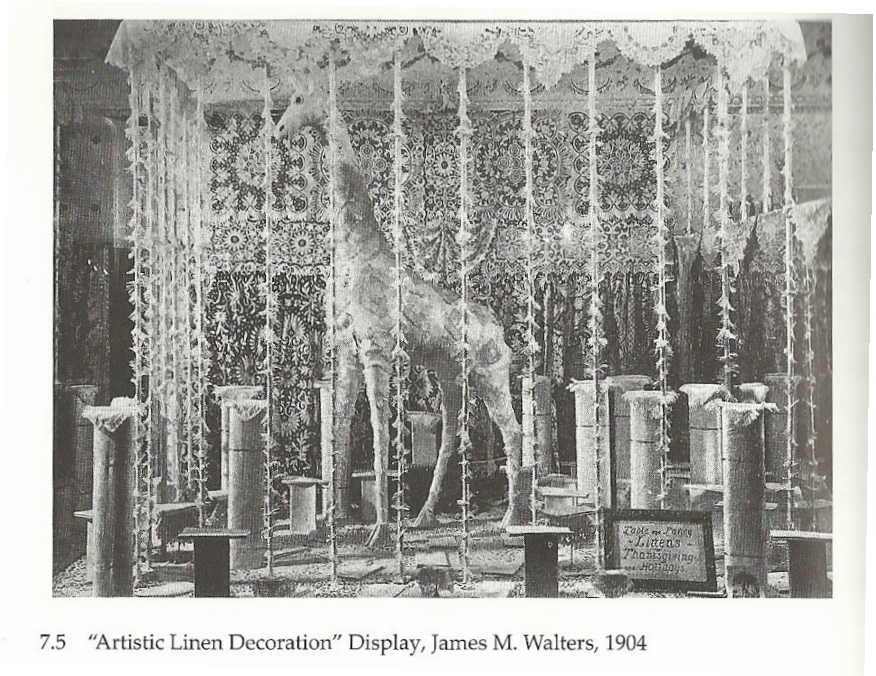
Similar to a storefront, the engravings in *Scientific American* had many analogous strategies to draw in "customers", increase their interest in the product (or invention in this case), and potentially increase the sales of said product (or the knowledge of the invention). A storefront has basic functions such as structure, enclosure, entry, identity, and display.[52] In a similar fashion, the engravings were a central part or "structure" of the magazine, as the masterful art was one of the defining things that set *Scientific American* apart from other publications at the time. It helped to "enclose" or encapsulate what the description of the invention portrayed to the reader.

In many ways, what *Scientific American* did, as far as business sense with advertising and flaunting its products, was far ahead of the times and something that would not be looked at until the later nineteenth century. The phenomenon in the late nineteenth and early twentieth century businesses was all about presentation, specifically with storefront and window display presentations in bustling and clustered cities. In the 1880's, the show windows became the "eyes and soul" of the store, and the retail world exploded with studies and entire books dedicated to perfecting this topic.[53] *Scientific American*, one could argue, understood this and accomplished this as a virtual store with virtual "windows" long before the explosion of interest in the subject nearing the end of the century.

There were other scientific magazines at the time of *Scientific American*, especially during the mid-nineteenth century, which begs the question: what made consumers prefer this

[52] Jackson, M. Storefronts on main street: An architectural history. *Illinois Preservation Series* (19).
[53] Iarocci, L. (2013). *Visual merchandising: The image of selling*. Burlington, VT: Ashgate, 142.

"virtual store" over others? Undoubtedly, one of the defining characteristics of *Scientific American* was the quality of the pictures that accompanied its articles. It had many detailed sketches and engravings of various well-sketched patented inventions produced by famous engravers and produced in a clear and crisp way. *Scientific American* also almost always made sure the front page had some sort of large engraving that brought in the reader's attention, thus making them want more and continue to read the magazine. This is similar to the desire of the window dressers and stylers to use their creations to "not just capture attention but excite in people 'the desire of possession'".[54] For example, the following photograph shows a display made entirely out of products the store sold. The point of it was to capture the attention of the shopper, to make them become enthralled in the store.



7.5 "Artistic Linen Decoration" Display, James M. Walters, 1904

Figure 5. A creative store front decoration for a textiles store, featuring a giraffe made entirely of the store's cloth inventory.[55]

[54] Ibid, 143.
[55] Ibid, 148.

This is akin to what the editors, writers, and artists of *Scientific American* wanted to accomplish. The more successful its patented and showcased inventions became, the better business was for them. This is because more people would then want to use them to patent their inventions and subsequently want to be in their magazine, which would increase their success in a business and status sense. From the very first image the reader sees, and the very first article about said image, the hope for the owners of *Scientific American* is that it would excite the reader into imagining themselves using or manufacturing the product. The end hope would be that the reader ultimately ventured into the manufacture or investment of an invention. The following figure shows an example of a fanciful device that never was patented or produced at the time, but nonetheless engaged the reader and most likely got them to read the rest of the magazine, which included patented inventions that could be bought or inquired about.

Scientific American.

A JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, AGRICULTURE, CHEMISTRY, AND MANUFACTURES.

VOL. V.—NO. 14. NEW YORK, OCTOBER 5, 1861. NEW SERIES

Pneumatic Dispatch.

A company has been formed in London under the title of the Pneumatic Dispatch Company, for establishing lines of pneumatic tube for the speedy conveyance of letters and parcels. The chief feature of the invention consists in propelling a train of carriages through a tube by the creation of a vacuum before them; the tube being, in fact, the cylinder, and at the springing of the invert (for the tube has a segmental bottom) two feet four inches. The tube is of cast iron, in nine feet lengths, each weighing about one tun, and fitted into each other with an ordinary socket joint, packed with lead. Within the tube, and at the lower angles on either side, are cast raised ledges, two inches wide on the top, and one inch high, answering the purpose of rails for the wheels of the despatch trucks to run upon. The latter are made of a framing seven or eight feet long, inclosed in sheet iron, and having four flanged wheels, twenty inches in diameter each. The whole truck is so made that its external form, in cross section, conforms to that of the tube, although it does not fit it closely, an intervening space of an inch or so being left all around. Some light india rubber flanges or rings are applied at each end of the truck, but even these do not actually fit the inner surface of the tube, a slight "windage" being left around the whole truck. There is, therefore, no friction beyond that of the wheels; and the leakage of air, under a pressure of four or five ounces per square inch, amounts to but little. The air is exhausted, from near one end of the tube, by means of an exhausting apparatus, from which the air is discharged by centrifugal force. Some idea of this apparatus, which is very simple may be formed by comparing it to an ordinary exhausting fan. It is the intention of the company, now that they have obtained Parliamentary powers for opening the streets to lay down their tubes, to establish a line between St. Martin's-le-Grand and one of the district post offices, and ultimately to extend their system throughout the metropolis, so as to connect the railway stations and public offices.

EXTENSION OF THE NEW MODE OF SENDING PARCELS.

and the carriages the piston. A piece of ground adjoining the Victoria Railway bridge at Battersea, and belonging to the Vauxhall Waterworks Company and London and Brighton Company, has been selected for testing the project. Here upward of a quarter of a mile of the tubing has been laid down; various irregular curves and gradients being introduced to show that hills and valleys would not prevent the effective working of the system. The apparatus certainly works well. With an exhaustion varying from seven inches to eleven inches of water, or from four ounces to six ounces per square inch, the speed is about twenty-five miles an hour. The tube through which the dispatch trucks are drawn is not circular in form, but of a section resembling that of an ordinary railway tunnel; the internal hight being two feet nine inches, the width at the springing of the arch (the top being semi-circular) two feet six inches

Some successful experiments were made on Tuesday. One trip was made in sixty seconds, and a second in fifty-five seconds, the distance being a quarter of a mile. Two gentlemen occupied the carriages during the first trip. They lay on their backs on mattresses, with horsecloths for coverings, and appeared to be perfectly satisfied with their journey. It is calculated that the carriages will eventually move through the tubes at the rate of from thirty to forty miles an hour. The arrangements are in the hands of Mr. Latimer Clarke and Mr. Rimmell.

[The above description is taken from the London *Illustrated News*, and our engraving is compiled from a series of cuts in the same paper; our artist having succeeded admirably in showing in this one large view the whole structure and operation of the apparatus, which is less clearly displayed in the pages of our famous cotemporary.—Ed.

Figure 6. A fanciful "mail train" engraving in Volume 5, Issue 14 of *Scientific American*.[56]

[56] Extension of the new mode of sending parcels. (1861). *Scientific American, 5*(14), 209.

Fanciful patents and inventions were present, but there were plenty of instances in which *Scientific American* helped to advertise and create the boom for the "next big thing." One example is the mass production, use, and implementation of improved functions of Allen Wilson's sewing machine that was patented and displayed through *Scientific American*.[57] Again, this shows an example of *Scientific American* successfully advertising and marketing an invention that was later picked up by a manufacturer and made into a huge success.

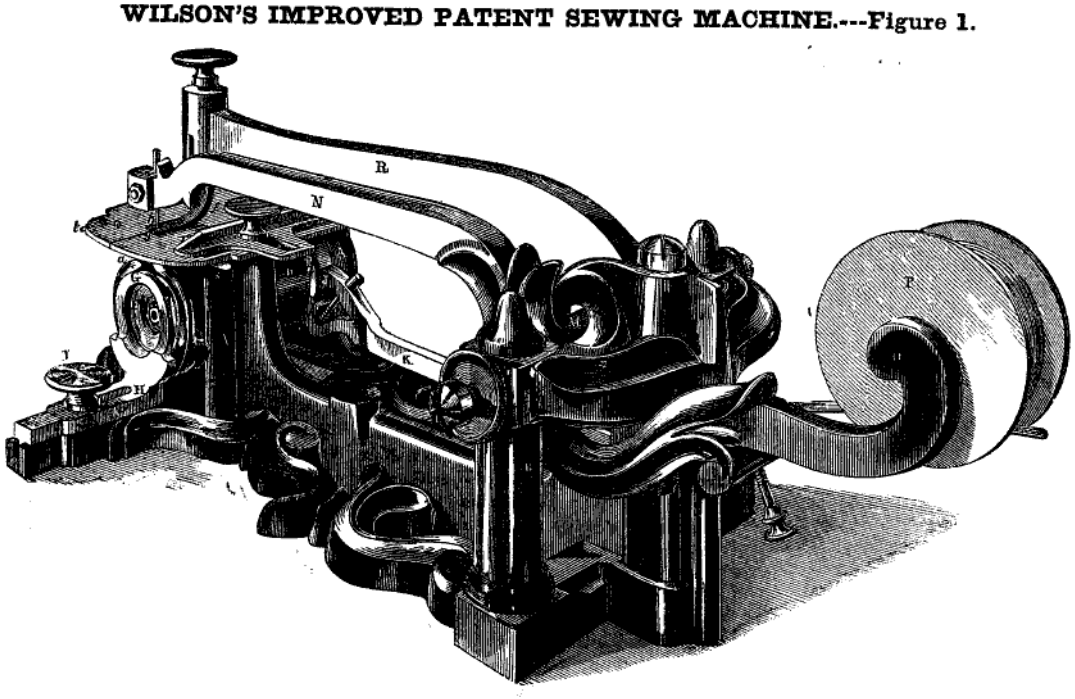


Figure 7. Engraving of a patent sewing machine in *Scientific American*. [58]

It is impressive to see a magazine that seems to have understood all of these nuances that many physical businesses would not realize until at least twenty years later down the road. *Scientific American* took advantage of this knowledge to gain its power and respected standing as

[57] Mehrtens, K. and Montague, E.
[58] Wilson's improved patent sewing machine. (1853). *Scientific American, 8*(38), 297.

a scientific magazine in the nineteenth century. *Scientific American* portrayed many of the similarities of a physical store in the nineteenth century, but it was far ahead of the times in regards to offering various non-physical services as well as in presentation, marketing, and selling of its products. Thus, *Scientific American* effectively acted as a middleman between its showcased inventions, akin to window displays in a store, and its readers, like the passersby of the store displays.

Conclusion

With the conclusion of this research, our project team suggests further examination into the role of *Scientific American* as a middleman of knowledge between the various stakeholders of inventions and industry. In the years following the Civil War, corporate involvement in industry placed a greater emphasis on consumerism and advertisement, as well as the prospect of manufacturing inventions. We have demonstrated that *Scientific American*, under Munn and Co., was able to exert various aspects of business theory, including methods of advertisement, years before the theories were established, perhaps unknowingly, in order to relay information to its readers. Various channels of technical information existed at the time, including other periodicals, trade shows, and a greater emphasis on higher level technical education. Following along with Neil Harris's essay, regarding museums, trade fairs, and department stores in particular, we have seen that the techniques used by *Scientific American* were similar to those used by museums and stores to draw in consumers. Through study of the periodical itself, we were able to discern that Munn and Co. brought a stronger focus on science and invention than it had previously contained, while staying unfocused enough to appeal to a wide audience, unlike other magazines such as *The Engineer*. We offer that further research can be continued about

Munn and Co.'s actual intentions for the magazine, whether they had determined the best practices for the periodical, or if they had simply developed them on intuition. Our research has opened discussion to the role of *Scientific American* as a middleman between inventors and readers who were interested in manufacturing the inventions for further detailed study in business and industrial history.

Recommendations for the Next Group

As this year's cataloging comes to an end, suggestions for directing the next group arise. Over the years, many suggestions from previous groups were not particularly fulfilled or taken into consideration. As a group, we are anticipating that these recommendations will come into play in the near future of this project. Our recommendations are to guide the next group in fulfilling objectives for which we had not the time to accomplish.

Over the next year or two, there are two directions in which this project can be taken: 1) finish cataloging the *Scientific American* provided by the Cornell University website and 2) edit the past entries that contain broken links and update the older entries. We recommend that finishing cataloging would be the first to occur as there are only four more years to catalog from Cornell's website. Additionally, although we have updated the publication options in the indexing field, all entries indexed prior to this change have not been updated accordingly, and will need to be updated in that respect as well. Editing could pose to be a daunting task, because the only current method of editing, that does not require SQL coding, is to re-input every entry. We encourage obtaining a member of a future group that has a strong Computer Science background, particularly with knowledge of SQL, as this is the language currently supporting the

database. This would be beneficial in creating an 'edit' function on to the site. This 'edit' function would facilitate the editing process and make it more efficient.

Additionally, it is essential to finalize the look of the website itself. Mending all missing information that may not be given and ensuring the site looks visually pleasing is essential for having a successful debut. While a public debut of the site is foreseen to happen in a couple years, these tasks require completion. A sampling survey on the ease of use and visual appeal of the website itself might be beneficial. The feedback from the survey will further aid in the refining of the database.

Partly through the project, our team encountered an unexpected complication where the permissions of the website were reset, thus rendering access to the database impossible. We were unable to gain control of the original user account that controlled the website, and so our communications with the Helpdesk were slow and somewhat confusing. Eventually, the Helpdesk was able to repair the errors, and we regained access to the database. However, these complications caused our project team to lose valuable time in the project. We suggest that if future teams encounter similar problems to contact the Helpdesk. In this event, it is likely that there are problems with the users "editdisplay" and "sciamingiqpuser", which point back to the database storage, and it is suggested that future groups relay this information to the Helpdesk to expedite finding a solution.

The *Scientific American*, as a periodical, was used for showcasing inventions from the Munn & Co. Patent Agency. The publication years covered by our group in *Scientific American* are the Civil War era; in this time there were many patents that were related to war and military. If we were able to continue cataloging through 1869 (into Reconstruction), it would be

very interesting to see if there is a new trend of patents related to the times, or a shift in categories of patents from the Civil War Era.

We will pass along various pieces of the project to the next IQP group. The Twitter account should stay active and updated, as cataloging and editing occurs in future groups. A Gmail account will also be passed along which is beneficial for Twitter log in and use as a group email. Once the database and website are ready to be made available to the public, we suggest contacting *The Towers* again to make an announcement. The newspaper can be contacted at towers@wpi.edu. Future groups should keep in mind that since the newspaper is weekly and published every Tuesday that deadlines for submissions usually occur around the Friday or Saturday prior to the issue to allow for ample preparation time. Also, since the American Antiquarian Society is the sponsor of the IQP, a good relationship is to be kept, and contact with Molly Hardy should and can be made if any future group needs assistance with the project.

Conclusions

Over the course of this project on *Scientific American* illustrations, the project team had two main goals: index entries through 1865 and research the role of the *Scientific American* as a middleman between inventors and consumers, as potential investors or manufacturers. Along the way we added a few accomplishments, which included creating a Twitter account, making small changes to the database site, and getting more in touch with the American Antiquarian Society. We were able to accomplish our goal of indexing through the year 1865, which marks twenty years of entries in the database. Indexing these illustrations did not come easy at times, and there were a few obstacles to attend. There were permissions issues and revisions in the subjects to be made, as well as minor changes in the indexing options. Some issues were fixed by our group,

but due to our technical level, we leave for the next group a few recommendations as to what we believe should happen. Regardless of these small issues and changes we were still able to catalogue an astonishing ten volumes of the *Scientific American* and research our view on if the magazine served as a middleman between inventors and consumers.

Upon finishing up our goal of indexing ten volumes, the group switched our focus to our research topic: *Scientific American* as a middleman. While indexing, we had noticed a trend with the articles in the magazine, which presented their respective inventions as revolutionary, useful, and well-designed. This observation sparked interest in our research topic. Our discussion was based on the writings of Neil Harris, who proposed the topic of competing industries, particularly museums and stores, for consumer interest and appeal. We researched the business theory of the time, including the rise of the corporation and push for advertisement, patent law, and other sources of technical information. We also discussed the credibility of Munn & Co. and viewed the magazine in comparison to store and museum displays. These topics aided in discovering if *Scientific American* could be viewed as a middleman. *Scientific American* used illustrations to showcase inventions, as businesses and corporations would with their own products. Through our discussion, we have proposed the topic of *Scientific American* as a middleman and opened the idea for further research.

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Appendices

Appendix A: Revised Subject Definitions List

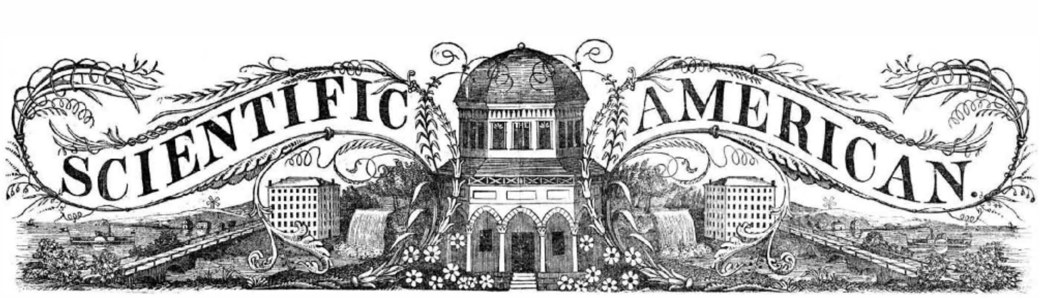
Subject	Definition
Agricultural Implements and Operations	Agriculture is the cultivation of live products to sustain human life. This subject refers to all tools needed to perform agricultural activities. This includes implements for operations such as cultivation, harvesting, processing, packaging, storage, and transport of agricultural goods - e.g. cattle, grain, potatoes, etc.
Arts – Fine, Polite, and Ornamental	This subject refers to any forms of art, either visual, conceptual, or musical, and the tools required to produce them. This can include actual works of art and performance pieces, as well as implements such as cameras, instruments, and other related items.
Calorifics, Lamps, Stoves, etc.	A calorific is anything relating to or generating heat or calories – calories being units of energy. Therefore, this subject refers to heat- and energy-giving inventions, such as lamps, furnaces, chimneys, and stoves.
Chemical Processes, Manufacture, and Composition	A chemical process involves a reaction that changes the chemical composition of substances. The manufacture and composition of chemicals would be any process for creating, mixing, or changing these substances. Examples include combustible gases, batteries, and other processes.
Civil Engineering and Architecture	Civil engineering refers to the design, construction, and maintenance of structures. Architecture refers to the designing and erecting of buildings. This subject can include processes of design and construction, as well as buildings and structures themselves, including bridges, walls, and buildings.
Communication Instruments and Operations	This subject refers to any and all instruments, devices, and operations that serve as ways for communication. This can include telegraphing, package delivery, and postal services.
Fire Arms and Implements of War	This subject refers to all implements involved in the acts of war and battle, and other related activities. This can include actual firearms, cannons, and

	ammunition, as well as troop supplies, and military operations.
Grinding Mills and Mill Gearing	A mill refers to a machine for grinding or crushing substances. This subject refers to all implements and operations involved in the process of grinding and processing substances. It can include actual grinding mills and the gears included in them, as well as improved methods for completing the process.
Household Furniture	This subject refers to any furniture or appliance on the scale of household use. This can include dressers, desks, and shutters, as well as ice boxes, laundry tools, and cupboards.
Hydraulics and Pneumatics	Hydraulics refers to the science of moving fluids and energy transmitted by the flow. Whereas pneumatics refers to mechanical properties of gases. These two terms can include turbines, water wheels, and hydraulic lifts.
Land Conveyance	This subject refers to the movement of objects, including people, to different location; in essence can refer to land transportation. It can include railroads and its system, cars, and any means of transporting goods or objects.
Leather – Tanning, Dressing, and Manufacturing	This subject refers to the manufacturing process and uses for leather. Tanning is the process of turning animal skin into leather and dressing is a conditioning process of the leather. It can include machines for manufacturing, such as a tanning machine, and uses of leather, such as driving straps.
Lever, Screw, and Other Mechanical Powers	This subject refers to simple machines, for example the lever, screw and ramp. It also refers to apparatus's that create a mechanical advantage for the user. Examples of devices can include crank motion, pulley systems, and screw jacks.
Lumber, Machines for Manufacturing	This subject refers to the preparation of lumber as well as the manufacturing of it, including tools for manufacturing. This can include saws, barrel-making machines, and dovetailing.

Manufacture of Fibrous and Textile Substances	This subject refers to the transformation of fibers into textiles or fabric. Fibers are found generally from plants or animal fur and then made into thread for creating fabric. The cloth is then made into various items. This can include looms, India-rubber manufacturing and sewing machines.
Mathematical, Philosophical, and Optical Instruments	This subject refers to tools used for the study/practice of mathematics, studying philosophy, and optical implementations. Instruments for mathematics can include a straight edge or compass. Philosophical instruments can include anything used for gaining general knowledge or understanding existence, for example barometers, hygrometers, and scales to name a few. Optical tools can consist of chromoscopes, and telescopes.
Metallurgy and Manufacture of Metals	Metallurgy is the art and science of extracting metals from their ores and modifying the metals for use. This category includes any machines, processes, etc. that modify metals and any uses of metals themselves. This can include new alloys, smelting processes, etc.
Miscellaneous	Miscellaneous is defined as dealing with or interested in diverse subjects. For the purposes of this database the category of miscellaneous includes engravings that don't fit well into any other of the subjects or are not common enough to merit their own subject.
Navigation and Maritime Implements	Navigation is defined as the act, activity, or process of finding the way to get to a place. Maritime can be defined as of or relating to sailing on the sea, or doing business by sea. Implements in both of these cases can be a variety of objects from tools related to each subject to full-blown ship designs. Navigation can also relate to land and air as well. Example of some of these implements could be compasses, rudders, nets, scuba gear, hull-design, etc.

Pedagogical	This subject refers to the science of education, and more specifically instructional theory. It includes scientific or educational articles intended to provide scholarly information to readers.
Printing and Writing Implements	This subject includes all instruments and operations that deal with placing words upon paper or other mediums. This can consist of printing presses, engraving machines, writing instruments such as pens and pencils, or other similar implements.
Steam and Gas Engines	These are engines which use steam or gas to power them. Engines convert energy (in these cases, the steam or gas) into mechanical motion – i.e. propelling a vehicle forward. This subject can also include components of and accessories to the engines.
Stone and Clay Manufactures	This subject refers to the manufacturing and refining of clay and stone. It can range from brick making to refining for gold.
Surgical and Medical Instruments	Surgical in this case is defined as relating to the process of performing a medical operation. Medical in this case means relating to, or concerned with physicians or the practice of medicine. Instruments for both of these definitions can be more related to any tools that would be used or assist in any of these practices.
Wearing Apparel and Implements for Manufacturing	For all intents and purposes apparel is treated synonymously as clothing, or items related to clothing. Implements for manufacturing wearing apparel would be any machine or process that helps to produce apparel or related articles. Examples of apparel are shirts, pants, jackets, etc. Examples of implements for manufacturing would be looms, sewing machines, etc.

Appendix B: Volume 1, Issue 4 of *Scientific American*, containing the "Travelling Balloon".[59]



THE ADVOCATE OF INDUSTRY AND ENTERPRISE, AND JOURNAL OF MECHANICAL AND OTHER IMPROVEMENTS.

VOLUME I. NEW-YORK, THURSDAY, SEPTEMBER 18, 1845. NUMBER 4.

THE SCIENTIFIC AMERICAN, PUBLISHED EVERY THURSDAY MORNING, AT No. 11 SPRUCE STREET, NEW YORK, NO. 16 STATE STREET, BOSTON, AND NO. 21 ARCADE, PHILADELPHIA, (THE PRINCIPAL OFFICE BEING IN NEW YORK,)

By RUFUS PORTER.

Each number will be furnished with from two to five original engravings, many of them elegant, and illustrative of *New Inventions, Scientific Principles*, and *Curious Works;* and will contain, in addition to the most interesting news of passing events, general notices of the progress of Mechanical and other *Scientific Improvements;* American and Foreign Improvements and Inventions; Catalogues of American Patents; Scientific Essays, illustrative of the principles of the sciences of Mechanics, Chemistry and Architecture; useful information and instruction in various Arts and Trades; Curious Philosophical Experiments; Miscellaneous Intelligence, Music and Poetry.

This paper is especially entitled to the patronage of Mechanics and Manufacturers, being the only paper in America devoted to the interests of those classes; but is particularly useful to farmers, as it will not only apprise them of improvements in agricultural implements, but instruct them in various mechanical trades, and guard them against impositions. As a family newspaper, it will convey more useful intelligence to children and young people, than five times its cost in school instruction. Another important argument in favour of this paper, is, that it will be worth two dollars at the end of the year when the volume is complete, and will probably command that price in cash, if we may judge from the circumstance that old volumes of the New York Mechanic, by the same editor, will now command double the original cost.

TERMS.—The "Scientific American" will be furnished to subscribers at $2,00 per annum,—one dollar in advance, and the balance in six months.

Five copies will be sent to one address six months, for four dollars in advance.

Any person procuring two or more subscribers, will be entitled to a commission of 25 cents each.

[From the Boston Courier.]

Ballad of the Alarmed Skipper.

"*It was an ancient mariner.*"

Many a long year ago,
Nantucket skippers had a plan
Of finding out, through 'laying low,'
How near New York their schooners ran.

The custom was to grease the lead,
And then by sounding through the night,
Knowing the soil that stuck, so well,
They always guessed the reckoning right.

A skipper gray, whose eyes were dim,
Could tell, by tasting, just the spot,
And so below he'd 'douse the glim'—
After, of course, his 'something hot.'

Snug in his berth, at eight o'clock,
This ancient skipper might be found;
No matter how his craft would rock—
He slept,—and skipper slept profound.

The watch on deck, would now and then
Run down and wake him with the lead,
He'd up, and taste, and tell the men
How many miles they went ahead.

One night 'twas Jotham Marden's watch;
A wag was Jo,—the pedlar's son,—
And so he mused, (the wanton wretch,)
'To-night I'll have a grain of fun.'

'We're all a set of stupid fools,
To think the skipper knows by *tasting*,
What ground he's on,—Nantucket schools
Don't teach such stuff, with all their basting.

And so he took the well-greased lead,
And rubbed it o'er a box of earth
That stood on deck, (a parsnip bed,)
And then he sought the skipper berth.

'Where are we now, sir? please to taste;'
The skipper yawned, put out his tongue,
Then opened his eyes in wondrous haste,
And then upon the floor he sprung.

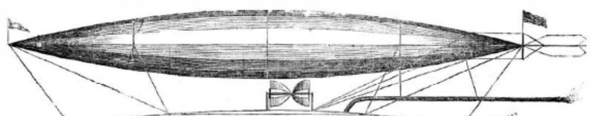
The skipper stormed and tore his hair,
Thrust on his boots and roared to Marden,
'*Nantucket's sunk, and here we are*
Right over old Marm Hackett's garden."

A Dandy.

A dandy is a chap that would
Be a young lady if he could,
But as he can't, does all he can
To show that he is not a man.

If wright you would write right,
You should not write it rite,
Nor write, nor right: but write it wright
And you will write it right.

THE TRAVELLING BALLOON.



ÆRIAL NAVIGATION.—The practicability of travelling rapidly and safely through the air, has been already established, as far as theory can establish a point without actual experiment; and the most important principles on which success in this mainly depends, have been already thus established. The specific gravity of hydrogen gas is less than that of atmospheric air, by something more than one ounce per cubic foot; and consequently a cubic foot of this gas being enclosed, has a buoyant power of one ounce in atmospheric air. A hollow globe, five feet in diameter, may be made of oiled silk of less than one pound weight; yet this globe, being filled with hydrogen gas, will possess a buoyancy in atmospheric air of more than four pounds. This sufficiently illustrates the first principles of ballooning; but as it is plain that a spherical balloon cannot be propelled with any considerable velocity on account of atmospheric resistance, we have adopted the eliptic spindle form, which will encounter—as will be proved in our next number,—less than 1-200th part as much resistance as a globe of equal diameter. A balloon of this figure, 350 feet in length and 35 in diameter, being inflated with hydrogen, will have acquired a buoyancy equal to 12,000 pounds. It will require in its construction 16 long rods, extending the entire length, and estimated to weigh 1000 pounds. 2,200 yards of strong linen cloth which, when varnished, will weigh 1000 pounds, thus leaving a balance of buoyancy of 10,000 pounds. An eliptic or revoloidal spindle-shaped saloon is attached to the balloon, being suspended immediately under it by cords or wires. It is covered with cloth, excepting about 100 feet of the central part, which has a permanent floor and is ceiled with thin boards. The weight of this part of the apparatus is estimated at 3,000 lbs. We have already constructed and put in operation a steam engine and boiler capable of working two horse-powers, but weighing only 200 lbs., from which it is estimated that an engine and boiler, of a size to work two horse-powers, may be made within the weight of 1000 lbs. One or two spiral fan-wheels, of 16 feet diameter, together with the requisite machinery for communicating the power of the engine to the fan-wheel; and the requisite ropes and rigging connecting the saloon to the balloon, &c., may all be comprised within the weight of 1000 lbs.: thus leaving a balance of buoyancy of 5,000 lbs. for passengers, baggage, &c. A rudder consisting of two broad fans, intersecting each other at right angles in the centre, is attached to the stern end of the balloon, by a ball and socket, or universal joint. Four arms project in opposite directions from the rudder near its connecting joint; and from the ends of these, small lines extend to the interior of the saloon, and by means of which the direction of the balloon is completely governed, both horizontally and vertically. With regard to the velocity of this ærial ship, it is susceptible of demonstration, and will be shown in a future number, that ten horse-powers is sufficient to balance the atmospheric resistance at a velocity of 100 miles per hour: but if it were otherwise, there is sufficient buoyancy to admit of engines capable of producing 30 horse powers. This balloon being once inflated, is intended to be kept constantly afloat, being *moored* at about 100 feet distant from the earth, when not in use. When passengers are to be received or landed, the balloon will descend to within a few feet of the ground, and a light-seated car will descend with passengers, to receive them. When passengers are received, a corresponding weight of stone blocks will be deposited, and *vice versa*. The saloon will be furnished with an apparatus for the production of hydrogen, sufficient to supply whatever quantity may escape by leakage. The interior of the balloon will contain an arrangement of lines and pulleys, by which the circumference may be contracted sufficient to cause the balloon to descend whenever occasion requires. These lines, which are attached to the rods, and by which the rods are drawn towards the centre, are operated by a small iron rod or wire, which passes from the interior, down through a small stuffing box, to the saloon. By means of this rod and system, the vertical movement of the balloon will be principally governed. With regard to the safety of this mode of travelling, we think it can be readily made to appear that there will be less danger in travelling over *land* in ærial vessels, than there now ordinarily exists in travelling by either sailing vessels or steamboats. In the first place, the balloon will be less liable to accident, than either steam vessels or railroad cars, on account of being less exposed; resting on the elastic atmosphere, and floating with the current, except what forward motion is given it by the propelling machinery, it cannot be effected by gales or squalls, like a stationary object, and its motions must be comparatively gentle. In the second place, the balloon will never soar so high but that in case of accident, or any derangement of the machinery, it may safely descend to the earth, in ten minutes: an idea much more consolatory to the passengers, than that of being five hundred miles from land, and surrounded by a violently raging element, to which, in case of either fire or leakage, the marine passenger must commit himself. A third consideration is, that the balloon will be furnished with an improved parachute for each passenger, and of which each may avail himself in less than one minute, in case of any extraordinary emergency, and thus descend safely to terra firma, much easier than he could paddle himself to shore, on a cotton bale, even from the middle of Long Island Sound. The steam engine by which the balloon is propelled, will be very small, and the boiler being constructed of small copper tubes, there can be no possibility of damage by explosion: and no accident can possibly happen to the balloon, that would cause a sudden descent, so as to prevent the passengers from having sufficient time to avail themselves of the parachutes. Moreover, their baggage would all come to land in due time. We shall give further and more minute particulars on this subject, with sectional illustrations, and mathematical demonstrations; but these must be deferred for future numbers.

MECHANICAL TASTE.—We are often surprised that mechanics do not pay more attention to the art of design—Indeed, knowledge of every kind is valuable to them. Sir Richard Arkwright was, we believe, a barber, but having turned his attention to machinery, and getting hold of a hint invented the spinning jenny and amassed a fortune. Wedgwood's pottery came first into notice in consequence of the elegant shapes and designs of his vases, cups, &c. A poor German mechanic rose to wealth in New York city, by being the first to introduce iron railings of beautiful patterns in place of the plain, old-fashioned straight rail pointed at the top. There is a yankee now making his fortune by a cheap process of map colouring which a little chemical knowledge suggested to him. We know a man who has improved the ordinary machine for plating whip-lashes, and applied it to the making stay laces, so that he can manufacture these articles for a price indefinitely below any rival. So, too, in common house-building, the carpenter, in a newly settled district, who understands how to erect a graceful dwelling, will soon carry off the business of those who are contented with the old clumsy style. Who would not prefer a window screen prettily painted to an old fashioned Chinese blind? Yet the one is not dearer than the other. In a word, taste and knowledge, when brought to bear on the mechanic arts, will always carry off the palm from stupidity and ignorance.—*Neal's Saturday Gazette.*

BOTHERING A WITNESS.—A Little Rock paper tells a story of a youth put upon the witness's stand, who was bothered by the counsel on the opposite sides—one complaining that he could not understand the witness, and the other claiming the protection of the court against such interruptions. Losing all patience, at last, the witness addressed himself to the court—"If you'll just stop 'em both, I'll tell my story so that the biggest fool in the house will understand it all."

A BEAUTIFUL FIGURE.—Life is beautifully compared to a fountain fed by a thousand streams that perish if one be dried. It is a silver cord twisted with a thousand strings that part asunder if one be broken. Frail and thoughtless mortals are surrounded by innumerable dangers, which make it much more strange that they escape so long, than that they almost all perish suddenly at last. We are encompassed with accidents every day to crush the mouldering tenements that we inhabit. The seeds of disease are planted in our constitutions by nature. The earth and the atmosphere whence we draw the breath of our life are impregnated with death—health is made to operate its own destruction! The food that nourishes the body contains the elements of its decay; the soul that animates it by a vivifying fire tends to wear it out by its own action; death lurks in ambush along our paths. Notwithstanding this is the truth, so palpably confirmed by the daily examples before our eyes, how little do we lay it to heart! We see our friends and neighbours perish among us, but how seldom does it occur in our thoughts that our knell shall, perhaps, give the next fruitless warning to the world!

A MAN OF MUCH EXPERIENCE.—A Glasgow paper tells of one Robert Arkless, aged 73, who has been wedded to five wives, and has been the father, up to this time, of 33 children. He has been one of the Church's best customers. Of his children, 29 have died, and of his wives four. This gives 33 funerals. As all his wives are churched for each birth, he has paid for 33 churchings. As all his children up to this time, have been christened, this gives 33 christenings. Having been five times married, he has paid for five weddings! This is a pretty account. A century ago he would have been taken to Court and rewarded as a praiseworthy subject. He is now working for one shilling a day, and his wife for 8d, his master allowing him house and garden.

COMMERCE OF THE UNITED STATES.—The following statement of the commerce of the United States, for the year ending June 30th, 1845, is from the Washington correspondent of the New York Courier. It will be seen from it that the balance of trade is against us to a small amount.

The total value of imports for the year, ending June 30, 1845, is	$119,512,606
The total value of exports for the year, ending June 30, 1845, is	107,891,622
Excess of imports,	$11,620,984
The total exports of specie for the year, ending June 30, 1845, is	$8,477,851
The total imports of specie for the year, ending June 30, 1845, is	3,952,233
Excess of exports of specie,	$4,525,418

PAPERING CHURCHES.—This is a new fashion, which has grown up lately in Pittsburg, and one that adds much to the interior neatness and beauty of churches. The Fifth Presbyterian church in Pittsburg has been papered with plain granite walls, and a handsome figure paper on the ceiling. The Disciples' Church, in Allegheny, is papered with granite paper on the walls, with marble columns.—The South Carolina Methodist Church, in Allegheny, is covered with marble paper on the walls, with marble columns supporting cornice. The ceiling is covered with white watered paper. The Gazette says paper combines neatness and cheapness, and can be renewed at small expense—not more than double that of whitewashing.

GOOD ADVICE.—Somebody says: The best cure for hard times is to cheat the doctor by being temperate: the lawyer by keeping out of debt: the demagogue by voting for honest men; and poverty by being industrious: but pay the printer if you wish to be happy, and don't want to have the nightmare.

CATALOGUE OF AMERICAN PATENTS

ISSUED IN 1844.

CLASS V—*Calorific, comprising lamps, fireplaces, grates, furnaces for heating buildings, cooking apparatus, preparation of fuel, &c.*

[Continued.]

Improvement in the draught of chimneys—Archibald Wieting, Middletown, Pa., Dec. 16th.

Method of breaking coal—Joseph Batten, Philadelphia, Pa., Feb. 12th.

Fire-fenders—M. Morgan, Jr., New York, July 22nd.

Fire-places—Daniel Hemingway, Leesburg, Ky., Nov. 9th.

Hot-air furnaces—Jeptha Bradley, St. Albans, Vt. June 24th.

Improvement in grate-bars of furnaces—John Kymer, Caermarthen, South Wales, Eng., July 19th.

Furnaces for heating buildings—George Walker, New Haven, Ct., June 10th.

Portable furnaces—George E. Waring, Stamford, Ct., March 16th.

Lamp—Henry B. Fernald, Boston, Mass., May 17th.

Alcohol lamp for medicated vapour baths—Giles L. F. Griswold, assignee of L. E. Hicks, Middletown, Ct., March 16th.

Lamp-caps—Francis Draper, Esq., Cambridge, Mass., Nov. 20th.

Lamp-caps—D. Jarvis and New England Glass Co., assignees of R. M. Eddy, Boston, Mass., May 10th.

Improvement in the construction of lamps—Christopher West, Baltimore, Md., Oct. 7th.

Lard-lamp—John Tobin, Bloomfield, N.J., March 26th.

Light-house lamp—Winslow Lewis, Boston, and Benjamin Hemmenway, Roxbury, Mass., Aug. 7th.

Self-supplying lamp—Edwin B. Horn, Boston, Mass., Sept. 11th.

Lamp for burning volatile ingredients—Isaiah Jennings, New York, Oct. 12th.

Mode of raising lamp-wicks—Samuel Rust, New York, March 9th.

Improvement in oil feeders—Joseph Benson, Boston, Mass., Feb. 28th.

Cooking-ranges—Herbert H. Stimpson, Boston, Mass., May 17th.

Kitchen-ranges—A. W. Thompson, Philadelphia, April 10th.

Metalic reflectors—Alonzo Farrar, Boston, Mass., April 4th.

Air-heating and cooking stoves—John Wolley, Springfield, Mass., March 16th.

Air-tight stoves—John Cline, Norwalk, Ohio, Jan. 6th.

Self-regulating air-tight stoves—Harned & Elliott, assignees of Saxton and Elliott, Philadelphia, Oct. 30th.

Apparatus for regulating the heat of stoves—Samuel D. Tillman, Seneca Falls, N. Y., April 17th.

Improvement in cooking-stoves—James Young and Elmon Parker, Philadelphia, Feb. 12th.

Improvement in cooking-stoves—Jordon L. Mott, New York, Feb. 12th—Simon Peters, Schenectady, N. Y., Feb. 12th—S. S. Jones, Philadelphia, Feb. 20th—Ashley Hotchkiss, Maryland, N. J., Feb. 20th—Samuel Beutz, Boonsboro', Md., March 9th—Roswell Bush, Rochester, N. Y., April 4th—Abner Leland, Milton, Pa., April 4th—Frederic Kesselmeir, Wooster, Ohio, April 13th—Peter Mills, Binghampton, New York, April 30th—Isaac Straub, Cincinnati, Ohio, June 5th—W. & R. P. Resor, assignees of Thomas Bent, Cincinnati, O., June 5th—James White, Milton, Pa., June 10th—Calvin Fulton, Rochester, N. Y., June 10th—John C. Hermance, Schenectady N. Y., June 13th—Henry W. Camp, Oswego, N. Y., June 24th—James Wager, Troy, N. Y., July 9th—Lewis James, Amsterdam, N. Y., Sept. 2d—John W. Riggs, Fort Plain, N. Y., Oct. 30th—James H. Lyon, Schenectady, N. Y., Nov. 18th—Adam Ketler, Philadelphia, Pa., Dec. 7th—Archibald Wieting, Middletown, Pa., Dec. 16th—William L. Potter, Clifton Park, N. Y., Dec. 19th.

Cooking and heating stoves—Laommi Baily, Boston, Mass., March 26th.

Railway cooking stoves—Chollar, Jones & Low, assignees of Chollar and Parmelee, West Troy, N. Y., July 11th.

Heating apparatus—John Smart, Philadelphia, Pa., March 25th.

Apparatus for warming buildings—Benjamin Blaney, Boston, Mass., Sept. 7th.

CLASS VI—*Steam and Gas Engines, including Boilers and Furnaces therefor, and parts thereof.*

Steam-boiler or generating apparatus—Gabriel H. Moreau, France, Jan. 26.

Heater of steam-boiler, &c.—Zenas C. Robbins, St. Louis, Mo., Oct. 16.

Regulating the supply of water to steam-boiler—Daniel Barnum, Bridgeport, Conn., July 24.

Furnace of steam-boilers—Lemnn Bradley, Sharon, Conn., Dec. 12th.

Gas-light apparatus—James Crutchett, Great Britain, (now in Cincinnati, Ohio)—Eng. July 12th, 1842; U. S. A. May 6th, 1844.

Inflammable Gas or vapor engine—Stuart Perry, Newport, N. Y., May 23d.

Mode of constructing and governing steam engine, for the purpose of supplying a steam boiler, auxiliary—Henry R. Worthington, New York, July 24th—reissued Sept. 7th.

Condenser and boilers of steam engine—Benjamin Crawford, Allegheny city, Pa., Sept. 7th.

Conical balance valves, steam engine—Thomas McDonough, Middletown, Ct., Feb. 12th.

Conical seat and steam valves, steam engine—Sprague Barber, New York, April 20th.

Locomotive steam engine—Edwin F. Johnson, New York, Dec. 31st.

Opening and closing the valves of steam engine—Frederick E. Sickles, New York, Oct. 19th.

[To be continued.]

[59] *Scientific American, 1*(4), 1.

Appendix C: *The Towers* article on the project, published February 11, 2014.[60]

History and invention

Patent engraving IQP in sixth year

Hannah Bond
Editor-in-Chief

What do cannons, ice skates and steam engines have in common? The answer to this may not be readily apparent unless you're Tyler Alexander, Tori Miller or Amanda Pierce - three juniors working on an IQP dealing with patent engravings and the magazine Scientific American. Their project of cataloging engravings of patented inventions included in mid-1800s issues of Scientific American has exposed them to a myriad of innovative creations, including the aforementioned items along with others such as plows and lamp chimneys.

This IQP is actually unaffiliated with Scientific American, which has understandably shifted its focus quite a bit since the 19th century, and is instead being performed in collaboration with the American Antiquarian Society. Professors M. David Samson and Steven C. Bullock reached out to the society, which is located on Salisbury Street, in 2007, and the project has been continuing on since then. This year, the IQP is being advised by only Professor Samson due to Professor Bullock being away on sabbatical. There will be at least one more IQP team working on this project after the current team finishes their work.

It can be easy for resources compiled before the digital age to be lost in time, relegated to a distant corner in a library, or worse, a box in someone's attic. This IQP ensures that the inventions published in Scientific American remain publicly available via a database. Students participating in this longstanding IQP have worked on entering data about engravings of patents and associated information such as inventor, title and artist, along with other tasks such as promoting the database and tweaking its interface.

Although the database is currently only available to members of the IQP and their advisors, there are plans for it to become public within a year. The database will provide a wealth

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History and invention
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of information to researchers, as it is searchable and contains 20 years' worth of patent engravings.

While the historical aspects of this project are clear, the IQP team has found that it connects to their engineering education more than one might think. Miller relates that the 19th century was "a time when technical education was starting to become more prominent," and that she has found the inventions of the time period to be fascinating. Alexander, in a similar vein, says that he has learned "just how smart the innovators and engineers of the world were before us."

With WPI encouraging outside-the-box thinking and innovation, the IQP seems like a logical fit. Once the database becomes public, the public and students alike will be able to view the patent engravings and appreciate the innovations of the past, and maybe even be inspired to make some creations of their own.

[60] Bond, Hannah. (2014). History and invention: Patent engraving IQP in sixth year, *The Towers,* pp. 1, 10.