Scientific American's Impact on America:
Scientific American Illustrations

Interactive Qualifying Project Report completed in partial fulfillment
of the Bachelor of Science degree at
Worcester Polytechnic Institute, Worcester, MA

Submitted to:
Professor Steven C. Bullock
Professor M. David Samson

Trevor Alexander   _____

Alexander Horton   _____

Jonathan Ariza   _____

March 3, 2017

_____
Advisor Signature

_____
Co-advisor Signature

Abstract

This project, sponsored by the American Antiquarian Society, established a website for a database of illustrations found in the *Scientific American* magazine through the years of 1845 to 1869. As the seventh team to work on this project, the team enhanced the website and corrected entries that contained errors, such as broken links, grammatical errors, and incorrect data. The team added an edit option and fixed links to the *Making of America* website, a Cornell-run collection of nineteenth century texts. The team also investigated the impact that the agricultural implements found in *Scientific American* had on manufacturing and farming in the nineteenth century.

Authorship

Table of Contents

Table of Figures

Introduction

The goal of this series of IQPs is to create a website that makes it easy to search the illustrations in early issues of the *Scientific American* magazine, from 1845 to 1869. Electronic scans of old documents allow for searching for text, but finding illustrations is much more difficult. The solution to this was to create a database of information on those illustrations. These illustrations are largely inventions or devices patented through the Munn & Company patent firm, which owned the magazine from 1845 until 1948. The anticipated audience for the website is historians of American technology and invention, as well as scholars of visual culture.

The entries contain links to the *Making of America* online collection, a Cornell University-run digital collection of nineteenth century texts, allowing users to look at the actual magazine entry on the illustration's subject. The site is "a digital library of primary sources in American social history from the antebellum period through reconstruction" (The Making of America). They contain the issues of *Scientific American* from volume two in 1846 until the end of volume twenty-one in 1869.

We refined the website by adding images while also looking through earlier entries to check for missing information that had been reported missing in previous reports. Our initial look through the database from 1846 to 1848 revealed no noticeable errors. It appears that previous teams had managed to fix any discrepancies in the database. There was some suspicion that the dips that appeared for entries from year to year may have been from missing illustrations.

A major issue that we took up from previous teams were the broken links that had affected over three hundred entries in the database that connect to the *Making of America* collection. This occurred because at some date, the website updated and changed its format,

making a large amount of the stored links no longer valid. To address this issue in a more efficient and timely manner we split the task into two separate tasks. The first task was to add another feature to the website to allow entries to be edited in line. The second task was to acquire a list of entries that had broken links to them, which we did by going into the database itself and running a query to search for links that resulted in an error. Once we completed both tasks, we corrected all of the broken links that we found.

In this work, we noticed many entries pertaining to agriculture when looking through the database. Thus, we focused our research on inventions related to agriculture, such as reapers, mowers, and planters. Our central topic dealt with the agricultural inventions and improvements found in the database and their important to farmers during that time period.

Background: Previous IQP Work

This series of projects started in the 2007-2008 academic year, and has continued almost every year since then. The project's purpose was to catalog illustrations from the early issues of the *Scientific American* magazine in order to make information about them easily accessible to historians. The first team focused almost exclusively on creating a database and website to access the entries contained within. The second team then picked up the project the following year, only to realize that they had a lot of fixing to do. The database created for this project was completely inaccessible to anyone, as it was hosted on a student's personal website, meaning that the student was the only person with the authority to access it. They were able to recover the entries and then migrated them all to a MySQL database run on WPI resources in order to avoid this problem in the future. This team also improved the headings for the data presented in the

entries, getting rid of redundant or convoluted, such as column and extra descriptions and simplified the headings.

The third team resumed work on the projects in the 2010-2011 academic year. They undertook the task of improving the website used to access the database, since it was basically a blank page with very simple search functionality. They remade the website so that it would work more intuitively and allowed for basic browsing of the database, as well as changing it so that only authorized users could edit the data. The next year, the fourth team initially had issues with administrative and access rights which were resolved after having contacted some of the previous teams. Much of their contribution to the project was data entry for various volumes of the magazine.

The fifth team started the indexing of the new series of the *Scientific American*. They added more functionality to the website through adding an advanced search page. They had to fix various broken links, since the *Making of America* website had made changes to the server address, making almost all of the links useless. They fixed the majority of the links. The final team to work on this series of projects before us had significant trouble gaining access to the database and the website, but were able to address these issues and they finished cataloging the rest of the magazine until 1969, which is all that the *Making of America* website contained.

Challenges within our Project

Much like the previous teams, the first issue we faced in starting this project was getting the necessary access to the website, database, and the shared network drive that contained all code for the website. The network drive was the easiest to acquire, as the only thing that we needed was the folder path name, which the Professors provided us with, and permission rights

to login to the network drive. With the path name, we simply had to map it to our computers and login with our student credentials. After reviewing previous reports, it was apparent that there had been issues when first starting the IQP. One issue that has had been already addressed was that both the host of the database and the administration rights to the website had been registered to an earlier IQP team member who had exclusive control and access to them. This prevented anyone from any new teams from gaining administrative rights to the website and denied access to the database. Previous teams did not provide any detail on how to access the database directly or how new users gained administrative rights. As a result, work on the IQP ended up being delayed for several weeks in several teams' cases. We added instructions to the network drive to make it simpler for teams to learn how to obtain the necessary administrative rights and links for this project.

When dealing with the programing of the website in this project we had a very poor understanding of how the code worked as it seemed to have python code that wrote the html for the website. The team that created the website also failed to follow proper programming guidelines by not commenting on the code. Therefore, we wasted much time on trial and error experimentation to understand how the code functioned and making sure the website would not crash with any edits we made to the code. Once we had a better understanding on how the program worked and what files actually contributed to the makeup of the website, we made considerable progress. Various files in the directory were no longer in use and were just clutter. Once we finished the edit feature, we went back and added comments into the code and a readme text file that described what files were important and what they contained so that anyone looking at the code could have an estimate of what is happening.

The last issue we found was when working on correcting broken links. It became evident that there were spelling errors or incomplete sentences in a few entries. Various entries whose links we fixed also had incorrect entries in many of their fields like the page, issue, and volume numbers. This raised a concern that other entries within the database had errors in them. However, we did not have the time or manpower to search the entire database to spellcheck the entries.

Current IQP Work

The initial approach on this IQP was to review the reports of previous IQP teams. These reports offered a rough idea of what needed to be done or improved with regards to the website and database. The central issues were in regards to the database such as missing information and links. We noticed that several teams did not have computer science background to address these problems. There was also some discussion of continuing with adding entries into the database. The digitized issues of the magazine on Cornell's *Making of America* website only go through the years of 1845 to 1869. Previous project teams wanted to extend the database to cover later years. However, this would require finding less convenient sources for the issues. This would have consumed a great deal of time to accomplish, thus being one of the reasons that we decided to end the database with the year 1869. More important, the magazine began to change from focusing on patents and designs to material having to do with pure science, and so this date seemed to mark a natural end to the database. Thus, we turned our attention towards the more technical aspect of the project and divided the tasks among ourselves such that one person would be creating the edit feature, another would be finding all the broken links, and lastly looking

through entries for missing information along with other minor tasks. When help was required in addressing these tasks we would help one another such as editing the broken link.

The first impression we had when we first viewed the website was that it was somewhat outdated in terms of appearance. The website has a grey background. The only other color present is red on the header and footer of the page. The website also only had a single image on the home page. Some of the website's pages also had large amounts of text, which made it dry and less easy to read than it might be. To increase the appeal of the website, we added more images from *Scientific American* magazine to a few of the pages so that there would be less dry text.

We decided to focus on technical problems in the database and website. One of the things that a previous team suggested was to add an edit option to the website. We made this feature the main goal of this project as it had a great potential to benefit future teams who will work on the database. This option would avoid the arduous task of having to take down the entry's information on paper, delete the entry from the database and then add it back with the edits. This meant that the old version of the website did not have an edit feature and users would have to delete the old entry and add the new version back in which is laborious and time consuming. The first thing that needed to be done to achieve this was creating a search page to find the entry that is to be edited. When searching for the entry an error or a success message will appear telling the user if the entry was found or not. The user will then be shown a table populated with all the values where they can make their edits directly and then apply the changes to the database.

When deciding how we would search the database we noticed that all the entries must have unique titles, so we simply made the search look for the exact inputted title. Once the user compiles the entry, the screen changes either confirming that the title entered was valid and

should proceed or that the title does not exist within the database and the user should return to the previous page to enter a valid title. The next page then displays two tables: one that allows fields to be entered and another containing the information of the entry that is to be edited.

The original goal of this page was to have one table that contained all the information from the entry and then allow the user to go directly and change the information. However, our first attempt ended in failure. We were unsure of how the code retrieved the field values from the database. All we could tell was that the database was imported at the start of each file and there was nowhere else in the code that told how the actual data within the database was accessed. Since we were unsure about how to get the values from the database we had to experiment through much trial and error until we found what commands allowed us to retrieve data from the database.

As a result, we shifted our strategy to display a table with all the information on the entry next to a table input so that the user can copy and paste the needed information and change the rest. We made this our temporary solution and continued to work on the edit feature to get it the way we originally wanted. Eventually we found the solution by a stroke of luck and managed to get the table to populate all the information from the entry. We also kept the second table that shows what the old entry currently looks like on the database as shown on Figure 1 on the following page. Once the user has added the changes to the entry they will click a submit button which will once again change the page to confirm that the entry has been changed. This part of the edit feature took some time to accomplish, as we were unsure of whether there was a command that allows us to edit an entry in the database like there was for adding and removing entries. The way we overcame this was by deleting the original entry from the database and then adding the new version back into the database, thus updating the entry.

Input Module for Database of Early American Mechanical Drawings

| Home | Basic Search | Advanced Search | About | Data Input | Data Edit | Data Removal |

Field	Value
Title	test file
Image Description	something
Artist	ME
Article Summary	None
Inventor	None
Author	None
Patented	None
Subject 1	Mathematical, Philosophical, and Optical Instruments
Subject 2	Leather -- Tanning, Dressing and Manufacturing
Subject 3	Fire arms and Implements of War
Keywords	None
Publication	Scientific American New Series
Date	1845-01-01
Volume	86
Issue	9
Page	8
Series	asfib
People Involved	everyone
URL	yes

Title	test file
Image Description	something
Artist	ME
Article Summary	None
Inventor	None
Author	None
Patent Date	None
Subject (Multiple If Necessary)	Mathematical, Philosophical, and Optical Instruments / Leather -- Tanning, Dressing and Manufacturing / Fire arms and Implements of War
Keywords	None
Publication	Scientific American New Series
Date: Year	1845
Date: Month	1 January
Date: Day	1
Volume	86
Issue	9
Page	8
Series of Images	asfib
People Involved	everyone
URL: Auto?: ☐	yes

Click this compile button before submiting
the data above into the database.

Submit

Figure 1: Website Edit Feature

With a fully functioning edit option to help us, we shifted focus to make edits to the entries with broken links. Several of the links in the online database had been broken and led to an error page when the links were selected. From what we could gather from these broken links, it seemed that the Cornell website hosting the digitized issues had changed the way it formatted images of the *Scientific American* magazine pages. Thus the URLs did not match the updated version or the URL was simply entered incorrectly which led to a page fault when link is selected on the database. To find all the broken links, we wrote a simple SQL query and produced a table with the name of the entry, its volume, page, date, and the broken link. The query returned about three hundred entries with broken links spread around through the years of 1855 and 1858. Once we had a list of all the entries that had broken links, we simply went through the list as a team fixing the URLs. With the help of the edit option, we were able to go into the database and correct all these links within a week. It is highly possible that other entries within the database contain the same errors that we fixed in the entries that we found. Most of the errors seemed to be simple spelling errors while or incomplete sentences most likely due to reaching the character limit and simply putting the information in the wrong field. However, with such a large range of entries we saw that it was impractical to go through each entry in the database to look for errors, as we knew no simpler way to find these errors.

Several reports from earlier teams indicated missing information or errors that had appeared in several entries in earlier years due to technical difficulties of other teams. We went back to the earliest entries in the database to make sure everything was properly categorized just to make sure that the website would be without errors when it goes public. However, it appeared that teams have in the gone back in the past and fixed some of these inconsistencies, as we did not find many errors.

During the final weeks of working on the website, we became curious about the number of entries that were added corresponding to different teams that had worked on this IQP. From our research, we found that a couple of years had significantly fewer entries than others. According to the database, there was usually an increase in the number of illustrations in the magazine per year. The early years had about 300 entries per year, while the later years were reaching near 600 entries per year. However, there is a large dip in the years 1855-1858 where the number of entries dips well below 200 per year, as is illustrated below in Figure 2.
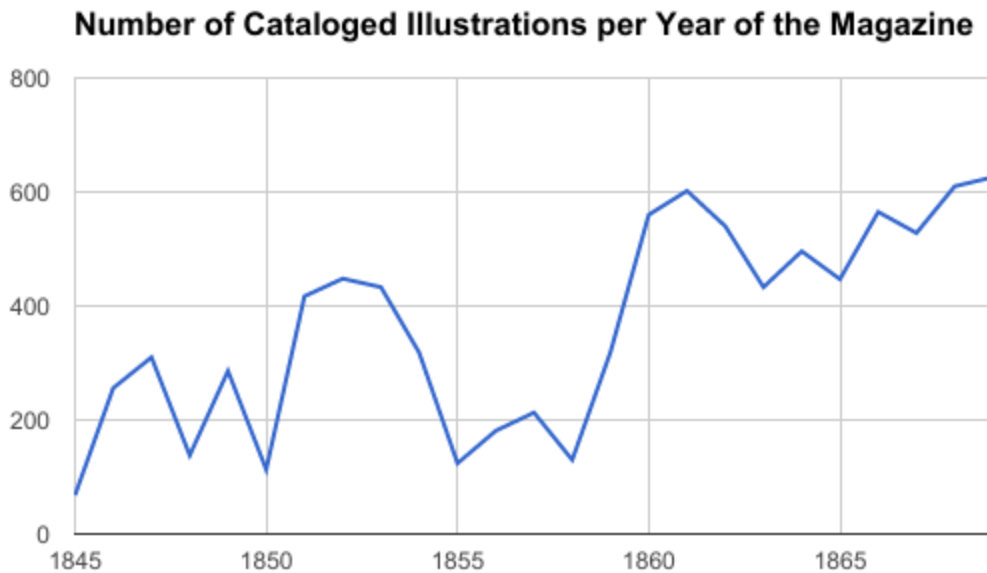
Figure 2: Entries added in the Database through the Years

After seeing the significant decrease in the number of entries in those years, we sought the cause for these discrepancies. This date range covers volumes 10, issue 17 of the old series until the first half of the first volume of the new series. After looking into this, we found that the database is missing large portions of these volumes entirely. As of this moment, we are not sure

why. One possibility is that at some point between the cataloging by the IQP team and today, that somebody made a mistake that ended up deleting large portions of the database. We checked the database to see if there were more missing issues and we have found that 1848 and 1850, the other two years that dip under two hundred entries, are also missing a significant number of issues. As a countermeasure to something of larger proportions, we created a backup of the database that can be used to restore it to its current state if anything were to go very wrong. This is something that we did not find until late into the project, when it was impossible to go in and catalog the missing entries. Future teams should look at this and re-catalog the missing issues. The missing issues are listed below:

Series	Volume	Missing Issues
	3	20-52
	5	3-52
	10	1-35,43-52
	11	21-31,41,49-52
	12	1-4,15,16,37-46,49-51
	13	1-4,25-36,47-52
Old Series	14	1-42
	1	13-15,25,26
	2	21-26
	8	23
	11	5
	13	2-9
New Series	17	21

Figure 3: Missing Issues in the Database

The last thing we planned on tackling in this IQP was the security of the website when logging in as an administrator. When someone logs in as an administrator, the URL displays both the username and password of the user. Not only would this be displayed in browser history for

15

anyone else to use the computer, but it would also be visible for anyone that could intercept the traffic. Thus, the security of the admin access login needs to be strengthened, as it is far too easy to gain access to the input and removal options given to admin users. It is possible for someone to simply walk by and see the URL that contains both the password and username or they could go into the browser history and click on the link that goes to any of the administrative pages. This could lead to unauthorized parties deleting entries or altering entries, thus making the database ineffective. Unfortunately, we did not have the required time to do this as it would have required replacing a large amount of code.

Agriculture in the Mid-Nineteenth Century

"Mechanics, Inventors, Millwrights, and Manufacturers: The *Scientific American* is a paper peculiarly adapted to all persons engaged in these pursuits, while to the Farmer, Housekeeper, and Man-of-Science, it will be found of equal interest and use" (New Series, Vol.1, Issue 7, page 112). This magazine was first printed in 1845 with the purpose of distributing weekly reports of what was going on at the US Patent Office. As time went on, the magazine grew in popularity and in the information that it covered. The first ten months of the magazine's publication were under Rufus Porter, who was an inventor. After this, the magazine was sold to Munn & Company, a New York patent firm run by Orson Desaix Munn and Alfred Beach. Munn was a professional publisher and Beach was an inventor, patent lawyer, and publisher[1]. Not only did it include information about patents, but it also spread to include news about westward expansion, and other things such as the development of railroads and the success

---

[1]Cataloging 19th Century Periodical Images

of crops in different regions. Our research question was to find how useful and informative the magazine was to the average American farmer in the mid nineteenth century United States.

Through querying of the database through the website, we found various images for new patents that were directly applicable to American farmers. There are 9175 entries in the database, and 741 of those were agricultural patents. There are 72 total reaper and harvester images in the database. Over half of those patents, 47 to be exact, were direct improvements and additions to previous designs. Compared to the rest of the magazine, this is a significant proportion of patents that target agriculture during the time period. By searching for any entries with titles that included "improve" in their titles, we found that there are 1558 patents that are direct improvements to others. The proportion of improvements in agricultural patents is much larger than for the rest of the magazine as a whole.

The improvements that occur throughout the years of the magazine show that most improvements dealt with small portions of existing machines. An example would be the way the blade is positioned or shaped in reapers.
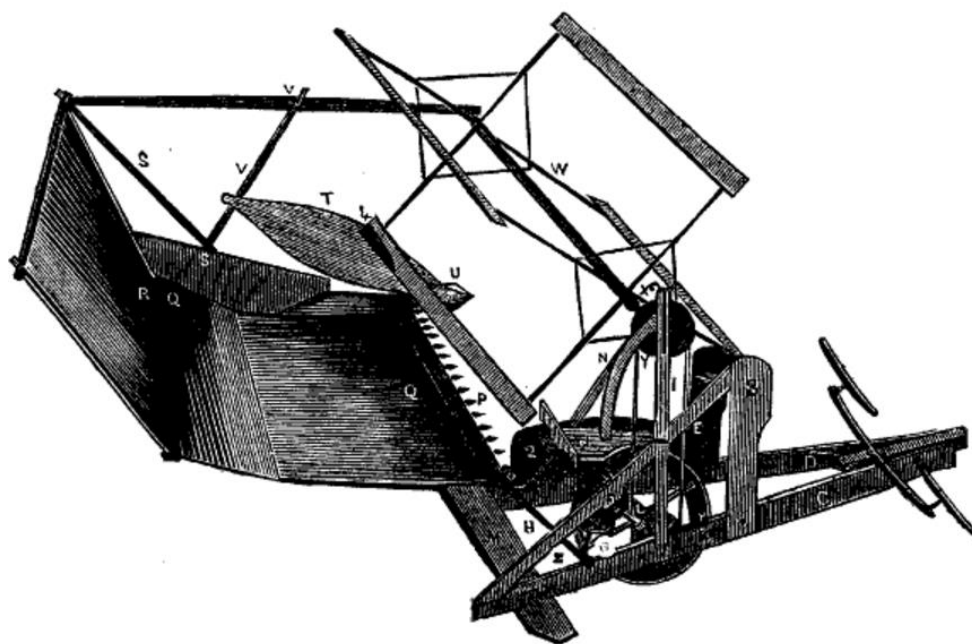
McCORMICK'S REAPER.

Figure 4: McCormick Reaper Illustration

The figure above comes from an illustration on the McCormick Reaper found in

Scientific American, where it mentions that the sickle of the reaper needed to be at a precise

angle or the blade would require a high velocity in order to cut the grain (Vol.6, Issue 21, page

164). With the previous reaper that is referenced here, it is clear that the old version of the

reaper had a fault that was recognized and mentioned to the public. The article further notes, "By

a thorough course of experimenting in cutting grass that was lying in a bad condition, Mr.

McCormick believes, and says, that he has now secured the best possible arrangements and

combination for cutting both grain and grass" (Vol.6, Issue 21, page 164).

Further search reveals apparatuses to simplify difficult and expensive procedures. The

Excelsior Grinder for Mowing and Reaping Machines offered, "a handy implement for grinding

the teeth of reaping and mowing machines, now so generally used throughout the country, is

certainly a desideratum." This article notes that the blades of reapers and mowers become dull

easily when run through the field. It then further explains that sharpening the blade usually required a master craftsman since the blade has triangle teeth. However, this invention would allow novices to sharpen the blade in the field much more cheaply.

There are also inventions combining two concepts such as the Charles Denton's reaper and self-raker mechanism. It effectively making a two-in-one machine this could save farmers hours of valuable time and money. A farmer could now do a single pass on his field to reap and rake his crop. It worked by having a conveyer belt feed the freshly cut grain directly into a hopper that would then dump the grain in piles. Already piled up, the grain could be bundled and collected with ease. The article points out the flaws of previous machines and then introduces a solution that creates a completely new version of the product that is more effective.
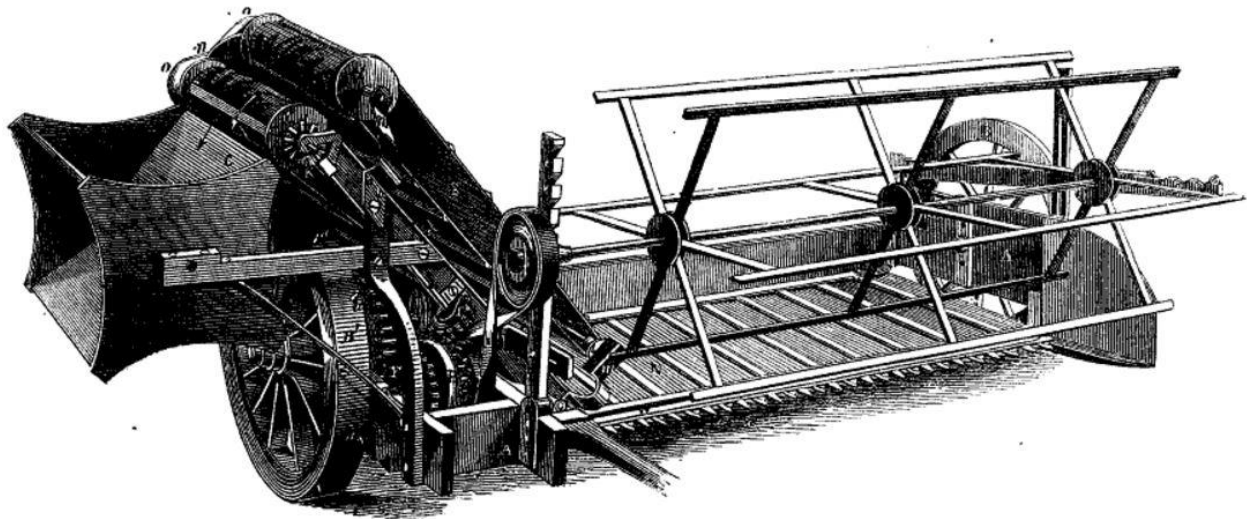

Figure 5: Denton's Reaper and Self-Raker Illustration

These improvements and adjustments occur throughout the magazine from year to year as shown by the Powers and Lancaster's Grain Binder, which appears in the October 18, 1862, issue sixteen, volume seven of the magazine. This grain binder is an attachable add-on for the reaper. Being fed grain by the reaper the binder would then wrap twine around the sheaves of

grain making neat bundles. Putting on this attachment would save money, as you would only need three people to operate it and do the necessary tasks. The ultimate goal of the magazine was to spread information on new and enhanced machines with the goal of selling the patent to willing buyers to produce the machine in factories. This might result in farmers buying machines that enabled them to produce more crops with less physical labor and farm help thus increasing their own profits while feeding the population.
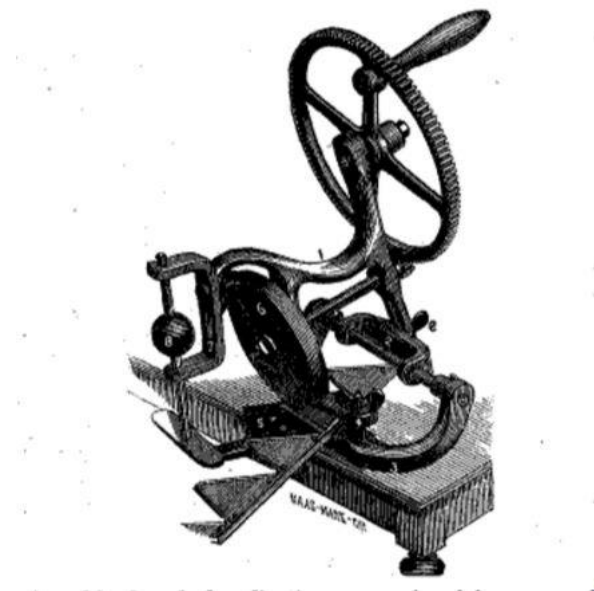

Figure 6: The Excelsior Grinder for Mowing and Reaping Machines Illustration

We found the number of agricultural illustrations by having the database return the number of illustrations whose subject included "Agricultural Implements and Operations." About eight percent (741) of the total entries in the database are categorized as such, making it the most popular category of illustrations in the magazine. The next largest category is the "Steam and Gas Engines" category, containing 466 illustrations. The largest subsets of the agricultural patents are reapers, planters, and mowers. There are numerous plows, windmills, and various livestock inventions, such as clasps and fences, and various storage devices that could be

beneficial to the farming population. There is also a large increase in the number of illustrations for agricultural items from the year 1854 until 1864, shown in Figure 6 on page 23.

The magazine in that time period also reported various other patents that would be beneficial to farmers, such as improvements to wheels, tools, and other everyday objects. The magazine also had an active correspondence with many of its readers, as shown in its "To Correspondents" section where the writers respond directly to the readers' questions and inquiries about patents and other things that have been presented in the magazine. These responded to people all of over the country, from people in the big cities like Boston and New York City to the farmers of Ohio asking about their new corn planters. (Vol.8, Issue 50, page 399) There were usually at least one or two agricultural related correspondences of about 15 different correspondences per issue.

Number of Cataloged Agricultural Illustrations Per Year of the Magazine
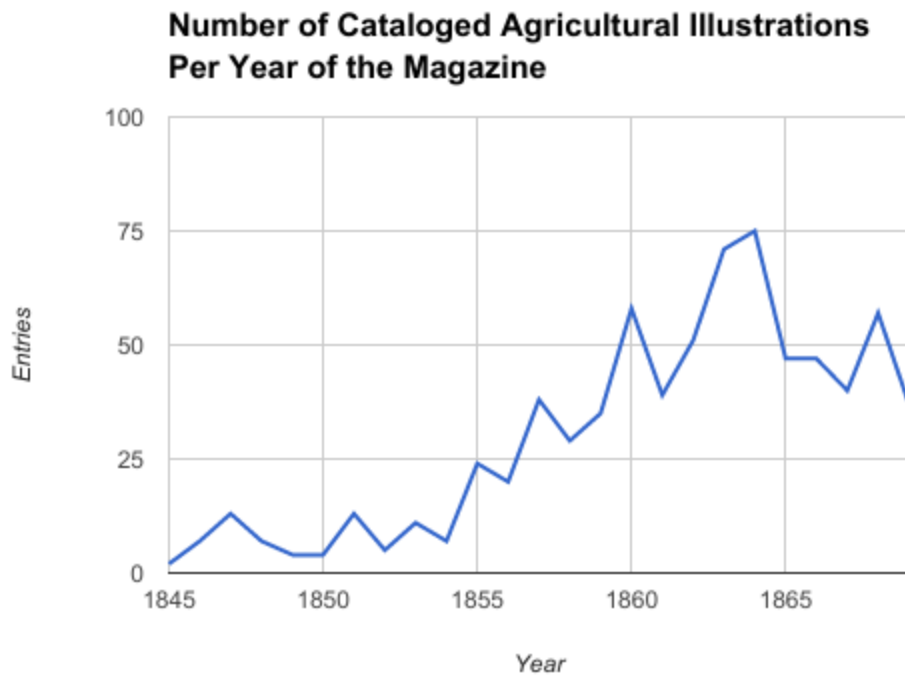
Figure 7: Agricultural Illustrations per Year in the Magazine

The table above shows the amount of cataloged entries per year that had the "Agricultural

Implements and Operations" subject as one of their subjects. These values may not accurately

portray the amount of agricultural patents that were presented in the magazine. One possible

reason for this could be that the entries of up until 1854 were the ones that the original team

input. They used an older format with limited fields that was later improved by the next team that

worked on it to include more fields and options to the entry table. Thus, there was a difference

between the two teams in terms of how they classified their entries. We gathered these numbers

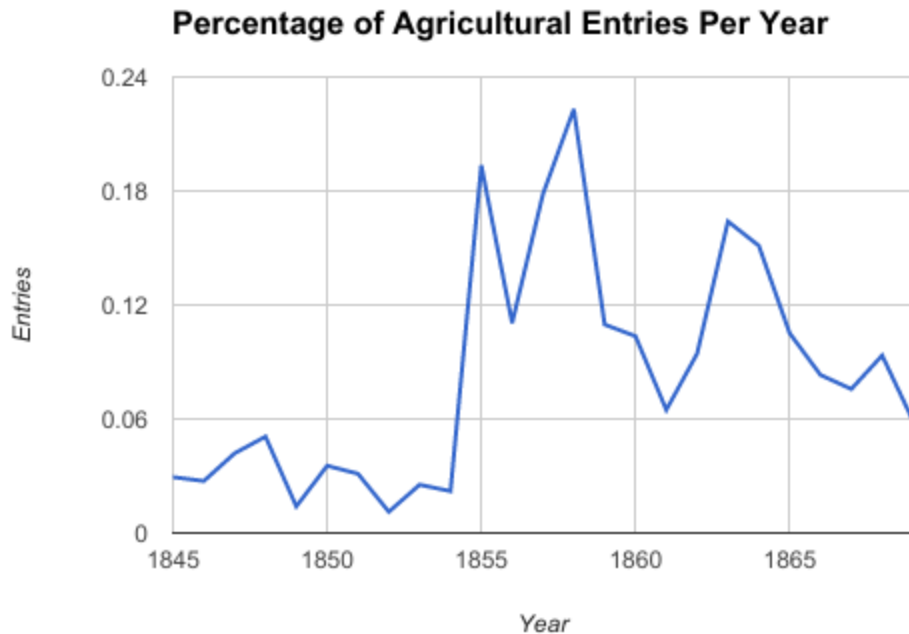by going through the entries for those years and counting them individually.

Figure 8: Percentage of Agricultural Entries per Year

This table shows the percentage of agricultural entries per year. As seen above, this

peaked in 1858, where 22% of the total cataloged images for that year were for agricultural

purposes. As we stated earlier, the 1855-1858 time period was one with a reduced amount of

illustrations in those years of the magazine. Yet there were still increasing amount of agricultural patents being published, making them a much larger part of the magazine. We still need to look into the publications of those years to gather more information on what else they were reporting.

What they were saying about the agricultural things at the time? It does not really say much about what the people were saying at the time. In the articles about the new patents, it mostly just describes exactly how the invention works, and mentions what it has improved or what issue it is addressing, and does not really give opinions of the people, unless the one or two line summary at the end of the article counts.

According to the 1860 Census of the United States, over three million Americans worked as farmers and farm laborers, making up just under ten percent of the total population of the country at the time. Before the introduction of inventions such as the reaper, "scytheman could with infinite toil harvest barely two or three acres of grain each day…Because of lack of labor, much of the crop could not be harvested and was given over to cattle and hogs turned in to feed on golden wheat"[2]. To make things even worse for the American people the country was becoming engulfed in a Civil War. The war took more people from the farms and demanded more food production to feed the people. It would have been essential for the growth of the nation to keep these people informed of the new inventions and patents that could help them improve the yield of production and allow a surplus of food to be produced with limited field hands.

Conclusion

Based on our research the magazine was good for farmers and agricultural people of the time period. The publishers of the magazine recognized that farmers would be an audience of

---

[2] The Century of The Reaper by Cyrus McCormick

their product and knew that the magazine would be as informative to them as it would be to engineers, other inventors, and entrepreneurs. Through querying of the database, we have found that it is the single most popular category for illustrations in the magazine, making up just over 8 percent of the cataloged images. More than just providing information about new patents and inventions, it includes reports of farming in different regions.

The variety of the illustrations for different types of agricultural inventions shows the wide range of needs across the nation. Further research would need to be conducted in order to learn how much these new inventions were put into use and whether they had an impact on the agriculture of the United States. Whether that be better plows that reach deeper into the ground to get more fertility from the soil or irrigation/well systems that improve use of water or machines that make planting easier like planters or machines that make harvesting and collecting easier like mowers and reapers. Whatever the challenge, American ingenuity has risen to find solutions to the most challenging problems and continues to finding better alternatives even when the need is not explicitly necessarily there.

Recommendations for the Next Team

As was mentioned earlier in the report, the administrative login has a very weak protection against hackers and from people simply seeing the URL of the users that have logged in as an admin. However, this should only be attempted by those with extensive computer science and an understanding of html and python. The reason being that the way the program is written the password and username are printed to the URL of the website and taken from input and stored in as global fields and used to check if the user is a valid. A much more effective and safer method would be to remove the password and username from the URL and store them in a

separate table, that will making it more difficult for the password and username to be accessed by outside forces.

Another suggestion would be to change the way the website is designed in general as it is rather dull. The color scheme can be changed to be a much more inviting color instead of having a grey background for every page. The footer banner can also be made to stay at a certain position on each page. The way it is now the footer is positioned a few inches below the last text of the page. Thus, it varies from page to page making it inconsistent from page to page and unprofessional for a website for public use.

The last suggestion would be to traverse through the database to find entries that have incomplete sentences, spelling errors, and information entered in the wrong field. A large number of issues that are not present in the database. This task would most likely require a significant work going through every single entry to find errors on pages. The only other way to do this is to have a spell check typescript run through the database to check for misspelled words and sentences that are cut off since they go past the character limit. This is important to do, as it would give the website a bad image to have these type of errors in the database.

Conclusion

The main goal for this project was to finalize the website and database as to make sure that it is ready to be presented to the public. Previous reports suggested some obvious things that needed to be done before the website was made public. This was done in the form of the edit feature which then allows us to fix broken links within the database. We were able to accomplish the edit feature in a timely manner and above our original expectations. Even though we started

with unfamiliar code with no comments on what the code was doing, we created an edit feature based on our own skills and understanding of the code.

We hope that future teams will learn from the difficulties we faced and record any new additions to the website or database within the network drive. It is accepted practice to do so when working on a team project where other may come in and work off your additions. Overall we accomplished a great deal on the website and database of the project, work we hope will be found beneficial to others. The deeper we looked into the website/database the more problems seemed to appear. We attempted to fix any issues we encountered along the way. These new problems dealt with the database containing errors in the entries such as cataloging the entries wrongly or with entire issues missing from the database. We unfortunately we did not have the time to address these issues and will leave it to the next team to accomplish.

In addition to our work on the website and database, we investigated the agricultural patents involved in *Scientific American* and how helpful the magazine was to farmers and the general public. We looked into a few agricultural inventions that appeared during the time frame to get another perspective of the time period. Articles on these inventions had comments from the inventor that talked about faults their inventions improve upon or overcame. Research was also done on *Scientific American* itself and the number of entries it contained on agricultural implementations. Through our discussion and research we proposed that the *Scientific American* magazine was in fact helpful when it came to addressing the benefits these inventions had for American farmers.

Appendix A: Code for Updating the Database

```
elif str(pagetype) == "edit":
    query="""DELETE from %s where title="%s";"""%(dbSection, title)
    cursor.execute(query)#executes the deletion of the old entry
    data = cursor.fetchall()
    date = str(year)+"-"+str(month)+"-"+str(day)
    dateint = str(year)+str(month)+str(day)
    if x == "boo":
        cgiValues = (title, imageDescription, artist, articleSummary, inventor, author, patented,
subject1, subject2, subject3, keywords, publication, date, volume, issue, page, series, peopleInvolved, url,
dateint)
        mysqlValues = ("title", "image_description", "artist", "article_summary", "inventor", "author",
"patented", "subject", "subject2", "subject3", "keywords", "publication", "date", "volume", "issue",
"page", "series", "people_involved", "url", "dateint")
        cgiString = ""
        mysqlString = ""
        for key in range(0, len(cgiValues)):#copy entry values into another field
            if cgiValues[key] != "None":
                cgiString += """\""""+str(cgiValues[key])+"""\", """
                mysqlString += mysqlValues[key]+", "#increment through list
        cgiString=cgiString[:len(cgiString)-2]#generates space for fields
        mysqlString=mysqlString[:len(mysqlString)-2]
        print """Found:<br />""", data, "<br /><br />"#will find nothing as entry was deleted
        print """Inserting:<br />%s<br />Into:<br/>%s<br />"""%(cgiString, mysqlString)#inserts entry
to the database
        query = """insert into %s (%s) values (%s) ;"""%(dbSection,mysqlString,cgiString)
        print query + "<br />"
        cursor.execute(query)
        results = cursor.fetchall()
        print "Command returned: "+str(results)
```

Appendix B: Illustrations

"McCormick's Reaper" Illustration. Scientific American. February 8, 1851. From the Cornell University
Library Making of America Collection.
http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia&cc=scia&idno=scia0006-21&view=image&seq=168&size=200 (accessed February 26, 2017)

"Denton's Reaper and Self-Raker-Figure 1" Illustration. Scientific American. July 30, 1853.
From the Cornell University Library Making of America Collection.
http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia;cc=scia;rgn=full%20text;idno=scia0008-46;didno=scia0008-46;view=image;
(accessed February 26, 2017)

"The Excelsior Grinder for Mowing and Reaping Machines" Illustration. Scientific American.
February 18, 1868. From the Cornell University Library Making of America Collection.
http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia&cc=scia&idno=scia1018-18&node=scia1018-18%3A1&view=image&seq=280&size=175 (accessed February 26, 2017)

"To Correspondents" Illustration. Scientific American. August 27, 1853. From the Cornell
University Library Making of America Collection.
http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia;cc=scia;idno=scia0008-50;view=image;seq=403;size=200;page=root (accessed February 26, 2017)

"Miscellaneous" Illustration. Scientific American. February 8, 1851. From the Cornell University
Library Making of America Collection.
http://ebooks.library.cornell.edu/cgi/t/text/pageviewer-idx?c=scia;cc=scia;rgn=full%20text;idno=scia0006-21;didno=scia0006-21;view=image;page=root;seq=166;size=200 (accessed February 26, 2017)

Appendix C: IQP Research Bibliography

Barton, Steven, Candace Chouinard, Forrest Hogeboom, and Sarah Latta. "Cataloging 19th
    Century Periodical Images." (n.d.): n. pag. Web. 27 Feb. 2017.
    <https://web.wpi.edu/Pubs/E-project/Available/E-project-031609-
    121839/unrestricted/FinalReport_SCBAAS2.pdf>.

Fuller, Stephanie, Jonathan Gibbons, Nicole M. Nelson, and Allison Smyth. "Images in Mid-
    Nineteenth Century American Scientific Periodicals." (n.d.): n. pag. Web. 27 Feb. 2017.
    <https://web.wpi.edu/Pubs/E-project/Available/E-project-052008-
    144211/unrestricted/Report.pdf>.

Guertin, Michelle, Andellle Kudzal, and James Martinez. "CATALOGING AND HISTORY OF
    MIDNINETEENTH CENTURY SCIENTIFIC AMERICAN ILLUSTRATIONS." (n.d.):
    n. pag. Web. 27 Feb. 2017. <https://web.wpi.edu/Pubs/E-project/Available/E-project-
    030212-100614/unrestricted/Final_Draft3.pdf>.

Hurt, R. Douglas. American Agriculture: A Brief History. West Lafayette, IN: Purdue UP, 2002.
    Print.

Jackson, Luke, Matthew Nicholson, and Jonathan Rheaume. "The Expansion of Educational
    Science Articles in Scientific American." (n.d.): n. pag. 3 Mar. 2016. Web. 27 Feb. 2017.
    <https://web.wpi.edu/Pubs/E-project/Available/E-project-030316-
    170013/unrestricted/IQP_Final_Draft.pdf>.

McCormick, Cyrus. The Century of the Reaper: An Account of Cyrus Hall McCormick
    ...Boston: Houghton Mifflin, 1931. Print.

Mehrtens, Keegan, and Eric Mantague. "MID-19th CENTURY SCIENTIFIC AMERICAN
    ILLUSTRATIONS." (n.d.): n. pag. Web. 27 Feb. 2017. <https://web.wpi.edu/Pubs/E-
    project/Available/E-project-030311-
    183355/unrestricted/Scientific_American_IQP_Final_Report.pdf>.

"The Making of America." Cornell University Library Making of America Collection,
    ebooks.library.cornell.edu/m/moa/. Accessed 26 Feb. 2017.

Roberts, Devin, Sarah Thomson, and Andrew Wolff. "ONLINE INDEX OF ILLUSTRATIONS FROM SCIENTIFIC AMERICAN, 1859- 1860, AND THE GEOGRAPHY OF AMERICAN INVENTION." (n.d.): n. pag. Web. 27 Feb. 2017. <https://web.wpi.edu/Pubs/E-project/Available/E-project-022813-160548/unrestricted/SciAm_IQP_Final_Report.pdf>.