Vitascope

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Moving Image and Sound: Basic Issues and Training
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On April 23rd, 1896, at Koster and Bial's Musical Hall, in New York City, Thomas Edison presented to the world Vitascope, the first commercially successful moving image projector. An enormous crowd gathered in awe and anticipation to witness six different scenes shown on the screen, although originally twelve scenes had been planned for the demonstration. Mesmerized by the Vitascope display, the audience asked for scenes to be repeated, proving the success of the presentation. A few days later, the *New York Dramatic Mirror* stated, "it was a success in every way and the large audience testified its approval of the novelty by the heartiest kind of applause."[1] After the introduction of the Vitascope projector, there was a technological boom in the motion picture industry; new companies began developing projectors during the summer of 1896, each one determined to produce their own projector. Over the course of the rest of the year the amount of inventions regarding projectors skyrocketed, thus, the Vitascope projector, unfortunately, lost its appeal in the industry. "By October 1896 the Vitascope Company was disintegrating under the pressure of external competition and internal discord."[2] Thomas Edison realized he needed to create a new and improved projector to compete with the other projectors currently circulating the market. Barely seven months later, in November 1896, Thomas Edison abandoned the Vitascope projector, in favor of his new format, the Projectoscope or projecting Kinetoscope. Nevertheless, the dawn of the Vitascope projector invited a new time period in the history of cinema, one of significant technological changes and advancements. Despite the fact that the format only remained in sufficient use for roughly six months, the invention remains one of the most pivotal technologies in the history of American cinema since it was one of the main foundations for the future of moving image projectors.

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[1] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 116

[2] Ibid., 164

Before the invention of Vitascope, inventors such as Thomas Edison, the Latham brothers, the Lumière brothers, the Skladanowsky brothers, Charles Francis Jenkins and Thomas Armat had been playing with the idea of a moving image projector. The first recognizable device was Thomas Edison's Kinetoscope, presented in May 1893 at the Brooklyn Institute of Arts and Sciences. The Kinetoscope was not a projector but "…a peepshow device into which a single viewer peered to see short films of dancers, acrobats, or May Irwin and John Rice's famous stage kiss."[3] Within a year of the Kinetoscope demonstration, Kinetoscope parlors began appearing all over the country, allowing the public the opportunity to view this extraordinary device. However, Edison did not believe it was necessary to patent his device outside of the United States, therefore, inventors located in Europe were free to use his "idea" to improve the Kinetoscope; thus, in the process, create their own projector. "This spurred a race to not only recreate the Kinetoscope in Europe but also to create a useable projector for the mass audience."[4]

After Kinetoscope parlors opened in New York, southerners Otway and Gray Latham visited the parlor and were joined later, on another visit, with their father, Colonel Woodville Latham. After visiting the parlor, the family was inspired by the possibility of projecting film on to a screen, contemplating if this task could be achieved. With the help of William Kennedy Laurie Dickson, a previous employee of the Edison laboratory, and Eugene Lauste, also a previous employee of the Edison laboratory and a friend of Dickson's, the Latham's experimented with the invention of a motion picture projector. On May 20th, 1895, in New York, Colonel Woodville Latham presented to the country the first American machine for projecting

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[3] Gunning, Tom. "Early Cinema and the Variety of Moving Images." *The University of Chicago Press* 22, no. 2 (2008): 9-11. Accessed September 22, 2014. doi:10.1086/591163, 9

[4] Manley, Brian. "Moving Pictures: The History of Early Cinema." *ProQuest*, July 2011. Accessed September 22, 2014. http://www.csa.com/discoveryguides/film/review3.php.

motion pictures: the Eidoloscope, also known as the Pantopticon. Similar to Edison's Kinetoscope, the projector ran the film continuously and used an extremely small opening in the shutter to prevent a fuzzy picture. "Latham and his sons doubled the width of Edison's original 35mm to 70mm, providing a clearer picture. In order to show longer motion pictures without the film ripping, the Latham's created a small loop of excess film preceding the gate, easing the tension from the feeding reel. This is known as Latham's Loop."[5]

Since Edison had not patented his Kinetoscope outside the United States, Robert W. Paul, a London inventor, was legally allowed to manufacture and sell the device in London. Eventually, he decided to expand on Edison's device and create his own version; "he built a projector-the Bioscope-which took into account the all-important principle of persistence of vision and thus effected the necessary intermittent motion."[6] In February of 1896, at Finsbury Technical College, Robert W. Paul presented the Bioscope to the public. Similar to the Bioscope projector, Emil and Max Skladanowsky, two brothers in Germany invented their own version of the Bioscope projector, which they also named Bioscope. The projector was introduced in November 1895, at the Wintergarten theater in Berlin, Germany.

While Thomas Edison was inventing the Kinetoscope, Auguste and Louis Lumière, at their Lyons factory in France, were creating the Cinèmatographe, a camera that was more portable and useful than Thomas Edison's Kinetoscope. "It combined camera, film processor, and projector in a single unit and ran at 16 fps, the eventual standard for silent film."[7] On

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[5] Mast, Gerald, and Bruce F. Kawin. *A Short History of the Movies*. 9th ed. New York: Longman, 2006, 19

[6] Balio, Tino, ed. *The American Film Industry*. Madison: University of Wisconsin Press, 1976, 36

[7] Lewis, Jon. *American Film: A History*. New York: W.W. Norton, 2008, 12

December 28th, 1895 in the basement of the Grand Café in Paris, France, the Lumière brother's introduced the Cinèmatographe to the world. This exhibition is known as the "Birth of Film" since it was the first showing to a public audience of a large screen projected film.

Since 1893, American inventor Charles Francis Jenkins had been attempting to develop a projector; however, after the premiere of Edison's Kinetoscope, Jenkins was forced to abandon his original plans. In light of Edison's design, Jenkins now focused his attention on improving the Kinetoscope by utilizing various methods to avoid Edison's patents. In the fall of 1894, an unlikely alliance occurred when Jenkins met Thomas Armat, a real-estate manager from Washington D.C. The two men began discussing the opportunity of working together and decided to form a partnership to develop a motion picture projector.

After many failed experiments, it was not until August of 1895 that Jenkins and Armat finally manufactured a working projector, the Phantoscope. The fundamental idea behind the Phantoscope was that, "the film in the projector- just like the film in the camera-must move intermittently, known as a beater mechanism. More than this Armat realized that each frame of picture must be projected on the screen as long or longer than it was exposed in the camera."[8] This new discovery permitted an efficient amount of light to display on the screen; therefore, a large, clear image appeared to the audience. Unlike the Kinetoscope, which only allowed the image to remain on the screen for as short a time as possible, the Phantoscope projector allowed for the image to remain on display for an adequate amount of time. The Phantoscope also superseded Colonel Latham's Eidoloscope projector. Although the Eidoloscope contained the Latham Loop, which prevented the mechanism from pulling on the unexposed film, it still lacked

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[8] MacGowan, Kenneth. "The Coming of Camera and Projector: Part II." *The Quarterly of Film Radio and Television* 9, no. 2 (1954): 124-36. Accessed September 21, 2014. www.jstor.org/stable/1209969.

an intermittent mechanism to counteract the heat created by the light when displaying the image on the screen. Ultimately, Armat and Jenkin's invention of the beater mechanism in the Phantoscope projector fixed this dilemma.

On September 29th, 1895, at the Cotton States Exhibition, in Atlanta, Georgia, Armat and Jenkins introduced their Phantoscope projector. By dividing the exhibition room in half, and with the use of two projectors, Armat and Jenkins granted visitors continuous showings of films. Even though the Phantoscope was damaging to the films, ultimately, the unveiling of the projector was a success. For example, the *Atlanta Journal* described the exhibit as, " 'the most wonderful electric invention of the age' and as presenting 'a perfect reproduction, full life size, of the living originals, every act and motion absolutely perfect, even to the wink of an eye.' "[9]

After the exhibition, upon realizing the potential monetary gain the Phantoscope could produce, Armat and Jenkins had a terrible falling out. The two men viscously fought, each arguing that he was more important to the invention of the Phantoscope than the other. Finally, they decided to part ways, each determined to sell their version of the Phantoscope separately. If one reads Armat and Jenkins' essays in the *Journal of the Society of Motion Picture and Television Engineers* regarding the invention of the Phantoscope projector it is hard to determine whom the inventor of the Phantoscope truly is because they each claim sole ownership.[10]

As previously mentioned, Armat and Jenkin's Phantoscope exhibition in Atlanta was completely adequate; however it caused severe and unwanted damage to the film threading

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[9] Rossell, Deac. "A Chronology of Cinema, 1889-1896." *Film History* 7, no. 2 (1995): 115-236. Accessed September 21, 2014. www.jstor.org/stable/3815166.

[10] Card, James. "The Historical Motion-Picture Collections at George Eastman House." 1959. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 105-08. Berkeley: University of California Press, 1983, 106

through the projector. “This machine was satisfactory as far as exhibitions were concerned but it was very destructive of films, partly because of hasty workmanship, and principally because there was no means for feeding the film so as to avoid sudden jerks on the entire reel of pictures.”[11] Therefore, Armat continued to work on the machine by himself to improve the overall quality of the device. The final device, “uses a beater intermittent consisting of a bar attached to a circular cam. As the cam rotates, the bar comes into contact with the film, moving it to the next frame. No shutter is used in the mechanism.”[12] Armat also added a loop to the projector in an effort to lessen the damage to the film, along with changing the overall aesthetic design of the projector. Regarding the finished product, Thomas Armat wrote in, *The Journal of The Society of Motion Picture and Television Engineers,* “it was the first projecting machine using an essential loop-forming means for the film and embodying a practical intermittent movement giving the pictures the required long period of rest and exposure.”[13]

Hearing of the news of the Phantoscope demonstration in Atlanta, Frank Gammon and Norman Raff, two businessmen who owned the Kinetoscope Company, became deeply interested in acquiring the rights to the Phantoscope. The Kinetoscope Company was slowly deteriorating due to the Kinetoscope’s failed popularity with the public; therefore the two men were eager to find a new device to market. After giving them a demonstration of the projector,

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[11] Hiller, John. "Film History for the Public: The First National Movie Machine Collection." *Film History* 11, no. 3 (1999): 371-86. Accessed September 21, 2014. www.jstor.org/stable/3815208.

[12] "Pre-Cinema - Tech Collection Series." George Eastman House. Accessed November 01, 2014. http://www.geh.org/fm/precin/htmlsrc/ma727300001_ful.html.

[13] Card, James. "The Historical Motion-Picture Collections at George Eastman House." 1959. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 105-08. Berkeley: University of California Press, 1983, 106

Raff and Gammon proposed a deal to Armat to buy the rights. Armat may have invented the Phantoscope; however, Raff and Gammon had the means to manufacture the device. After negotiating an agreement with Armat, a contract was established which granted Raff and Gammon, " 'the sole and exclusive right to manufacture, rent or lease or otherwise handle in any and all countries of the world the aforesaid machine or device called the Phantoscope.' "[14] Armat would receive a percentage of the profit from the Phantoscope but, ultimately, the contract completely excluded him from any public recognition regarding the invention of the machine.

After acquiring the rights, Raff & Gammon approached Edison at the Edison Manufacturing Company, asking him to provide Kinetoscope films for the Phantoscope. After Armat gave Edison a demonstration of the Phantoscope on December 8th, 1895, Edison was surprised at the technological capabilities of the Phantoscope; however, Raff and Gammon still needed to convince Edison to permit the screen projection of his Kinetoscope films. Edison agreed to provide the films for the Phantoscope and in return he was allowed to "adapt the Armat Vitascope for his purpose rather than to attempt building a projector of his own."[15] Armat would provide Edison with a model of the Phantoscope allowing him to produce the machines by copying the model. Before production began on the Edison Phantoscope, Armat decided to change the name of the machine to avoid any legal complications or confusion with the Phantoscope he created with Jenkins. Therefore, the Phantoscope became the Vitascope;

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[14] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 110

[15] Card, James. "The Historical Motion-Picture Collections at George Eastman House." 1959. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 105-08. Berkeley: University of California Press, 1983, 106

"emphasizing 'showing life' rather than 'showing phantoms.' "[16]

The Koster and Bial demonstration of the Vitascope projector almost did not occur since the Cinèmatographe projector was supposed to be publicly debuted instead. After hearing of this possibility, Raff and Gammon quickly began negotiating with vaudeville managers asking them to premiere the Vitascope instead of the Cinèmatographe in their theaters. In a letter dated April 7th, 1896, from the Raff and Gammon Collection, "Raff wrote to Abraham Bial, offering him the use of the Vitascope 'at a largely reduced compensation,' out of consideration for 'a certain benefit to us from your advertising, etc.' "[17]

On April 23rd at Koster and Bial's Musical Hall, Armat personally operated the Vitascope projector backstage, as he watched Thomas Edison present to the world, "Edison's Vitascope," the first commercially successful moving image projector. During the Vitascope exhibition, the films were printed on George Eastman's clear-base 35 mm stock and "used four rectangular perforations per frame."[18] This became known as "Edison-gauge" and is the industry standard format still used today. It was Thomas Edison's name that the audience chanted repeatedly after the Vitascope demonstration finished, while Armat remained ignored behind the curtain. It is important to note that although Thomas Edison was responsible for manufacturing the Vitascope and the films presented that day, he did not contribute to the actual invention of the device. On the other hand, Armat was aware that he would receive absolutely no public recognition

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[16] Gaudreault, André, ed. *American Cinema, 1890-1909: Themes and Variations*. Screen Decades: American Culture/American Cinema. New Brunswick, NJ: Rutgers University Press, 2009, 46

[17] Allen, Robert C. "Vitascope/Cinematographe: Initial Patterns of American Film Industrial Practice." *Journal of the University Film Association* 31, no. 2 (1979): 13-18. Accessed September 21, 2014. www.jstor.org/stable/20687471.

[18] Rogge, Michael. "More than One Hundred Years of Film Sizes." 1996. Accessed November 1, 2014. http://www.xs4all.nl/~wichm/filmsize.html.

whatsoever. "…by mutual agreement, it was decided that Edison's name should be used in connection with the machine. This was done for…partly because he was the producer of and had patents pending covering the films, an essential part of the machine, that he was to supply."[19]

In total, six screenings were shown to the audience; each film was spliced end-to-end, with each lasting about twenty seconds. The first, known as the *Umbrella Dance* (hand-tinted in color), was of two dancers moving gracefully, simultaneously twisting and turning an umbrella between them. A hand-tinting process was used to achieve the desired affects of colored film, a process similar to that used for stereopticon slides. Next, Edison presented a screening of waves at Dover pier, called *Rough Sea at Dover*. This film was supplied by Robert W. Paul and shot by Birt Acres in England. According to the April 24th, 1896 edition of the *New York Mail and Express*, "This was by far the best view shown, and had to be repeated many times."[20] The third viewing titled, *Burlesque Boxing*, was of a burlesque boxing session, in which Charles Walton, a tall, skinny man repeatedly knocked down John Slavin, a short, fat man. The fourth screening, *The Milk White Flag*, consisted of a scene from the Broadway musical, *A Milk White Flag*, illustrating soldiers and a military band. The fifth film shown, *Monroe Doctrine*, was specifically produced for the Vitascope presentation, and illustrated numerous patriotic figures; for example Uncle Sam and John Bull. The final film shown in the series, *Annabelle Serpentine Dancer*, was another favorite among audience members. Similar to the first film, *Serpentine* was hand-tinted in color allowing the serpentine dancer to entice the audience as she moved on the screen.

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[19] Armat, Thomas. "My Part in the Development of the Motion Picture Projector." 1935. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 17-22. Berkeley: University of California Press, 1983, 19

[20] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 116

The introduction of the Vitascope projector ignited an excited rage across the country; between May and July, the Vitascope debuted in twenty-six major US cities and by the end of the summer, any city large enough to hold an electrical system contained a Vitascope. Edison's demonstration was an enormous success since the American public had never before witnessed such an amazing event as projected images on a large screen. The subject of the material the public was viewing was irrelevant; on the contrary, the screenings shown were relatively ordinary. Edison's achievement arose from the combination of the audience's fascination with life-like projected images and the possibility of enjoying his film's surrounded with other individuals. "Projected images were conceived as a novelty in which lifelike movement in conjunction with a life-size photographic image provided a sense of heightened realism and intensified interest in quotidian. This new level of realism dramatically expanded the screens importance as a source of commercial amusement."[21]

Raff and Gammon initially planned to exhibit the Vitascope projector to vaudeville houses, using clips from plays and vaudeville acts to show the public. However, after the Vitascope demonstration, it was obvious that the public craved films that consisted of mundane activities, since the most popular film in the series was *Rough Sea at Dover*. "…Scenes of everyday life were often greeted with much greater enthusiasm than excerpts of plays and vaudeville acts."[22] Raff and Gammon were not prepared for this unexpected outcome and as a result they had to scrounge around for new films to show the audience. Without any viable material to showcase, Edison was required to produce new films. His earlier films were produced in his Black Maria studio in which actors would re-enact roles from plays. He continued to

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[21] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 118

[22] Ibid., 118

produce these films but also embarked on a new genre, which featured ordinary subjects performing regular tasks (such as kissing, walking, bicycling). Known as, "scenics, a kind of family or tourist's collection of views of everyday life: the baby eating, workers leaving factories, vacation spots…a moving record of present-day life around the world…"[23] Some of his

titles include: *Ferry Boat Leaving Dock, Street Sprinkling and Trolley Cars*, *Parade of Bicyclists at Brooklyn,* and *Parade of New York City Crossing Sweepers.*

The most famous Vitascope film in history is *The May Irwin Kiss* or *The Kiss*; actors May Irwin and John C. Rice re-enact the last scene in the musical, *The Widow Jones*, by repeatedly kissing on screen. "They get ready to kiss, begin to kiss, and kiss and kiss and kiss in a way that brings down the house every time."[24] Directed by William Heise for Thomas Edison, the film is forty-seven seconds long and was shot in April 1896 in Edison's Black Maria Studio in West Orange, New Jersey. When the film was released, a scandal erupted due to the film's sexual content, causing it to be the most popular film of the year.

After the debut of the Vitascope projector, an abundance of new projectors began flooding the market. "Although 'Edison's Vitascope' was the first successful screen machine in the American amusement field, competing projectors and enterprises began to appear within a month of its Koster & Bial's debut."[25] The first major competition came from the original

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[23] Bordwell, David, Janet Staiger, and Kristin Thompson. "The Hollywood Mode of Production to 1930." In *The Classical Hollywood Cinema: Film Style & Mode of Production to 1960*, 85-154. New York: Columbia University Press, 1985.

[24] "May Irwin Kiss." Library of Congress. Accessed October 15, 2014. http://www.loc.gov/item/00694131/.

[25] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 133

Phantascope. After breaking up from his partnership with Armat in October 1895, Jenkins presented the Phantoscope to the Columbia Phonograph Company, advertising the device as his own invention. On May 14th, 1896, the Columbia Phonograph Company agreed to manufacture and produce the product simultaneously, becoming the first projection machine with an intermittent mechanism sold exclusively in the United States.

After witnessing the Vitascope debut at Koster & Bial's, Woodville Latham realized that an intermittent mechanism needed to be added to his projector (the Eidoloscope). After adding the mechanism, Latham's Eidoloscope was presented at the Hammerstein's Olympia Music Hall in New York on May 11th, 1896. On May 28th, the Eidoloscope was presented at the Detroit Opera House; however, the projector only lasted for four weeks before Vitascope took its place. Ultimately, Eidoloscope was exhibited in various venues over the summer of 1896 before losing popularity against higher quality projectors on the market.

The Vitascope projector received its true competition from the Cinèmatographe. After the Lumière Brothers' initial demonstration of their Cinèmatographe machine in March 1895, they continued to re-exhibit the machine in many countries all across Europe, thus creating a popular demand for the product. The Cinèmatographe was exhibited for the first time in the United States on June 29th, 1896 at Keith's Union Square Theater in New York City (two months after Vitascope's premiere). American Benjamin F. Keith, who reserved the Cinèmatographe for his vaudeville shows, stated, " 'The Cinèmatographe is worked in the same way as the Vitascope and the Eidoloscope, but the pictures are clearer and there is less vibration, so that the pictures are not so trying on the eyes as those produced by the other machines.' "[26]

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[26] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 137

Almost immediately after the US debut of the Lumière Brothers' Cinèmatographe, the Cinèmatographe began besting the Vitascope in the market. One of the first problems that occurred was Raff and Gammon's relationship with vaudeville in regards to their state-based franchise plan. For instance, instead of a combined contract, individual contracts had to be negotiated in each state (to acquire the rights to use the Vitascope projector in a theater). On the other hand, to obtain the rights to use the Cinèmatographe projector, all negotiations were carried out in New York. Raff and Gammon also began having issues regarding the distribution of the Vitascope. Raff and Gammon could control when Edison actually manufactured the machines, however the time between manufacture, distribution and exhibition became extremely problematic. The two men mistakenly promised theaters when to expect the projector, providing them with exact ship dates; however, the company failed to live up to their promises. Late deliveries were inevitable, forcing upset theater owners to turn to different projectors on the market. The Cinèmatographe was manufactured in Lyons, France; however the Lumière Brothers prevented any distribution or exhibition dilemma from erupting by providing an operator with the machine to each theater.[27]

Raff and Gammon also struggled with acquiring fresh films to show to the public while the Lumière Company provided a steady stream of interesting and exotic films to their customers; for example, scenery of Venice from a moving gondola and scenes of the Czar's coronation. Since Raff and Gammon could not supply their customers with a regular delivery of material, some places canceled their contracts with Raff and Gammon. A Pennsylvania franchise

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[27] Allen, Robert C. "Vitascope/Cinematographe: Initial Patterns of American Film Industrial Practice." *Journal of the University Film Association* 31, no. 2 (1979): 13-18. Accessed September 21, 2014. www.jstor.org/stable/20687471.

holder stated, " 'the museum people were so much disappointed that they stopped the Vitascope. They expected eight new subjects and I only had three and they were poor.' "[28]

One of the main technological aspects that lead to the demise of the Vitascope was that the projector relied on a direct electrical current to operate; however, the majority of theaters in the United States relied on alternating current. Without a direct current in the theater, a new form of direct electricity would have to be sought out for the projector to run efficiently. For example, sometimes electricity would be borrowed from a streetcar. In this case, since up to 500 volts of electricity was used, the Vitascope would become burned out, causing the projectionist to experience severe electric shocks. "The nations patchwork of conflicting currents and voltages meant that the projectors frequently had to be adapted to different conditions when moved to a new locale."[29] For example, after a failed installation of the Vitascope projector at Ford's Theater in Baltimore (no direct electrical current was available), Charles Ford decided to cancel his contract with Raff and Gammon, determined to wait for a better product. Ultimately, for the Vitascope to continue successfully, a productive change would have to be made. "Vitascope agents complained to Raff and Gammon about the situation, 'If the small towns of the continent are to be worked, a radical change will have to be made in the construction of the machines so that exhibitions can be utterly independent of electric power companies.' "[30] On the other hand, the Cinèmatographe projector did not require an electrical current to operate since it was a hand-

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[28] Ibid.

[29] Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990, 129

[30] Allen, Robert C. "Vitascope/Cinematographe: Initial Patterns of American Film Industrial Practice." *Journal of the University Film Association* 31, no. 2 (1979): 13-18. Accessed September 21, 2014. www.jstor.org/stable/20687471.

cranked device radiated by a spotlight. It also only weighed sixteen pounds and was a camera, projector and a printer all in one, making it the better device between the two.

Not only did the Vitascope projector require direct electric current to function but also only a few people fully understood how to operate the machine (Thomas Armat and his brothers, Edward Murphy, James White, along with a few other men). When Raff and Gammon provided the theater with the Vitascope projector they did not also provide the theater with a trained projectionist, therefore "the success of the Vitascope exhibition depended far less on the projector itself than on the skill of its operator."[31]

The Vitascope began to severely decline by the end of the summer of 1896 due to Rammon and Gaff's failed market strategies and the overall quality of the product compared to other projectors on the market. By the fall of 1896, production on the Vitascope had been terminated, forcing Edison to manufacture a new projector to replace the Vitascope. Barely seven months later, Thomas Edison abandoned the Vitascope projector, in favor of his Edison Projectoscope (also known as the Projecting Kinetoscope or spool-bank model); "the film, instead of being fed from the reel, was in a continuous loop. There were no upper or lower sprockets and no means for framing. Edison used a 2-pin cam in his Geneva movement."[32] The spool-bank projector debuted on November 30th, 1896 at Bijou theatre in Harrisburg, Pennsylvania, officially replacing the Vitascope projector.

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[31] Allen, Robert C. "Vitascope/Cinematographe: Initial Patterns of American Film Industrial Practice." *Journal of the University Film Association* 31, no. 2 (1979): 13-18. Accessed September 21, 2014. www.jstor.org/stable/20687471.

[32] Malkames, Don G. "Early Projector Mechanisms." 1957. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 97-104. Berkeley: University of California Press, 1983, 98

Since the Vitascope projector had failed in the market, Thomas Armat decided to re-model his design in an attempt to improve the technology and engineering of the projector. In September 1896, Armat incorporated a new and improved intermittent mechanism for the Vitascope, known as the Geneva drive or 'Maltese cross' mechanism, which would eventually replace the beater mechanism. "This was the 'Maltese cross' movement, a device which in essence converts the continuous drive from a cranking handle or motor into the intermittent movement of a shaft with a sprocket at one end, which engages the film's perforations."[33] A year earlier, the Maltese cross mechanism had been credited to Oskar Messter and Max Gliewe's projector in Germany and Robert W. Paul's Teatrograph projector in England. The Maltese cross mechanism was superior to the other mechanisms in the projectors on the market since, "Unlike any of the claw-based alternatives, the sprocket teeth inserted and retracted through the projectors at a far gentler angle, and the downward force was exerted by at least two sets of teeth at any one time."[34] Ultimately, using this new mechanism with the Vitascope projector would guarantee a quality image projected on the screen, while also reducing the damage to the perforations. However, the Vitascope projector utilizing the Maltese cross mechanism was not available to customers until 1897.

After the debut of the remodeled Vitascope in 1897, with the Maltese cross mechanism, the film industry changed forever. Before the Maltese cross mechanism was invented, the claw-and-cam system was the standard mechanism for projecting film; unfortunately, this mediocre technique often damaged the film. Recognizing the value of the Maltese cross mechanism, film companies slowly began installing it in their projectors; eventually, by the 1920s, almost all

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[33] Enticknap, Leo Douglas Graham. *Moving Image Technology: From Zoetrope to Digital*. London: Wallflower, 2005, 135

[34] Ibid., 135

projectors that were manufactured in the country were using this new mechanism, eliminating the previous technique of intermittent movement. Thomas Armat explained his invention in *The Journal of the Society of Motion Picture and Television Engineers,* "The intermittent movement is known as the 'Star Wheel' or Geneva Cross movement and it superseded all others by 1897 and is in use today in practically every motion picture theater the world over."[35] Ultimately, the introduction of the Maltese cross mechanism forever changed the technological advancements of cinema since it allowed film to be projected on a screen with a bright image simultaneously protecting the film from damage.

Unfortunately, preservation and conservation concerns regarding the original 1896 Vitascope projector are severe since only two machines are known to exist. There is an original Vitascope projector located at the George Eastman House in Rochester, New York and also one at the Smithsonian Institution in Washington, D.C. Considering that there are only two copies of the machine in the entire world, proper preservation of these two machines is absolutely crucial. Thomas Armat's invention of the Vitascope ignited a spark among inventors, allowing technology to thrive over the next few years and the motion picture business to fundamentally develop. Ultimately, this was a time of economic and technological boom in the industry, which only continued throughout the early 1900s.

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[35] Armat, Thomas. "My Part in the Development of the Motion Picture Projector." 1935. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 17-22. Berkeley: University of California Press, 1983, 20

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Allen, Robert C. "Vitascope/Cinematographe: Initial Patterns of American Film Industrial Practice." *Journal of the University Film Association* 31, no. 2 (1979): 13-18. Accessed September 21, 2014. www.jstor.org/stable/20687471.
This source contains information regarding the differences between the Lumière brothers Cinèmatographe and Thomas Edison's Vitascope. This source also contains an excellent bibliography. For example, many sources were used that come from 1896, when the Vitascope officially premiered. This article is particularly useful to my paper since it analyzes specific aspects of the Vitascope (such as weight and design layout) to explain why the machine failed to sustain popularity among the competitive projector market.

Altman, Rick. *Silent Film Sound*. Film and Culture Series. New York: Columbia University Press, 2007.
This source contains information regarding early film history and compares and contrasts the silent film era with the beginning of the sound film era. Even though I did not use this source in my paper, it still was an excellent research tool and helped clarify certain facts regarding issues in my paper.

Armat, Thomas. "My Part in the Development of the Motion Picture Projector." 1935. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 17-22. Berkeley: University of California Press, 1983.
This is an article published in an anthology, which includes articles from the *Journal of the Society of Motion Picture and Television Engineers*. This source is extremely helpful to my paper since it is a firsthand account of Thomas Armat describing his invention-the Vitascope. The book provides diagrams and photographs of his invention and explicitly explains the device.

Balio, Tino, ed. *The American Film Industry*. Madison: University of Wisconsin Press, 1976.
This book examines the economic and technological advancements the American film industry achieved since the beginning of motion pictures. This source is helpful to my paper since part of the technological advancements of cinema was the development of projectors, a section covered in the book. Tino Balio, the author, is a film professor and the author of many film texts making this a reputable source.

Bordwell, David, Janet Staiger, and Kristin Thompson. "The Hollywood Mode of

Production to 1930." In *The Classical Hollywood Cinema: Film Style & Mode of Production to 1960*, 85-154. New York: Columbia University Press, 1985.
This text examines the connections and significant changes among film style, film technologies and modes of production that took place in Hollywood from the beginning of the era to the 1960s.

Card, James. "The Historical Motion-Picture Collections at George Eastman House." 1959. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 105-08. Berkeley: University of California Press, 1983.
This is an article published in an anthology, which includes articles from the *Journal of the Society of Motion Picture and Television Engineers*. This article was helpful to my paper since it explained the motion picture projector collection located at the George Eastman House (which includes the Vitascope).

Enticknap, Leo Douglas Graham. *Moving Image Technology: From Zoetrope to Digital*. London: Wallflower, 2005.
This book explains the scientific and technological principles of moving image materials while also providing a basic understanding of the history of cinema. This source is helpful to my paper since it provides information regarding the mechanical structure of the Vitascope. For example, it explains how the beater mechanism and the Geneva Drive operate.

Gaudreault, André, ed. *American Cinema, 1890-1909: Themes and Variations*. Screen Decades: American Culture/American Cinema. New Brunswick, NJ: Rutgers University Press, 2009.
This source is a collection of essays, with each essay focusing on a particular year (or years) over the course of 1890-1909. The essays provide a theoretical examination of this time period by exploring the inventions that shaped and ultimately helped form the motion picture industry. This source is helpful to my paper since the book provides a timeline of events that took place relating to the motion picture industry in the late 1800s and the essays provide excellent information on Edison's Kinetoscope and the various other projectors produced during that time.

Gunning, Tom. "Early Cinema and the Variety of Moving Images." *The University of Chicago Press* 22, no. 2 (2008): 9-11. Accessed September 22, 2014. doi:10.1086/591163.
This article focuses on Edison's Kinetoscope and the different projectors that were manufactured after the Kinetoscope such as the Vitascope and the Mutoscope. Minimal information is provided since the article is only three pages, however, the information "cuts to the chase" allowing me to easily obtain the research I need.

Hiller, John. "Film History for the Public: The First National Movie Machine Collection." *Film History* 11, no. 3 (1999): 371-86. Accessed September 21, 2014. www.jstor.org/stable/3815208.
This article describes some of the projectors that were invented from 1895-1897 (however, not in chronological order). Accompanying each device is a photograph of the

projector along with a description of the mechanical/technological process of the device. This source is very useful to my research since it narrows down the amount of projectors produced during this early time by only mentioning the most important ones. For example, the article separates the two different projectors that Armat invented (the intermittent mechanism projector and the Geneva drive mechanism projector), comparing and contrasting them with one another.

Lewis, Jon. *American Film: A History*. New York: W.W. Norton, 2008.
This textbook provides a historical description of the history of cinema, beginning with Edison's kinetoscope in 1893 and concluding with how film has evolved in the 21st century.

MacGowan, Kenneth. "The Coming of Camera and Projector: Part II." *The Quarterly of Film Radio and Television* 9, no. 2 (1954): 124-36. Accessed September 21, 2014. www.jstor.org/stable/1209969.
This article is a technical account of how cameras and projectors originated during the late 19th Century. A brief history is provided on each major projector that was invented along with a paragraph or two describing the technological process of the camera or projector. This article is resourceful to my paper since it helps clarify the intermittent process that Armat added to the Vitascope.

MacGowan, Kenneth. "The Story Comes to the Screen: 1896-1906." *The Quarterly of Film Radio and Television* 10, no. 1 (1955): 64-88. Accessed September 22, 2014. www.jstor.org/stable/1209964.
This article is useful to my research since it provides an excellent overview on the history of cinema from 1896-1906. This time period was one of extreme technological advancement in the history of film; nonetheless, this article is able to condense eight years of information, highlighting only the major inventions and noteworthy moments. Even though I did not use a quote from this article in my paper, the source is still an important reference and should be listed in my bibliography.

Malkames, Don G. "Early Projector Mechanisms." 1957. In *A Technological History of Motion Pictures and Television: An Anthology from the Pages of the Journal of the Society of Motion Picture and Television Engineers*, edited by Raymond Fielding, 97-104. Berkeley: University of California Press, 1983.
This is an article published in an anthology, which includes articles from the *Journal of the Society of Motion Picture and Television Engineers*. This article was extremely helpful to my paper since it provided a thorough explanation of the intermittent beater mechanism.

Manley, Brian. "Moving Pictures: The History of Early Cinema." *ProQuest*, July 2011. Accessed September 22, 2014. http://www.csa.com/discoveryguides/film/review3.php.
This source examines the development of moving images by giving a general account of the technological advancements before specifically targeting the Vitascope. This article is helpful to my paper since it allows me to easily determine and narrow down which

projectors were invented before the Vitascope and which projectors were invented after the Vitascope.

Mast, Gerald, and Bruce F. Kawin. *A Short History of the Movies*. 9th ed. New York: Longman, 2006.
This book is a simple account of the history of film, focusing on the main events that have taken place over the past century. The book covers an abundance of material from film technology to theories about the film industry in general. This book is helpful to my paper since it provided me with a thorough description and understanding of Latham's Loop.

Mathews, Nancy Mowll., and Charles Musser. *Moving Pictures: American Art and Early Film, 1880-1910*. Compiled by Marta Braun, Ellery Foutch, Tom Gunning, Erica Hirshler, Antonia Lant, Michael Leja, Katherine Manthorne, Lucy Oakley, Dana Pilson, Joyce Schiller, Marc Simpson, and Dan Streible. Manchester, VT: Hudson Hills Press in Association with the Williams College Museum of Art, 2005.
This book examines the relationship between American art and the films produced during 1880 to 1910, providing an interesting analysis between the two mediums. Using examples from such films as "Sandow the Strong Man" and "The May Irwin Kiss," the authors ask how art influences cinema. I did not use this source in my paper, however it was a very interesting read. If this book was less about art and focused more on film perhaps it could have been more resourceful to my paper

"May Irwin Kiss." Library of Congress. Accessed October 15, 2014. http://www.loc.gov/item/00694131/.
This website contains the film clip of the "May Irwin Kiss," which is located at the Library of Congress. The site also lists a description of the film, the actors in the film and other information regarding the production of the film. This website is helpful to my paper since it provides information about the "May Irwin Kiss," which was the most famous film produced on Vitascope.

Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Vol. 1. History of the American Cinema. New York: Scribner, 1990.
This text is the first book in a series of ten that is dedicated to the history of cinema; each volume in the series completely focuses on that sole time period including as much information as possible. This volume provides a complete history of film from early cinema to 1907 by examining the production, distribution, exhibition and critical reception of the motion pictures created during this era. This book is helpful to my paper since it provides information relating to all aspects of my paper and it includes sources from 1896 (newspapers).

Popple, Simon, and Joe Kember. *Early Cinema: From Factory Gate to Dream Factory*. London: Wallflower, 2004.
The first chapter of this book provides a simple chronology of the development of moving images; under each year (from 1895-1914), there is a description of the major events that took place, separating them into technological advancements and industry

advancements. The rest of the book is dedicated to a theoretical analysis of early cinema instead of pure facts. Even though I did not use a specific quote from this book in my paper, I felt the need to include it in my bibliography since I frequently turned to the chronology to clarify certain dates.

"Pre-Cinema - Tech Collection Series." George Eastman House. Accessed November 01, 2014. http://www.geh.org/fm/precin/htmlsrc/ma727300001_ful.html.
This website is the source of the Pre-Cinema Technology Collection which is located at the George Eastman House in Rochester, New York. The Pre-Cinema collection houses many original models of projectors, cameras and devices that were invented from 1894 to 1915. The George Eastman House is one of two places in the entire world that contains a Vitascope, therefore this source is crucial toward my paper. It clarifies the preservation and conservation issues that concern the Vitascope.

Rogge, Michael. "More than One Hundred Years of Film Sizes." 1996. Accessed November 1, 2014. http://www.xs4all.nl/~wichm/filmsize.html.
This website provides explanations and photographs of an abundance of film sizes (35mm, 28mm, 16mm, 8mm, super 8mm, ectr.); exploring all of the film sizes that were created since 1897. I used this website to clarify what film size Thomas Edison used for the Vitascope projector. This website is a reliable source since it was listed on the syllabus for our course.

Rossell, Deac. "A Chronology of Cinema, 1889-1896." *Film History* 7, no. 2 (1995): 115-236. Accessed September 21, 2014. www.jstor.org/stable/3815166.
This article contains an extremely detailed chronology (fifty-nine pages) of the history of cinema between 1889-1996. Many projectors were manufactured during these early years and one can easily lose track of them all and become confused. Therefore, this source is very useful to my paper since it helps clarify the exact date, location and inventor of all of the projectors that were produced during this time.