

History, Technology, and Preservation of Biograph Company Mutoscope Reels

by

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Abstract

Not all moving images are created for film, some are for paper cards. Invented by Herman Casler in 1894, the Mutoscope reel was the first moving image distribution format produced by American Mutoscope and Biograph Company. The cylinder-shaped reels consisted of up-to two thousand paper cards with consecutive images printed from 68mm negative shots from the Mutograph camera, which offered a high-quality image of the latest productions of the company. Until the closing of the company in 1917, the company produced tens of thousands of mutoscope reels that were distributed in mutoscope arcades and other amusement sites all over the world. Many Mutoscope reels survive in museums and archive collections, as well as in private holdings.

This research paper examines the history and technology of the Mutoscope reels produced by American Mutoscope and Biograph Company and proposes preservation strategy. By focusing on the invention, production, and distribution of Mutoscope reels in the US, the thesis presents a history of the under-researched format from 1894 to 1917. The thesis then uses the Mutoscope collector and artist Douglass Crockwell as a case study to examine the role private collectors played in disseminating the knowledge of obsolete apparatus. I also examine the role artists played in generating public awareness by working with museums. The thesis further discusses the challenges involved in Mutoscope reel collection and the question of how to preserve and represent the reels authentically.

Chapter I Introduction

Prologue: An accidental discovery

In January 2020, I came across an odd film in the William K. Everson Collection at New York University Cinema Studies. At first glance, the film appears to be a 16mm print of *The Tramp and the Muscular Cook*, an American Mutoscope and Biograph Company production from 1898.¹ Upon closer examination, I was struck by the odd details on the images, including a half-circle dark shape looming over the top center of each frame and the rough, worn-out paper texture of images. Following the clues, I discovered the mystery film was made using one of the sixty-five original Mutoscope reels in the Douglass Crockwell, now at the George Eastman Museum. The film was probably made by the collector Crockwell while cracking through a Mutoscope machine, thus leaving the shadows of the metal flange on the images.

The 16mm film also includes another sequence with flashing colors and letters, which was titled “Red” and dated April 1964. Curatorial Assistant Sophia Lorent at George Eastman Museum was able to identify “Crockwell Color Wheel No.3”, an original Mutoscope reel by Crockwell, as a probable source for the sequence, which has the same title cards and contents. As the film bears the printing code of September 1966, Archivist Ken Fox at Eastman Museum also shared his thoughts that the 16mm film could be test footage for Crockwell’s 1967 exhibition at the Museum of Modern Art.²

¹The company went through several name changes from the American Mutoscope Company (1895), American Mutoscope and Biograph Company (1899), and the Biograph Company (1908).

²Email with Sophia Lorent, October 2020. Email with Ken Fox, November 2020. *Lovers of Cinema: The First American Film Avant-Garde, 1919–1945* lists “Red” as a mutoscope reel made in 1949, which contrasts with the title card in “Crockwell Color Wheel No.3”. More research will need to be conducted to date the work properly. Source from Jan-Christopher Horak (ed.), *Lovers of Cinema: The First American Film Avant-Garde, 1919–1945*, University of Wisconsin Press, 1998.

The Mutoscope was an early peep show device that utilizes the principles of flipbook to present moving images. When cranked, the reel started flipping inside the machine and a continuous movement was formed. For over twenty years, the Mutoscope reels were manufactured as a distribution format by the Biograph Company. However, as the company went out of business in 1917, the manufacturing and distribution of the reels declined and eventually disappeared from the public entertainment arenas in the U.S. The machine remained familiar through the 1940s as a different company kept the peep-show devices circulating as novelties.

New technology has offered the possibility for many unique formats to be preserved and presented to audiences across the world. In recent years, new preservation work by the Library of Congress, EYE Filmmuseum, British Film Institute, and Museum of Modern Arts has drawn interest from the public, historians, and archivists to the Biograph productions. Many people continue to be astounded by the high image quality of the new scans, which expanded the previous public impression of the early cinema. EYE Filmmuseum and British Film Institute worked with the lab Haghefilm Digitaal (Amsterdam) and Cineric, Inc. (New York) to undertake an 8K restoration project of their 68mm film collections. *The Brilliant Biograph: Earliest Moving Images of Europe (1897-1902)* (2020), a compilation 45 titles from the new restorations, has been screened at the esteemed Pordenone Silent Film Festival and other online revenues. The Museum of Modern Art has also restored and preserved 36 titles from its 68mm film collection. One title, *The Flying Train (1902)*, went viral after it was uploaded to the museum's Youtube

It's not clear how the film ended up in the Everson Collection. With the help of Archivist Ann Harris, I reached out to some of Everson's relatives and students who are familiar with the collection, however, none of them remember seeing the film before. Professor Tom Gunning, who was studied with Everson at the time, also made the connection between the film and the Crockwell Mutoscope exhibition and suspected that Everson got the film from MoMA. Source from email with Tom Gunning, October 2020.

channel and has since attracted more than 800,000 views.³ However, these restorations are from surviving 68mm film prints that the Mutoscope companies made for 68mm theatrical projection in the years before 1903. By contrast, this thesis addresses the flip-card rolls viewed on hand-cranked machines from 1895 to 1917.

As the parallel products of the Biograph Company, the Mutoscope reels have yet to receive the same archival or scholarly attention as the Biograph films. The history and productions of the Biograph Company have been a fertile area of research, yet no single work has been published about the Mutoscope reels exclusively. It is perhaps due to the lack of digital access to the contents of mutoscope reels in museums and archives. On the other hand, there is also a lack of published material on the technical information about the reels and machines. Many private collectors have the technical experience of the reels from the first-hand experience repairing and collecting mutoscopes, yet these experiences have yet to be recorded and organized in published form.

In 2013, the George Eastman Museum won the grant from Council on Library and Information Resources Hidden Collections Program to process the paper collections of four independent filmmakers, including Douglass Crockwell, whose paper and mutoscope reels are invaluable to the history. The finding aid created by Ken Fox in 2015 offer us a new perspective to fill in the unwritten history of the collection. From 1930 till his death in 1968, Douglass Crockwell searched out-of-business parks, arcades, and collectors to assemble his personal collections of Mutoscope reels. He also painted and assembled his own reels and machines. Moreover, he acted as an amateur archivist and rephotographed 9 mutoscope reels in his

³"Restoring The Biograph 68mm," Haghefilm Digitaal, accessed April 28, 2021, <http://haghefilm-digitaal.nl/projects-events/biograph-68mm-films/>; "The First Movies," Museum of Modern Art, accessed April 28, 2021, <https://www.moma.org/magazine/articles/70>.

collection on a 16mm film for a compilation named *The Classic American Mutoscopes*, which was distributed in MoMA's circulating film library. His works, both in creating and collecting, culminated in the first-ever exhibition dedicated to the Mutoscope at MoMA in 1967. The correspondences and notes in the Crockwell collection at George Eastman Museum reveal the mutoscope's circulation from a unique, personal perspective.⁴

Research Objectives and methodologies

The research aims to gain an understanding of the technology, history, and preservation of the Mutoscope reels produced by Biograph Company in the U.S. It is the hope of the author that by reflecting on the history of the Mutoscope reels, the thesis will generate more discussions and ideas about preserving and providing access to mutoscope reels in private collections, archives, and museums.

My research is based on two methodologies: a critical review of the existing literature on archival research about the artist and collector Douglass Crockwell. The research draws from a variety of primary sources and secondary sources. Primary sources include the original patents, published memoirs, audio interviews, and documents from the Douglass Crockwell collections at Eastman Museum. The thesis is also drawn from published research by film historians and archivists focusing on related subjects.

The second chapter will cover the history and technology of the mutoscope reels focusing on the invention process, as well as its production and the distribution model. The first section briefly chronicles the history of two key inventions, the Mutoscope and Mutograph camera. A

⁴"Finding aid", Douglass Crockwell Collection, George Eastman Museum, <https://www.eastman.org/douglass-crockwell-collection-1897-1976>, accessed May 1, 2020.

description of the manufacturing process of mutoscope reels will also be included in the section. The chapter will then move to the production and distribution model for Mutoscope, focusing on its most common subjects and distribution systems. Overall, what the chapter offers is a close examination of the mutoscope reel as a moving image format, and more significantly, a background for the chapters to follow.

The third chapter is a study of the Douglass Crockwell collection. I will elaborate on his activities as a Mutoscope collector, focusing on the collecting process and the repairing method. Subsequently, I will explore his work as an Mutoscope artist, especially through his collaboration with MoMA in exhibiting mutoscope reels in the museum. In the end, perhaps the most influential dimension of the study on Crockwell is the potential to preserve and exhibit a forgotten format through collaboration between collector and museum.

The fourth chapter will map the current challenges and practices of mutoscope preservation. It will propose several strategies to preserve the format accurately and authentically as well as discussing the question of how to present the mutoscopes in the digital world.

The final chapter will conclude by summarizing this exploration into the past, present, and future of Mutoscope. Hopefully, the experiments brought forth by Douglass Crockwell and the new technology in digital imaging can provide some new directions for the archiving and preservation of mutoscope reels, especially regarding how the fragile and unique format can be presented in the digital world authentically to allow the experience of past continue to shine into the future.

Finally, a word about the terminology used in the thesis. The Mutoscope consists of two components, the viewing machine, and the reel of cards that carry the images. In this thesis, the machine will be referred to as a "mutoscope" and the reel "mutoscope reel". The capitalized

"Mutoscope" will be used when discussing the company or its brand of technology. The American Mutoscope Company's success in the 1890s led to the brand name being used in other nations (British Mutoscope, Dutch Bioscope, et al.). In addition, in many trade catalogues, "Mutoscope " was a synonym for peep-show machines in general, referring to a variety of different machines that don't feature flip cards. This thesis will be exclusively focused on the moving image viewing technology using a reel of flipping cards as the image carrier. Furthermore, this thesis will use *reel*, which is the standardized term to refer to the apparatus carrying the flip cards. However, the word does not appear in the original patents for the Mutoscope, which refers to the card-bearing as *spool*. Other sources have used terms including *wheel*, *roll*, or *drum* to refer to the same object.

Chapter II Technical and Distribution History of Mutoscope

Background

Before diving into the history of the Mutoscope, it is necessary to look at the tradition of peep shows in which the device was created. Peep shows existed as a form of moving image presentation model before the breakthrough of the projected moving image. As Erkki Huhtamo argued, the history of "peep practice" has a deep root that developed alongside the projected image. Before the invention of the projectors, an enclosed box offered the dark environment necessary for the moving image to present in front of an audience. There were "curiosity cabinets" of the 16th century, public peep shows of the early eighteenth century, domestic peep boxes and optical toys, as well as the Cosmorama, an urban novelty picture gallery installed in the western metropolitans of the nineteenth century. The various incarnations of peep media prove itself to be a long-lasting phenomenon that attracts the public before and after the introduction of projected images.⁵

In 1894, W.K.L Dickson met with his friend Harry Marvin and discussed the prospect of making new improvements to the Edison's company's Kinetoscope machine, the first moving image peep show device invented by Dickson. He showed Marvin a pack of cards with a series of X symbols in different positions, demonstrating the flip book effect. Marvin took the cards with him and showed it to Herman Casler, an experienced engineer. Casler designed a prototype

⁵Erkki Huhtamo, 2012. "Toward a History of Peep Practice." in *A Companion to Early Cinema*, edited by André Gaudreault, Nicolas Dulac, Santiago Hidalgo, and Pierre Chemartin, 32–51. Malden, MA: Wiley-Blackwell.

and filed an application with the United States Patent Office on November 21, 1894. His patent was granted the following November.⁶

Although Mutoscope machines relied on the idea of consecutive images on flipping cards, Dickson didn't invent the flip book himself. People may have explored the trick for hundreds of years. However, flip book was first patented by J. B. Linnett in 1868 under the name of "kineograph". Also referred to as a flicker book, thumb book, and folioscope in different countries, it consists of a series of stop-motion images printed on successive pages. When rapidly rifles the pages with the thumb, the reader will see an illusion of movement.⁷

The first patent for the Mutoscope defined the essential characteristics of the machine. The cards were organized radially upon a spool. Viewers used a crank-arm to move the cards and were able to stop at a picture, rewind the reel, and repeat sections. For the reels, Casler suggested the cards should be made of elastic materials that ranges from stiff paper, celluloid, to metal, as long as they are strong enough to have the springy energy when released to achieve the desired effect. The version also differed from later models in the sole reliance on reflected light to illuminate the images. The patent didn't specify the size of the machine, the reel, or the number of cards inserted in the card, giving flexibility in the design of Mutoscope reels.⁸

Although the viewers are not the primary subject of this discussion, it is worth mentioning the company also developed mutoscope viewers of different sizes and materials for different exhibition arenas. The most common type was built by wood and iron thus nicknamed

⁶Paul Spehr. *The Man Who Made Movies: W.K.L. Dickson*, Bloomington, USA: Indiana University Press, 2008, 351-389.

⁷Laurent Mannoni, Donata Presenti Capagnoni, David Robinson, *Light and Movement*, Gemonia: Italy, Le Giornate del Cinema Muto, 1995, 355.

⁸A patent for Mutoscopes with electric headlight was filed jointly by Casler and Marvin in 1903. Casler, Herman, 1894, Mutoscope, United States Patent, US 549,309. Filed November 21, 1894. Marvin, Harry, and Casler, Herman, 1902, Moving Picture Apparatus, United States Patent, US 729,375. Filed May 25, 1903.

"Iron Horse". According to Billy Bitzer, who was an assistant for Dickson at the time, the machine was built as firm as possible to avoid people stealing cards. In addition, there are also the drawing room style Mutoscope and the cabinet Mutoscope, the former is heavily ornamented while the later was designed as a lightweight, small device as "an ornament to the private library".⁹ Later versions of the viewers featured electronic headlighting, coin-operated mechanism, as well as an electrical driven system.¹⁰ Despite the differences, mutoscope reel was playable in all the models.

Casler also filed patents for several hand-held Mutoscope designs that use smaller reels. Hendricks found there are no existing models for these designs, therefore doubting if the machines were ever commercially produced. Nevertheless, several advertisements between 1895 to 1896 mention Mutoscope as a portable device for travelling salesmen for showing their products, which leaves out the possibility a small amount of the hand-held model was produced for that brief period. Later, Leon Gaumont in France used Casler's patent to design the Kinora Casler-Lumiere, later simply known as Kinora, which became a popular optical toy in the 1900-1910.¹¹

The Camera

The design, uses, and implementation of the early apparatuses are not generally well understood, but Gordon Hendricks book *The Beginnings of the Biograph* (1964) and Paul Spehr's biography of W.K.L. Dickson are invaluable for their detailed primary sources, from which the following descriptions were summarized. Dickson hoped to use the movies shot in the

⁹ *The Phonoscope*, April 1899, Vol.III, No.4, 11.

¹⁰ Electronic lighting was designed by Harry Marvin, patent US 729,875, 1903.

¹¹ Paolo Cherchi Usai, *Silent Cinema: A Guide to Study, Research and Curatorship*, London, Bloomsbury/BFI, 2019, 24. Rossell. "The Biograph Large Format Technology, 78-115.

Black Maria, the film studio of Edison Company, but his request was refused by Edison. With no other option, Casler and Dickson decided to design a new camera, named the Mutograph (also known as Biograph camera), to produce the content for the mutoscopes. Dickson claimed that his contribution was limited to the idea of using flipping cards to create Mutoscope. Nevertheless, many historians suspected Dickson had contributed to the invention significantly but didn't admit it because of his involvement with the Edison company. Casler had no prior experience working with camera devices before.¹²

The first Mutograph was a bulky machine that used a friction-driven system and sprocketless film. The negative stock was off-the-shelf 68mm Kodak still-camera roll film.¹³ Being a still-camera stock for spooling, the thinness of the roll film is only 1/3 or 1/2 of the average 35mm film stock. It couldn't go through the normal sprocket-driven intermittent mechanics without tearing.¹⁴ A special friction-based intermittent system was developed to transport the unperforated film safely inside the camera. The two wheels rotated in opposite directions. When the raised parts came together, they pulled the film down into position, without using any sprocket holes. A perforator punched two round sprockets on either side of the film the instant the frame was exposed, which provides the tool for image registration in the printing process.¹⁵

¹²Gordon Hendricks, *Beginnings of the Biograph; The Story of the invention of the Mutoscope and the Biograph and Their Supplying Camera*. New York, 1964. Spehr, *The Man Who Made Movies: W.K.L. Dickson*, 323.

¹³Earlier publicity of AM&B refers to the film as 2 3/4" wide, which is close to the 2 23/32" size of the roll film from Eastman. In this thesis, the width will be referred to as 68mm for simplicity. See Richard Brown, and Barry Anthony, *A Victorian Film enterprise: the History of the British Mutoscope and Biograph Company, 1897-1915*. Trowbridge, Wiltshire, England: Flicks Books, 1999.

¹⁴ Hendricks, *Beginnings of the Biograph*, 60. Rossell, "The Biograph Large Format Technology." 78-115.

¹⁵ The perforator is described in Patent US #629063, Rossell, "The Biograph Large Format Technology." *Griffithiana*, 78-115.

Different scholars have different theories about the reasons the still-camera film was chosen for the Mutograph. Hendricks believes the reason is the special requirements of the Mutoscope viewer. The Mutoscope uses reflected light to illuminate the image and has low magnification, thus the photographs need to be large and clear for the images to look good. However, Rossell believed it was the other way around, the size of Mutoscope cards was determined by the large-format film. He explained that Dickson was aware the 35mm was a special order from Eastman, thus using it would run the risk of supplies cutoff for Edison's pressure.¹⁶ Nevertheless, the usual size of the film influenced the production of the Mutoscope reel, which will be elaborated on in the next section.

Printing, mounting, and assembling

As the Mutograph was tested successfully, the specifications of Mutoscope reels also standardized around 1896. The company purchased 68mm bromide paper from Kodak company as the source materials for manufacturing mutoscope cards. Bromide paper is paper coated with gelatin bromide of silver emulsion. Using the two round sprockets, the images of the film negative were printed on the long paper strip, which was then cut apart, kept in sequence, and mounted into a metal flange.¹⁷ The process was depicted in an illustration in an 1897 issue of Scientific American, which also reveals that there were mostly female workers who carried out the work of retouching the film prints and preparing them for mutoscope machines.

¹⁶Rossell. "The Biograph Large Format Technology." Hendricks, *Beginnings of the Biograph; the story of the invention of the Mutoscope and the Biograph and their supplying camera*.

¹⁷Paul C. Spehr "Unaltered to Date: Developing 35mm Film." in *Moving Images: From Edison to the Webcam*, John Fullerton and Astrid Söderbergh Widding, (Bloomington, IN: Indiana University Press, 2016), 3-28.

Every picture on the strip was separated by a blank section, which provided the space to mount the cards inside the hub. Casler also discovered that adding an auxiliary card between every picture card holds the latter in a more stationary position and snaps it down more quickly.¹⁸ With each backing card, one Mutoscope reel has about two thousand cards with one thousand different pictures.¹⁹

Printing and assembling the pictures was a slow and difficult process in the beginning. According to Bitzer, it took more than thirty minutes to print a reel that ran one minute. The printer operators also had to check the alignment of each frame to make sure the images were printed correctly. Mounting the cards into the hub was difficult because the cards had to be kept in order and secured enough to avoid slipping or wobbling inside the machine. Bitzer described his first experience arranging the cards:

Mutoscope reels were like taking a stack of playing cards and mounting them upright, on and over a round wood block. The first ones were hand-assembled, and it was a Chinese puzzle to squeeze and crowd, say, the last pack of cards around the block and have them all - from one to 999 - steady.....²⁰

A mechanical solution was developed by punching a small hole through the cards and putting a rubber through the holes. then fastened the cards on the spool and used metal flanges to clinch the cards on the sides. As a result, every Mutoscope card had a small hole underneath each

¹⁸A patent for the auxiliary cards' mechanism was filed on May 28, 1897, in United States Patent, US 638, 522. Mutoscope collector Bob Klepner also described the support cards as "interleaving cards." "Mutoscope Owners?", *Penny Machines Forum*, accessed July 22, 2021, <https://www.pennymachines.co.uk/Forum/viewtopic.php?f=5&t=6080&start=10>.

¹⁹G. W. Bitzer, *Billy Bitzer; His Story*. New York Farrar, Straus and Giroux, 1973.

²⁰Hendricks, *The Beginning of the Biograph*, 60.

image. The finished reel was then steamed and curved to give the pages a curl which helps with the snap flip action.

Subjects and distribution

In 1895, Dickson, Casler, Marwin, as well as their friend Elias Koopman, founder of an optical toy's manufactory company named the Magic Introduction Company, formed the American Mutoscope Company. In 1896, Dickson acquired a building at 1013 Grand Street in Hoboken, New Jersey, as the main technical facility for developing, printing, and assembly of Mutoscope reels.

Although there is no record of the first showing of Mutoscope pictures to the public, trade magazine Phonoscope reported the first large Mutoscope parlor opening at 1193 Broadway, New York, in 1898, noting that the machines have previously only been exhibited in saloons and places of amusement.²¹ The Mutoscope business expanded to other cities and internationally. Territorial companies were established in the US and across Europe, which offered exclusive rights for a certain territory. The company established an affiliated branch in London and subsequently established companies in Paris, Berlin, Amsterdam, and Milan. The company also reached an agreement with Leon Gaumont to manufacture the mutoscope viewers and reels made in France, Belgium, Holland, and Britain for the European market.²²

According to the company's publication, the goal of establishing territorial companies was to "secure the location of machines in the most desirable places and provide for their proper maintenance and the changing of views in the machines." Each US sub-company would own

²¹The Phonoscope, May 1898, Vol. II, No.5, 11.

²²Spehr. *The Man Who Made Movies: W.K.L. Dickson*, 489.

about 500 machines. The companies kept a tight control over their productions, both the machines and the reels were offered on lease instead of for purchasing. New subjects could be rented or swapped with a fee through an exchange system set up by the company.

The mutoscope business had been a steady success and source of income for the company. Compared to the Kinescope machine, the Mutoscope held the advantage of allowing viewers to fast forward, stop, and rewind the reels. The unprecedented control the Mutoscope gave to the viewers contributed to the long-lasting popularity of the format. Approximately four thousand different subjects had been photographed. From twenty to a hundred reels were printed from each subject. By the 1910s, Spehr estimates, approximately more than a hundred thousand reels had been produced and distributed to arcades and parlors.²³

Mutoscope productions covered a broad scope, from advertising and news to more racy subjects. The mutoscope was originally conceived as a commercial tool for traveling salesmen to showcase their products. In fact, one of the earliest Mutoscope productions features an engine pumping. Some productions were distributed both in Mutoscope parlors and Biograph projection, the company's more respectable venue. Some of the most well-known footages such as the coronation of Pope Leo XIII, were released in both Mutoscope and Biograph formats.

There were also productions exclusively made for Mutoscope. Bitzer described them as "off-color pictures" because they were made quickly and there was no location work involved. These pictures were made at night in the company studio at 841 Broadway. A lot of the films used exotic and pornographic themes to attract the peep show audience. such as, *Little Egypt* (1897), which Bitzer described as the first Mutoscope success, showed the popular dancer

²³Spehr, *The Man Who Made Movies*: W.K.L. Dickson, 489. Paul Spehr. "The Scope of Those Scopes: Production Diversity for the Mutoscope and Biograph During the Movies' Early Years." In *Beyond the Screen: Institutions, Networks, and Publics of Early Cinema*, edited by Braun Marta, Keil Charlie, King Rob, Moore Paul, and Pelletier Louis, 214-22. Indiana University Press, 2016.

dressed in turkish outfit swaying in a belly dance.²⁴ As Streible noticed, in 1899, AM&B copyrighted at least thirty such titles (*The Way French Bathing Girls Bathe*, *The Corset Model*, *Phyllis Was Not Dressed to Receive Callers*, etc.) and produced far more. Its sister Mutoscope companies in France, Britain and elsewhere were issuing similar work. The “indecent” pictures even became the target of a campaign launched by the Hearst press in 1899. Despite the backlash from the press, the production of mutoscope subjects remains steady until the 1910s.²⁵

Mutoscope after AM&B

The era of Mutoscope gradually ended as the production shifted towards 35mm and longer narrative film, symbolized in D.W. Griffith's arrival at the company in 1908. With Lumière, Edison, and nearly every other film production operation using 35mm film, the format was established as the standard for theater projection everywhere. The attraction of seeing the 68mm projection decreased significantly. In 1908, the name Mutoscope was dropped from the company's name, which was simply the Biograph Company. New reels were no longer produced, and the company only rented out old reels and kept the machines in maintenance.²⁶

When the company fell on hard financial times, the patents, and machines for manufacturing mutoscopes were bought by William Rabkin, who established the International Mutoscope Corporation and continued Mutoscope production until 1949. The company filmed about five hundred one-reels between 1924 and 1933 using regular 35mm film and enlarge the image during printing. Most of the company's new productions were dancing and strip tease or one-minute cut versions from famous star appearances in silent era productions. These

²⁴ G. W. Bitzer, Billy Bitzer; His Story, 1973.

²⁵ Dan Streible, "Children at the Mutoscope", *Cinemas* 14, no. 1 (2003): 91–116.

²⁶ Spehr, "Unaltered to Date," 2016, 3-28.

productions usually involved the same screenwriter, director, and photographer, and were cut by Rabkin himself.²⁷ The company also accepted commissioned work to print out exclusive reels for the client, which was a popular service among institutions and artists. In 1939, Crockwell commissioned the company to create a 50-foot negative from his own film, which started his life-long interest in Mutoscopes.²⁸

In summary, this chapter put the development of mutoscope reels and the American Mutoscope and Biograph Company into chronological perspective. It attempts to clarify the confusion of Mutoscope history and technology, especially between Mutoscope and Biograph technology and operation. The chapter established the fundamental text of this research, and the next chapter follow the chronological order and further analyzes the unwritten history of Mutoscope in the 1960s through the eyes of one important Mutoscope collector and artist.

²⁷Robert Rice, "Penny-arcade Philanthropist," *New Yorker*, October 16, 1948, 36-49

²⁸Douglass Crockwell Collection, 1897-1976, George Eastman Museum, Moving Image Department, Stills, Posters and Paper Collection <https://www.eastman.org/douglass-crockwell-collection-1897-1976>

Chapter III. A Personal Perspective: Douglass Crockwell and the Mutoscope

The closing of American Mutoscope and Biograph Company and its successor International Mutoscope Corporation led to the decline of the once-prosperous Mutoscope arcade business. New subjects were no longer produced and old reels worn out after thousands of flips no longer got replaced. Worse still, the beginning of the 1950s saw the television becoming the main source of entertainment. Furthering its demise, the attraction of seeing moving images for one viewer was no longer as attractive as it once was. Large quantities of Mutoscope reels were either discarded or sold on the market. As the heavy and cumbersome machine gradually faded from the commercial areas, collectors with personal interest started to take over the discarded reels.

To investigate the fate of the Mutoscope reels after the production period, this section focuses on one individual who was actively involved in collecting the reels in the 1960s. Douglass Crockwell (1904 - 1968) was an American commercial illustrator and experimental filmmaker. Crockwell started actively collecting mutoscope reels from the 1940s. By 1967, Crockwell had accumulated 55 reels produced by AM&B from 1897 to 1907, which he believed to be the largest collection of its kind in the world.²⁹ Crockwell's interest in Mutoscope reels also spread through activities including collecting, mending broken reels, transferring reels into 16mm film, as well as putting on an exhibition. George Eastman Museum acquired his collection from his widow in 1974. The museum had archived Crockwell mutoscope reels and machines, as well as his correspondence and notes about the collection. These documents shine new light on the unwritten history of mutoscope circulation from a unique, personal perspective.

²⁹The collection also includes 29 reels by International Mutoscope Corporation and 11 original reels made by Crockwell. "Finding aid", George Eastman Museum.

Douglass Crockwell was born in Glen Falls, New York. He was a commercial illustrator, working for national magazines such as *the Saturday Evening Post*, *Life*, *Look*, and *Esquire*. He was also the founding director of the Hyde Collection, an art museum in Glens Falls. An enthusiastic inventor, he owned several patents including animation making techniques and panorama photography.

Compared to institutions, private collectors were driven by their personal interest for certain objects, genres, and periods of history. Crockwell's fascination with mutoscope reels was rooted in his profession as an avant-garde animation filmmaker. In the draft of the article Crockwell wrote for the Mutoscope exhibition at MoMA in 1967, he described his understanding of the format as "sequential art".

"Visually, the moving picture is sequential art, but it is only one of the many sequential visual forms. Motion is but of the incidental byproducts. In essence the Mutoscope reel presents one image after another, after another, after another...Timing of the interval has no basic importance. The raw material of this art is the topological arrangement in time of a given set of images.... The written or printed word is sequential, A sentence is sequential. Comic strips are sequential. In fact, life is sequential."³⁰

Crockwell's radical definition of the moving image foregrounds the order and arrangement of still images over the duration. The process of arranging a series of still images resembles direct animation filmmaking, in which the camera doesn't record any motion. All Crockwell's films were made by using direct animation techniques, such as wax-slicing or

³⁰Douglass Crockwell, "Peep Show: The Past and Future Mutoscope," Douglass Crockwell Collection, George Eastman Museum.

painting-on-glass, filmed over a period of time. His most well-known film, *The Glens Fall Sequence* (1937-1946), was a series of shorts made over a period of nine years. Robert Russett and Cecile Starr's profiled the artist in their book *Experimental Animation: An Illustrated Anthology* (1976), in which William Smith described the process of working with him.

Crockwell added or removed non-drying paint on glass frame by frame, squeezed paint between two sheets of glass, or fingerpainted.³¹ The film draws viewers to follow on the illusory power rather than any narrative, which resembles the "cinema of attraction" defined by Tom Gunning. In fact, Gunning argues that "inventing a machine... defines Crockwell's unique positioning in the history of filmmaking and the machines were created, in imitation of, or homage to.... the Mutoscope." Crockwell's understanding of Mutoscope pictures in motion, which stems from his filmmaking practices, drove his passion in collecting and researching the reels as well as creating experimental, new Mutoscope art.³²

For Crockwell, Mutoscope pictures also fulfilled his desire to take cinema from the movie theater to the gallery. Before collecting reels, Crockwell's first experience with the Mutoscope traced was the previously mentioned commissioning the International Mutoscope Corporation to create a new reel in 1939. Crockwell chose a part of *Glens Falls Sequence* to make into a Mutoscope reel, which was exhibited in a nickel-operated Mutoscope machine placed at the office of the Museum of Modern Art until 1962. Crockwell likened showing Mutoscope reels as hanging a painting in the museum, which allows the audience to see the film whenever they want.³³

³¹Robert Russett and Cecile Starr, "Douglass Crockwell" in *Experimental Animation: An Illustrated Anthology*, New York, Van Nostrand Reinhold Co, 1976: 106-110.

³²Tom Gunning, "Machines that Give Birth to Images," in Jan-Christopher Horak (ed.), *Lovers of Cinema: The First American Film Avant-Garde, 1919-1945*, University of Wisconsin Press, 1998: 335-360.

³³Oral history interview with Douglass Crockwell, 1965 February 21, Archives of American Art, Smithsonian Institution.

Crockwell also saw the Mutoscope as an important invention in the history of moving images. He conducted extensive research about Mutoscope reels and wrote about the history with great accuracy. He researched the copyright records at the Library of Congress to investigate the dating of the productions. His research culminated in the notes he wrote for the exhibition program "Mutoscope" at the Museum of Modern Art. The short essay demonstrated the knowledge about the history of early cinema, the distribution model and production models of American Mutoscope and Biograph, as well as his attempts to date the reels in his collection. His writing also reveals a personal preference for the AM&B reels as opposed to the new ones by International Mutoscope Corporation. The former he titled "classic reels", which will be illustrated by the section below.³⁴

Collecting

Crockwell sourced a variety of different venues for Mutoscope reels to add to his collection. One of them was Mike Munves Corporation, a distribution company selling coin operated machines based in New York. The company, established by Mike Munves, also served as a distributor for the products of International Mutoscope Corporation. In 1956, Mike Munves sold new Mutoscope reels by International Mutoscope Corporation for \$35, with a \$7.50 allowance given for old reels by AM&B. Used reels were sold for \$15.³⁵

³⁴The published version of "The History of Mutoscope" is accessible from the MoMA press release for the exhibition. However, I was working on a 9-page draft of this article entitled "Peep Show: The Past and Future Mutoscope" in the Crockwell Collection from George Eastman Museum. Press Release for Mutoscopes, Museum of Modern Art, 1967, accessed May 2, 2021, https://assets.moma.org/documents/moma_press-release_326527.pdf?_ga=2.196856364.1863684331.1620045525-1682595250.1611952564

³⁵"Mike Munves Company Catalog: Mutoscope Arcade Movie Viewer / Peep Show", <http://www.pinrepair.com/arcade/mutosc.htm>, accessed April 23, 2021.

In a 1964 letter from Crockwell to Michael Gorman, who inquired about purchasing Mutoscope reel from him, Crockwell described his experience selecting from Mike Munves Company. Crockwell eventually purchased 16 reels from the Company on January 27, 1964, each at the price of 35 dollars:

I am in the process of buying some old mutoscope reel from the Mike Munves Corp in New York about a month ago. I spent several hours cataloging their collection of approximately fifty reels. At the present time, I believe I know more about this collection - its content and condition than the new [sic] people. Within the next few days, I plan to visit their warehouse to select some reels for acquiring - perhaps I can pick out one for you. They ask about 75 for the old reels, but a little dickering might bring that price down. The categories range from early comedies, newsreels, (American Mutoscope and Biograph), through later Westerns, comedies, and girlie (Int. Muto Co). If you will let me know your preference. I shall try to get a good one for you. Many of the reels are in bad condition, pretty [sic] stuck together etc, so that a careful choice must be made.³⁶

Crockwell also put in a lot of efforts into contacting arcades at New York City, Baltimore, and Washington, DC. Crockwell acquired reels from some of these businesses. At that time, many arcades were in bad condition and desperate to dispose of their entire machines and reels together. The large size of Mutoscope reels also worse to the problem, as they require a lot of storage space. In fact, Crockwell encountered an arcade owner who told him he threw away sixty-eight reels in the alley in the 1950s. Shocked by the information, Crockwell realized

³⁶Letter, [Crockwell] to Michael Gorman, undated, Douglass Crockwell, George Eastman Museum.

that the reels were disappearing and put on an intensive campaign to collect them. He wrote down a list of known arcades in Baltimore and Washington and contacted the owners to purchase their reels.³⁷

However, compared to those from the distribution company, the reels from the arcades were worn-out after years of operation. In addition, the arcades also only held a small number of reels, just enough to keep the visitors entertained, as the mutoscopes were only one of the money-making attractions. When the arcade at Steeplechase Park at Coney Island, New York, for example, ceased operation in 1964, the owner held 21 reels for 9 mutoscope machines, which he hoped to sell to Crockwell.³⁸ Despite the difficulties, Crockwell eventually established a significant collection of Mutoscope reels, which will be further studied in the next section.

Due to years of usage or lack of care in the distributor archive, some reels were already in poor condition when Crockwell received them. In an undated handwritten inventory, Crockwell listed 48 reels in his collection and identified 26 as "good" and 13 as "fair" and the rest with significant problems. "Stuck," "discolored," and "dark" were common issues he identified in the reels. Stuck, which refers to the cards becoming hard to flip in the mutoscope machines, was the most common issue in the collection. Sticking happened to varying degrees for different reels, with the reels with the highest stuck rate at 50 percent.

Crockwell spent time repairing the reels himself. In a letter to curator Margareta Akermark, Crockwell described his process of repairing one broken reel, which apparently from the Museum of Modern Art's own collection, by taking it apart and then using "neutral cards" from other reels to replace the missing cards.

³⁷Oral history interview with Douglass Crockwell, 1965 February 21, Archives of American Art, Smithsonian Institution.

³⁸Letter, Louis Fox to Crockwell, January 4, 1965, Douglass Crockwell Collection, George Eastman Museum.

Your broken stock reel has been put together and it now seemed that your gift was shy of a hundred or so cards to start with. These are being replaced with neutral pay cards and your total rebuilt reel will end up with about 90% of the original sequence. I would not bother this much if the hero were not an artist with beret and all. But it does seem to be a reel of a different type.³⁹

The dilemma between functionality and originality that Crockwell described is especially acute for Mutoscope reels. The Mutoscope viewer allows for a fair number of physical damages within the reels, such as missing cards or stuck reel, and remains functional. However, there is a threshold to the number of missing cards that the machine could take. In this case, Crockwell had decided to restore the functionality at the expense of the reel's originality. The intervention of Crockwell was problematic from a preservation perspective, however, it's common that collectors maintain their own collection by modifying and "restoring" objects. The issue will be further revisited in the discussion of preservation strategies in the next chapter.

Exhibition and transformation

Crockwell was also always interested in showing his collection and his creation to the public. In a 1965 interview with Smithsonian Archives of American Art, Crockwell brought up the idea of putting together an exhibition to show his reels to the public.⁴⁰ The exhibition became a reality in 1967 through his collaboration with the Museum of Modern Art. The exhibition,

³⁹Letter, Crockwell to Akermack, undated, Douglass Crockwell collection, George Eastman Museum.

⁴⁰Oral history interview with Douglass Crockwell, 1965 February 21, Archives of American Art, Smithsonian Institution.

Mutoscope, curated by Margareta Akermark, Associated Director of the Department of Film, demonstrated the history of mutoscopes with pictures, films, and mutoscopes machines. 4 reels from the MoMA archive were shown for the first time using the machines belonging to Crockwell.⁴¹

Douglass Crockwell, an artist and illustrator, has for many years collected Mutoscopes and their reels. Thanks to his diligence, the Museum is able to show actual "Iron Horses," as well as photographs and a short film made by Mr. Crockwell from the original Mutoscope reels.

Also on display are several modern Mutoscopes designed by Mr. Crockwell. Using a variety of techniques —photography, print, line, type, and color—he has created a number of reels which explore the potential of the medium.

The Mutoscope reel has proved to be an especially good, durable vehicle for a motion picture under one minute in duration. Although such a short period is obviously unsuited for the development of a literary theme, it is ideal for the presentation of art-in-sequence. Removal of the iron shell of the modern machine permits viewing by at least a dozen people at a time, taking the art out of the category of a peep-show, while still maintaining the impression of close personal contact.

Two of Mr. Crockwell's films, *Glens Falls Sequence* (1946) and *Long Bodies* (1947), are in the circulating film collection of The Museum of Modern Art.

The Museum is grateful to Mr. Crockwell for his generosity in making this valuable collection of Mutoscopes and other material available for this exhibition.

⁴¹"Mutoscopes," Museum of Modern Art, accessed July 23, 2021, <https://www.moma.org/calendar/exhibitions/3488>

— Margareta Akermark⁴²

The exhibition, designed by Clyde Rich, was one of the first, if not the very first, tribute exclusively dedicated to the Mutoscopes. The exhibition used historical illustrations, documents, and photographs about the Mutoscope to show the history of the technology, as well as different working models of Mutoscope machines. Walking into the Auditorium Gallery, the visitors were greeted with four "Iron Horse" Mutoscopes as well as six motor-driven Mutoscopes enclosed in the Plexiglas boxes (see figures 13-15). While the iron Mutoscopes displayed traditional AM&B reels, the modern Mutoscopes all displayed original reels created by Crockwell. The color reels consist of random shapes, lettering, and advertisement images that have been painted or rearranged.

Crockwell expanded the constraint of Mutoscope machine, which only allows for one person at a time, by creating a 16mm showreel of 9 mutoscope reels from his collection to project at the exhibition. To my knowledge, it was the only film that was ever produced specifically to document the contents of Mutoscope reels. Tom Gunning noted the speed of the movement in the movie was very slow, which allows the viewers to sense the pull/push movement between the moving and still images. The showreel was titled *The Classic American Mutoscope* and was included in the MoMA Circulating Film Library for distribution.⁴³

⁴²"Mutoscope," Museum of Modern Art, 1967, accessed July 23, 2021, https://assets.moma.org/documents/moma_catalogue_3488_300163665.pdf?_ga=2.65328487.899301312.1627003864-1682595250.1611952564

⁴³The reel includes *The Tramp and the Muscular Cook* (1898), *Reginald's First High Hat* (1899), *The Horse Thief* (1905), *An Affair of Honor* (1897), *How the Old Maid Got a Husband* (1900), *A Fight for a Bride* (1905), *The Convict's Bride* (1906), *Waltzing Walker* (1907), *She Baked in Her Stocking, or, Robbed of Her All* (1905). Tom Gunning, "Machines that Give Birth to Images." Eileen Bowser, "The Classic American Mutoscope," *Circulating Film Library catalog*, Museum of Modern Art Circulating Film Library. New York: Museum of Modern Art, 1984, 20.

The exhibition revealed how valuable the collaboration between the collectors and museums are to showcase obsolete technology and devices such as Mutoscope. The Mutoscope reels in the MoMA collection never exhibited before both probably because the lack of Mutoscope viewers and the difficulty of keeping the mechanical device running for the exhibition period. Crockwell not only supplied the machines, but also contributed his knowledge and passion in keeping the exhibition running. The Mutoscope reels and machines, which had undertaken many years of operation, suffered from various mechanical problems. According to news reports, Crockwell travelled to New York about once a week from Glens Fall during the exhibition period. to keep the machines in adjustment.⁴⁴ The exhibition was initially scheduled from August 2 to October 1, 1967 and was extended for two more weeks due to its popularity among the visitors. With the visitors interacting with the machine every day, it would be impossible to imagine the exhibition could run smoothly for two and a half months with the effort of Crockwell.⁴⁵ The technical expertise of the collectors supplements the lack of related experience of the museum.

Finally, although modern Mutoscope artwork is not the focus of this research, it is worth mentioning that Crockwell was also one of a few true Mutoscope artists in the sense that his reels remain completely compatible with the traditional Mutoscope viewers. Experimental animator Robert Breer, who was actively at the same period as Crockwell, shared the same idea with Crockwell of using Mutoscope to take the cinema to the gallery. He drew from elements from the Mutoscope to create a series of kinetic sculptures, such as *Homage to John Cage* (1963) and *3D Mutoscope* (1978). However, Beer's experiments were also fundamentally different from the

⁴⁴Jane H. Kay, "Douglass Crockwell and His Magic Mutoscope", *St. Louis Post-Dispatch*, September 3 1967.

⁴⁵Marilyn Nason, "Crockwell's Mutoscope Exhibit Held Over," *The Post-Star*, 10 October 1967.

ones from Crockwell. Breer transformed the object through what art historian Andrew Uroskie calls "deliberate formal reduction" while Crockwell's works were experimental primarily in the images instead of the sculpture.⁴⁶

The only comparable artist is animator Oskar Fischinger, who made three Mutoscope reels around 1945 and 1946. In 1944\5, He purchased a mutoscope reel and painted Johann Sebastian Bach's *Brandenburg Concertos* synchronization on the cards. He continued to create two other reels of 670 cards that were painted in oil and color pencils. One of the two were sent to Solomon Guggenheim as a gift in 1946, which now seems to be lost. In 1984, his daughter Barbara Fischinger and film historian William Möritz copied and reconstructed the two surviving reels so that the handmade original could be kept archivally and the duplicates could be played to viewers in various Fischinger exhibitions.⁴⁷

Eleven of the original reels were in the Douglass Crockwell collection at the George Eastman Museum, including the *Color Wheels series*, *A Long Body*, *Random Glow*, *Stripes*, *Ode to David*, *Around the Valley*, *Duopusses*, *Animation #1*, and *Playboy and Dancer Reel*. The color wheels mostly consist of a series of cards of single colors which create a sense of blending colors when flipped. As Gunning noticed, the most notable reel, which is titled *Playboy and Dancer Reel*, consists of images of the top-hatter dancer with fragments with images from *Playboy* magazine. According to Gunning, Crockwell seemed to merge his fascination of mutoscope along with his profession as a commercial artist together in the reel through exploration of

⁴⁶Andrew V. Uroskie, "Moving Image in the Gallery, " in *Between the Black Box and the White Cube: Expanded Cinema and the Postwar Art*, Chicago: The University of Chicago Press, 2014: 84-130.

⁴⁷ According to William Möritz, Guggenheim Foundation reported there were no record of the reel. Luckily, Fischinger filmed the reel in 35mm film before sending it to New York, which was then transferred to a 16mm film by Möritz. The film elements are now preserved at Academy Film Archive. Möritz also filmed the other two Mutoscope reels in 16mm film, which is included in VHS compilation *The Films of Oskar Fischinger : Volume 2*, Kinetica Video Library, 2000. William Möritz. *Optical Poetry: The Life and Work of Oskar Fischinger*. Bloomington: Indiana University Press, 2004: 124, 233.

movement and eroticism. With the *Playboy* allusions he connects the work to the mutoscope device's original and long-lasting association with disrobing women and "what the butler saw" genre of "naughty" content. Crockwell's original reels blend the element of attraction in early cinema with abstraction, thus offering a unique interpretation of the aesthetics of Mutoscope reels.

Conclusion

This chapter uses Douglass Crockwell as a case study to study the reels after the production period and the role artists and collectors play in preserving and advocating for obsolete technology. Crockwell not only acted as an experimental artist and a mutoscope collector, but also an amateur archivist and historian. His attempt to collect, preserve, and transform the mutoscope reels contributed to the knowledge-sharing of the obsolete format as well as generate public interest through the exhibition.

Crockwell's collaboration with the Museum of Modern Art also offers a successful model for institutions working with collectors to bring obsolete formats back to life. The model could help the institutions to find better solutions for the preservation and presentation of mutoscopes. The next chapter will analyze the physical characteristics of the reels, the status of preservation, to contribute ideas to the challenges of presenting historical apparatus in the digital era.

Chapter IV. Archiving a Past Medium in Museums and Archives

Value

The Mutoscope reels don't often offer the best image quality or the most complete version of a motion picture. Although the cards were often contact printed from 68mm negative, the image quality of the thin layer of emulsion is not comparable to the 68mm Biograph film print. In addition, the reels were designed and marketed as durable products that could withstand thousands of flips with no maintenance. The production of AM&B Mutoscope reels ceased in the 1910s, making any surviving original items more than 110 years old now. Most of the surviving reels saved from parlors and arcades had suffered from wear and tear of varying degrees.

The number of surviving Mutoscope reels is unknown but is certainly too small to reflect on the full production output of the American Mutoscope and Biograph company. In comparison, the Paper Print Collection at the Library of Congress offers a much more comprehensive record of the American Mutoscope and Biograph productions of the period. Because the copyright law in the US didn't cover motion pictures until 1912, film companies printed their films on rolls of bromide papers and sent them to the Library as photographs for copyright registration to protect their productions from infringement. The Paper Print Collection includes approximately 3,000 motion pictures, covering the production of a variety of American companies including the several hundred AM&B titles. However initially the company did not copyright its films of 1896-1902 because the propriety 68mm format could not be pirated by competitors. Most of the AM&B entries in the Paper Print Collection from that early period were deposited for copyright in 35mm in 1902-1903. Some were released as both Biograph films and Mutoscope reels. Surviving mutoscopes therefore often overlap with the paper print holdings.

However, some peep-show reels were neither deposited for copyright nor distributed as film prints.⁴⁸

I argue that the mutoscope reels are worthy of preservation not because they necessarily contain images from lost film, but because they are unique objects that reflect the production, distribution, and exhibition history. Each record, each iteration is different from the other. For mutoscope reels, the spectators were interacting with reels physically, inevitably leaving traces on the object that became the objects' own history. The traces of history are evidence of the past, which allows researchers today to learn about the media experience of different periods. As the mutoscope allows the viewers to rewind and repeat sections, the preference of the audience can be discerned from the most worn-out cards in one mutoscope reel. As Crockwell mentioned that one reel in his collection missed some cards in the reel's most erotic moment, which were probably stolen by some enthusiastic spectators.⁴⁹

Status/challenges

As Fossati and van den Oever argue, apparatuses and all film-related and special collections have commonly had a peripheral role in the tradition of film studies and archival practices. The content of the moving image had been valued over the materials and technology in which the film had been created from. The situation has changed over the past twenty years, with the new scholarship that focuses on the history of film technology. Fossati and van den Oever

⁴⁸Mike Mashon, "Where It All Began: The Paper Print Collection," Now See Hear! The National Audiovisual Conservation Center Blog, May 27, 2014, <https://blogs.loc.gov/now-see-hear/2014/05/where-it-all-began-the-paper-print-collection>. Kemp R. Niver, *Early Motion Pictures: The Paper Print Collection in the Library of Congress* (1985).

⁴⁹"Peep Show: The Past and Future Mutoscope," Douglass Crockwell Collection, George Eastman Museum.

also refer to another major phenomenon in museum and media studies as a reason behind the changes, the "material turn," a renewed longing for the experience for the experience of the materiality of the medium rather than its digital surrogate.⁵⁰

To my knowledge, museums and archives that hold Biograph Company Mutoscope reels include the Crockwell Collection at the George Eastman Museum, the Smithsonian Museum of American History, the Museum of Modern Art, Herbert E. Farmer Motion Picture Technology Collection at University of South California, the Library of Congress, the Cinémathèque Française, and the Museum of The Moving Images. Despite the growing interest in the technology history of cinema technology, Mutoscope reels, which are neither a unique film object nor a theatrical projection device, still hold a minor status in museums and archives. They often entered the collection by chance, as gifts from enthusiastic collectors, or gathered with the intention of showing the technological history of film. Many of the Mutoscope reels are deeply valuable and occasionally unique, however, they might have not been properly processed or catalogued for years since entering the collection.⁵¹

Mutoscope reels often fall into the crevices of different collections due to its unusual, hybrid composition between still and moving image. In fact, the Mutoscope reels at Smithsonian Museum of American History reside in the Photographic History Collection, rather than Motion Picture Collection. As Lintelman argues, the classification guarantees that the reels will always be treated first as photographic objects, which become a barrier to the scholarly and public access to them. The preservation requirement for the Photographic collection demands the

⁵⁰Giovanna Fossati and Annie van den Oever, "Introduction: Exposing the Film Apparatus," in *Exposing the Film Apparatus: The Film Archive as a Research Laboratory*, Giovanna Fossati and Annie van den Oever (eds), EYE Filmmuseum & Amsterdam University Press, 2016: 13-43

⁵¹Ibid. Ryan Lintelman, "Mining the Movie Museum: The Mutoscope Collection at the National Museum of American History" (2009). Undergraduate Honors Theses. Paper 267. <https://scholarworks.wm.edu/honorstheses/267>

curators and preservationists to specialize in photo conservation, which leaves the aberrant collection without the expertise of moving image archivists.⁵² As a result, Mutoscope reels often suffer from the "dead wood" scenario, where a large amount of the reels was seldom accessed or exhibited at all.

Apart from the issues in archival management, the Mutoscope reels are vulnerable to a variety of physical damages due to design issues and arrangement. The mechanical design of the mutoscope viewer offers little protection over the cards. Every time a card goes through the viewer, the metal flange will rub through the top. As a result, Mutoscope reels often show signs of worn and brittleness on tops of the photographic cards.

The reels are vulnerable to environmental threats due to its chemical composition. The photographic images were made using a light-sensitive gelatin silver bromide paper. The prints are sensitive to air pollutants, which would lead to discoloration and fading in highlights, at edges, and across the image. Warm and humid environments also accelerate the destructive effects. The reels were often stored inside the viewers for the period of exhibition, which offered an enclosed environment. However, some viewers were installed with electronic lighting systems, which generate heat, which in turn worsens the condition of the bromide images.⁵³

Approaches and proposed strategies

With these inherent challenges of preserving Mutoscope reels, it is necessary to consider the appropriate approach to take. In terms of the chemical composition, Mutoscope reels resemble closely with photographs in that the bromide paper cards require the same environment

⁵²ibid.

⁵³"Silver Gelatin DOP Print", Preservation Self-Assessment Program, accessed May 2, 2021, <https://psap.library.illinois.edu/collection-id-guide/photoprint>

control and treatment as photographic materials. However, unlike still photography, the reels also require playback devices to view and exhibit the works. The duality of the format suggests at least two approaches that can and should be taken in order to meet the preservation concerns for Mutoscope reels, the traditional object-based photograph conservation framework, as well as the time-based media framework.

From a photograph conservation perspective, it is important to keep the deterioration reversed as far as possible and prevented in the future. To avoid further physical, chemical, and biological damages to the materials, it requires careful handling, environment control, and appropriate housing and physical arrangement. Among the different procedures, preventive methods should be prioritized over practical conservation treatment due to the amount of work that is required to repair and clean each card on one reel. It might also require the cards to be taken from the core to conduct certain treatment, which might introduce risks even for professionals who had no prior experience with Mutoscope.

It's also very important for the reels to be kept within reasonable limits in terms of temperature, light, relative humidity, and air quality. High temperature, humidity, light, and air pollutants can all cause the rate of chemical deterioration, such as fading and tarnishing for the paper. For photograph collection, the minimum environmental standard is at 25°C, the physically safe range is 35-60% relative humidity. The print is also sensitive to light, thus light levels in research and exhibition areas need to be reduced.⁵⁴

Apart from the four factors, the reels should also be stored in appropriate storage materials which don't induce further chemical or physical risks. The reels should be stored horizontally in paper boxes that have a pH of 6.5-7.5 and free of lignin, acid, or metal particles.

⁵⁴Susie Clarke, and Franziska Frey. *Care of Photographs*. Amsterdam: European Commission on Preservation and Access, 2003.

The reels should always be handled with clean hand or cotton gloves when appropriate, which also help to sustain the collection in good condition.⁵⁵

Digitization, exhibition, and access

The aforementioned elements are important to preserve the physical integrity of the reels and avoid further deterioration. However, the Mutoscope reels also require other approaches to counter the challenges of format obsolescence and the dilemma between access and preservation. Although the Mutoscope as a format itself is not considered a time-based media artwork, however, the concept of work defining properties in TBM conservation is helpful for the institutions to consider the issue of authenticity, change and loss in preserving and presenting Mutoscope reels. As art conservator Pip Laurenson, head of Collection Care Research at Tate, puts it:

It seems that for a work to be like a performance, to any degree, it needs to specify something that is important to the identity of the work, for which there is an element of indeterminacy in its realisation...The kinds of things that might act as work-defining properties of a time-based media installation are: plans and specifications demarcating the parameters of possible change, display equipment, acoustic and aural properties, light levels, the way the public encounters the work and the means by which the time-based media element is played back.⁵⁶

⁵⁵ibid.

⁵⁶Pip Laurenson, 'Authenticity, Change and Loss in the Conservation of Time-Based Media Installations', in Tate Papers, no.6, Autumn 2006, <https://www.tate.org.uk/research/publications/tate-papers/06/authenticity-change-and-loss-conservation-of-time-based-media-installations>, accessed 3 May 2021.

I will argue that the stop, rewind, and repeat functions of the machines and the one-person-only viewing model were the work-defining properties of the Mutoscope productions. The American Mutoscope and Biograph Company were aware of the format specificity of Mutoscope and capitalized on the attraction. As mentioned in the first chapter, the company designated specific themes, such as erotic scenes and celebrity appearances, to be produced and distributed through the Mutoscope parlors.

One major challenge is how to provide access to the reels while preserving their interactivity and peep show nature. There are still two small companies that offer the service of fabricating new mutoscope reels, Mutoscope Man (mutoscopeman.com) and Tom Reverand's Old Time Movies (oldtimemovies.org).⁵⁷ A solution would be to use their technology to copy the mutoscope reels and then show the duplicates for exhibition, so that the original wouldn't expose to physical damages. In addition, some of the original Mutoscope reels were printed from photographic negatives, which may still exist as 68mm or 35mm film in archives. For exhibition, one could also use those high-quality sources to create new cards that would be built into a reel for playback on a mechanical device. Additionally, 3-D printing might extend the ability to make new copies of the machines.

Duplication may offer a solution for presenting Mutoscope in 2021, however, as the printing technology goes obsolete in the future. What are the options in the long term? The complexity of the archival requirement, the expense of the technology, as well as the required

⁵⁷Mutoscopeman's reels are produced using digital printing and the cards are not steamed and curved. Tom Reverand inherited the original machinery of the International Mutoscope Company from his father *John S. Reverand Sr*, who bought the company. The machinery is used to reproduce new Mutoscope reels. "Reproduction Mutoscope reels?" Penny Machines Forum accessed May 3, 2021, <https://pennymachines.co.uk/Forum/viewtopic.php?f=2&t=7154>. "History," Old Time Movies, accessed July 22, 2021, <http://www.oldtimemovies.org/about.html>

technical expertise all puts a strain on the resources. The cards couldn't be scanned on a flat surface without taking the entire reel apart. Collectors, such as Crockwell a generation ago, might still have the skills to conduct the disassembling and rebuilding of reels. The absence of skilled workers could make it difficult for institutions to make informed choices about their collection.

Even if scanning became possible with technological advancement, the user-controlled movement and the peepshow environment which is inherent to the mutoscope will be lost if the reels were digitized and presented as a movie. An alternative approach is to take the video from the peephole perspective. For the Kinora collection at Getty Research Institute, the archivists documented the Kinora reels through taking videos through the apparatus and made the videos accessible in the catalog record.⁵⁸ The method incorporated the participation of human intervention in the documentation and foregrounding the machinery which made the viewing possible. They offer a visual experience which is closer to that of an audience. As the technology advances, Virtual Reality might be a useful tool to imitate the physical interaction between the audience and the mutoscope and bring the mutoscope into the digital realm.

Building a Knowledge Base

As Ine van Dooren ruminates in her analysis about the preservation of magic lantern slides in museums and archives:

Digital reproduction offers a wide and proficient accessibility to a vastly growing amount of imagery and information. But it is creating a different experience, more mental, less

⁵⁸"Kinora," Getty Digital Collection, accessed May 3, 2021, https://rosettaapp.getty.edu/delivery/DeliveryManagerServlet?dps_pid=IE1990774

focused than the tangible original materials. And this in turn may feed a longing to revisit the specificity and tactility associated with the analogue audio-visual experience of the lantern medium. Here digitally generated knowledge and access can help to raise awareness to properly care for our analogue legacies – not to replace them or discard them as "old" but to rediscover their fascinating heritage, bringing them out of the stuffy cupboards of forgotten pasts into vibrant explorations in the brave new world of the future.⁵⁹

I will argue that even for Mutoscope reels, for which digitization was still yet to begin, building a knowledge base through digital tools is the crucial and fundamental method to keep the reels accessible in the future. This research benefited from discussion of Mutoscope collectors on online forums such as Penny Machines (<https://pennymachines.co.uk/Forum/>), who share expertise about the subject which had not been published elsewhere. Through a centralized and dedicated online platform that can be easily uploaded to and downloaded from, the unwritten history of Mutoscope reels may finally be uncovered.

Conclusion

This last chapter has proposed several strategies to respond to the challenges in preserving and presenting Mutoscope reels to the public. The hybrid nature of the Mutoscope reel created difficulty because it requires both photographic and paper conservation as well as film preservation knowledge to be documented and presented in the long term. Preserving the

⁵⁹Ine Van Dooren. "Our Magic Lantern Heritage: Archiving a Past Medium That Nearly Never Was." In *Screen Culture and the Social Question, 1880-1914*, edited by Vogl-Bienek Ludwig and Crangle Richard, 183-89. Indiana University Press, 2016.

interactivities of the Mutoscope reel is as important as preserving the physical carrier. The digital imaging technology in the future may provide high-definition digital reproductions of Mutoscope reels. However, establishing a knowledge base for collectors and institutions to share resources and expertise will be the most useful solution to preserve the obsolete format in the future.

Conclusion and Limitation

This thesis has explored the history, technology, and preservation of Mutoscope reels. It attempts to illustrate the technological development of the invention to appreciate its achievement at the time. The Mutoscope was unique because it allowed the moving image viewing to become an interactive experience. The simplicity of the mechanisms also attributed to its lasting popularity in the public. This historic research also clarified the manufacturing process of the Mutoscope and laid the foundation for the subsequent chapters.

Chapter III investigated the role collectors and artists play in the history of Mutoscope reels through focusing on Douglass Crockwell. Crockwell's activities in collecting, preserving, and transforming the mutoscope reels contributed to the knowledge-sharing of the obsolete format. Crockwell's collaboration with the Museum of Modern Art also offers a successful model for institutions working with collectors to bring obsolete formats back to life. The exchange of resources and expertise provided the ideal scenario for the preservation and presentation of mutoscopes. In turn, the George Eastman Museum has archived the Douglas Crockwell Collection, 1897-1976, in its Moving Image Department, Stills Posters and Paper Collection.

The last chapter has proposed several strategies to respond to the challenges in preserving and presenting Mutoscope reels to the public. Preserving the interactivities of the Mutoscope reel is as important as preserving the physical carrier. Although the digital imaging technology in the future may provide high-definition digital reproductions of Mutoscope reels, establishing a knowledge base for openly sharing expertise among collectors and institutions will be most essential in preserving the obsolete format in the future.

The limitation of this research was the lack of first-hand experience inspecting or working with Mutoscopes in the archival setting. Due to the COVID-19 pandemic, the planned trip to George Eastman Museum to see the Douglass Crockwell Collection could not be realized. Nevertheless, I hope the research is able to demonstrate through collaboration among film archivists, academics, artists, as well as collectors, the knowledge of obsolete technology can truly be explored and understood.

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Appendix I. Selected Chronology

1894 - Herman Casler invented the Mutoscope. Patent was filed on November 21.

1895 - K.M.C.D group founded the American Mutoscope Company.

1896 - W.K.L Dickson purchased a building at 1013 Grand Street Hoboken New Jersey as Mutoscope technical facility.

1898 - Phonoscope reported the first large Mutoscope parlor opening at 1193 Broadway.

1904 - Douglass Crockwell was born.

1908 - D.W. Griffins joined the American Mutoscope and Biograph Company.

1917 - William Rabkin purchased the patents and machines of Mutoscope from Biograph Company.

1939 - Douglass Crockwell commissioned International Mutoscope Corporation to make a Mutoscope reel from his film, *Glens Fall Sequence*.

1960 - International Mutoscope Corporation filed for bankruptcy.

1967 - "Mutoscope" exhibition took place at the Museum of Modern Art

1968 - Douglass Crockwell died.

1974 - Crockwell's widow transferred most of the Douglass Crockwell Collection to Eastman Museum.

2013 - George Eastman Museum won the grant from Council on Library and Information Resources Hidden Collections Program to process the paper and Mutoscope reel collection of Douglass Crockwell

Appendix II. List of Biograph Company Reels in Crockwell Collection

Box 1	Subject 228: "Dressing Room Scene, A" (1897)
Box 2	Subject 238: "Affair of Honor, An" (1897)
Box 3	Subject 694: "Tramp and the Muscular Cook, The" (1898)
Box 4	Subject 881: "'Moving' Picture, A" (1899)
Box 5	Subject 957: "Reginald's First High Hat" (1899)
Box 6	Subject 1443: "How the Old Maid Got a Husband" (1900)
Box 7	Subject 1527: "Career of Crime. No. 5, A" (1900)
Box 8	Subject 1576: "Trouble in Hogan's Alley" (1900)
Box 9	Subject 1671: "Good Time Behind the Scenes, A" (1900)
Box 10	Subject 1874: "Close Shave, A" (1901)
Box 11	Subject 2479: "Fatal Attempt to Loop-the-loop on a Bicycle, A" (1903)
Box 12	Subject 2528: "From Show Girl to Burlesque Queen" (1903)
Box 13	Subject 2714-B: "Love and Jealousy Behind the Scenes" (1904)
Box 14	Subject 2944: "Seashore Baby, The" (1904)
Box 15	Subject 3013: "Al Treloar in Muscle Exercises" (1905)
Box 16	Subject 3060: "Adjustable Chair, The" (1905)
Box 17	Subject 3072: "Japanese-Russian Peace Envoys" (1905)

Box 18	Subject 3074-A: "Bertha Claiche: The Lovers" (1905)
Box 19	Subject 3076: "She Banked in Her Stocking; or, Robbed of Her All" (1905)
Box 20	Subject 3080: "Teasing" (1905)
Box 21	Subject 3085-B: "Horse-Thief, The" (1905)
Box 22	Subject 3104: "Airy Fairy Lillian Tries on Her New Corsets" (1905)
Box 23	Subject 3099: "Halloween" (1905)
Box 24	Subject 3118: "Fight for a Bride, A" (1905)
Box 25	Subject 3134: "The Streets of New York" (1905)
Box 26	Subject 3141: "Raid on a Cock Fight, A" (1905)
Box 27	Subject 3206: "Spanish Barbecue" (1906)
Box 28	Subject 3213: "Old Swimming Hole, The" (1906)
Box 29	Subject 3215: "Convict's Bride, The" (1906)
Box 30	Subject 3218: "Weighing the Anchor" (1906)
Box 31	Subject 3223-B: "Lone Highwayman, The" (1906)
Box 32	Subject 3241: "Nelson-McGovern Prize Fight" (1906)
Box 33	Subject 3277: "Colon to Panama Canal Picture" (1907)
	Subject 3278-A: "If You Had a Wife Like This"/"How Would You Like a
Box 34	Wife Like This?" (1907)
Box 35	Subject 3278-C: "If You Had a Wife Like This"/"How Would You Like a

Wife Like This?” (1907)

- Box 36 Subject 3293: “Gay Girl Playing Pool” (1907)
- Box 37 Subject 3302-B: “Opening Day, Jamestown Exposition” (1907)
- Box 38 Subject 3306: “Dear Little Sister” (1907)
- Box 39 Subject 3310: “Bigger than He Looked” (1907)
- Box 40 Subject 3324: “Tenement House Battle, A” (1907)
- Box 41 Subject 3327: “Finish of Scrappy Patsey, The” (1907)
- Box 42 Subject 3348: “Mags Jag” (1907)
- Box 43 Subject 3355-A: “Mr. Easy Mark” (1907)
- Box 44 Subject 3355-B: “Mr. Easy Mark” (1907)
- Box 45 Subject 3362: “Light! Fight! White!” (1907)
- Box 46 Subject 3366: “Crooked Dog” (1907)
- Box 47 Subject 3372: “Waltzing Walker” (1907)
- Box 48 Subject 3374-B: “Yale Laundry” (1907)
- Box 49 Subject 3374-C: “Yale Laundry” (1907)
- Box 50 Subject 1337: “Energizer” (1907)
- Box 51 Subject X-247: “Motion Pictures Patents Company Meeting” (undated)
- Box 52 Subject G-319-B: “False Alarm, A” (1905)
- Box 53 Subject 7032: “Her Morning Exercise” (undated)

Box 111 Subject 3370: ["Girl \$9.98"] (undated)

Box 114 Subject 3355-A: "Buys a Dog but Gets a 'Lemon'" (undated)

Appendix III List of Figures



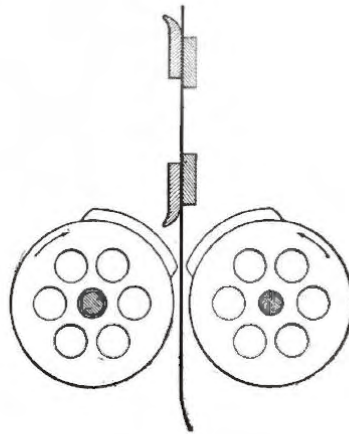
Graph 1. Freeze frame from the “mystery” 16mm film in William K. Everson Collection (NYU)



Graph 2. Mutoscope Reel *the Tramp and Muscular Cook* (George Eastman Museum)



Graph 3. 68mm film and 35mm film (Haghefilm Digitaal)⁶⁰

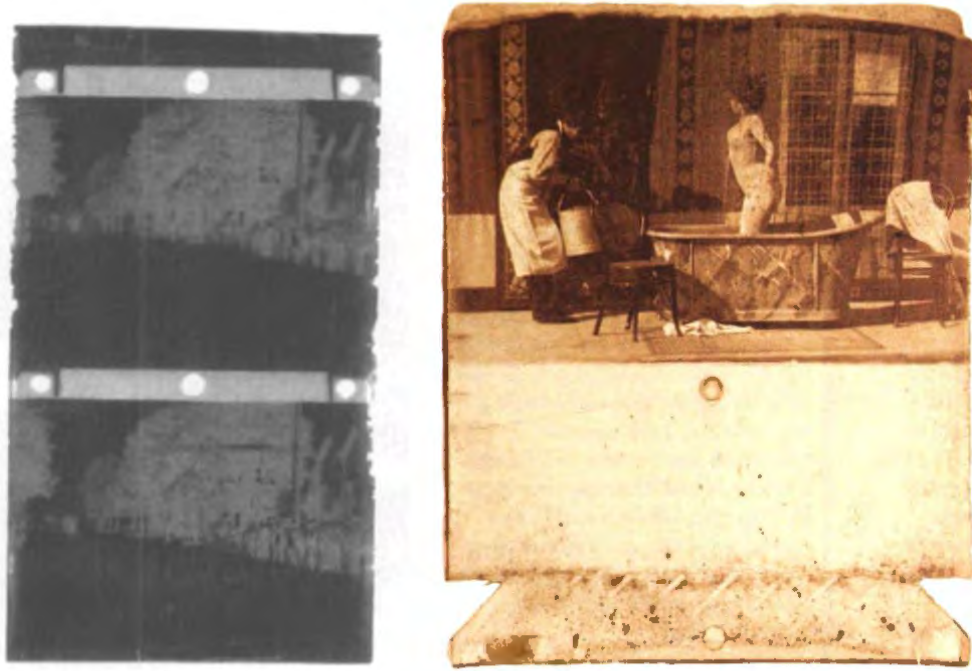


Graph 4. Schematic diagram of the friction-driven intermittent movement (David S.

Hulfish)⁶¹

⁶⁰"Restoring The Biograph 68mm," Haghefilm Digitaal, accessed April 28, 2021, <http://haghefilm-digitaal.nl/projects-events/biograph-68mm-films/>

⁶¹David S. Hulfish, *Motion-Picture Work: General Treatise on Picture Taking, Picture Making, Photo-plays, and Theater Management and Operation*, Chicago: American School of Correspondence, 1913, pt. 1, p.115



Graph 5. Left, original negative of 68mm Mutograph camera (Karl Malkames)⁶²

Graph 6. Right, Mutoscope card (Cinémathèque Française)⁶³



Graph 7. Mutoscope Reel (Dorinda Hartmann)

⁶²Karl, Malkames, Centennial of the Biograph Motion Picture System. It's not clear why there are three registration sprockets on the film instead of two.

⁶³Laurent Mannoni, Donata Presenti Capagnoni, David Robinson, *Light and Movement*, Genoa: Italy, Le Giornate del Cinema Muto, 1995, 355.

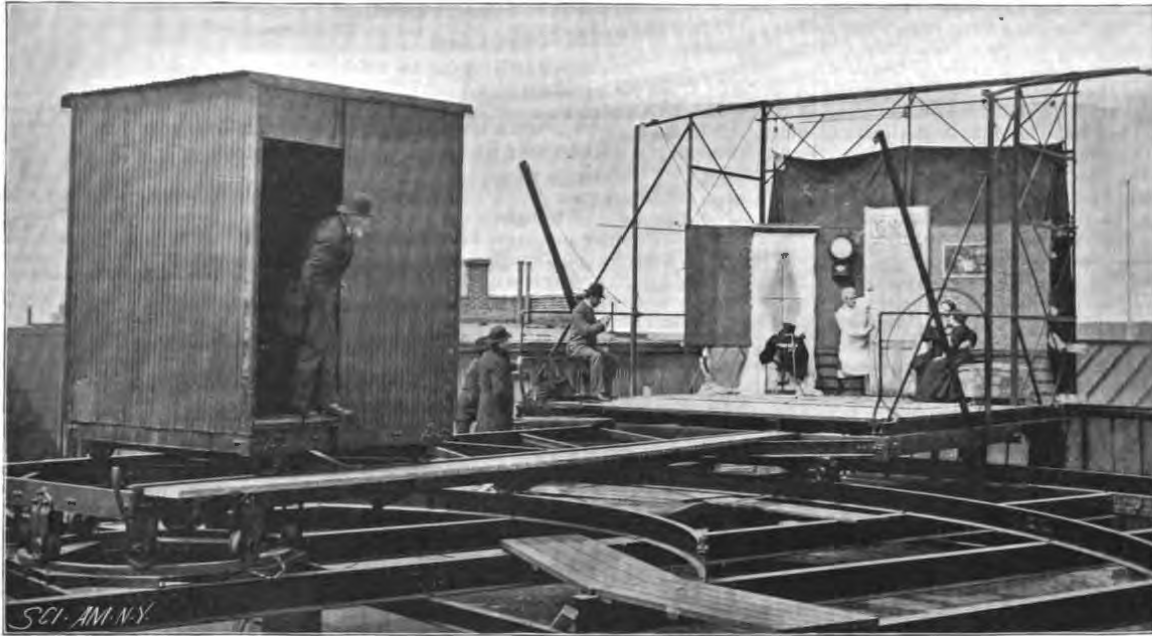


Fig. 6.—MOVABLE STAGE FOR PHOTOGRAPHING SCENES WITH THE "MUTOGRAPH."



Fig. 5.—DRYING AND RETOUCHING ROOM "MUTOSCOPE" SHOWN IN THE FOREGROUND.

Graph 8. Illustration of the AM&B Studio on 841 Broadway rooftop (Scientific American)

Graph 9. Illustration of Mutoscope Assembly Studio (Scientific American)⁶⁴

⁶⁴Scientific American, New York, April 17, 1897, 248, 249



Graph 10. One of the First Mutoscope Picture Depicting a Pump (Paul Spehr)

THE PENNY ARCADE HEADQUARTERS

These are some of the popular Mutoscope Subjects

COMIC AND WESTERN REELS

<p>7093—Charlie Chaplin, "Easy Street"</p> <p>7127—How Gibson in "Hey, Hey! Cowboy! A Universal Jewel"</p> <p>7128—Jack Hays, "The Fighting Three" A Universal Western</p> <p>7175—Wm. S. Hart in "The Stranger in Town"</p> <p>7204—The Cohens and Kellys in Paris—A Universal Special</p> <p>7207—Lloyd Hamilton in "Here Comes Charlie" an Educational Comedy</p> <p>7215—Bill Mena's dance "How to Handle Women" A Universal Picture</p>	<p>7304—Billy West in "Office! Do Your Duty"</p> <p>7310—Douglas Fairbanks in "Acrobatic Monkey Business"</p> <p>7317—Ben Turpin in "A Mile a Minute"</p> <p>7400—Babe Hardy in "He Ate the Dinner Plate"</p> <p>7495—"The Covered Wagon"</p> <p>7544—"The Mail Gravy's Death" with Mary Pickford and Mack Sennett. A Biograph Picture directed by D. W. Griffith</p> <p>7555—Leo Maloney "Western Justice"</p> <p>7577—"The Fight in Mid-Air" with Callen Lenda</p>
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SNAPPY GIRL REELS

<p>7029—Hollywood Scandals!</p> <p>7115—Sweet Sixteen!</p> <p>7134—After the Bath!</p> <p>7155—All Alone!</p> <p>7166—Strip Poker!</p> <p>7149—Why Men Leave Home!</p> <p>7158—The Hawaiian Blues!</p> <p>7168—The Naked Truth!</p>	<p>7167—Yacht!</p> <p>7171—Joy!</p> <p>7202—The Ole Swimmin' Hole!</p> <p>7315—"The Broadway Melody"</p> <p>7343—A Modest Venus!</p> <p>7344—Ladies Night in a Turkish Bath!</p> <p>7352—"Lady Godiva"</p>
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INTERNATIONAL MUTOSCOPE REEL CO., INC.
445-57 WEST 114 STREET, NEW YORK, N. Y.

[10]

THE PENNY ARCADE HEADQUARTERS

THRILLING MUTOSCOPE REELS
Snappy Girls, Hair-Breadth Escapes, Comedy, Scenes and Travel — Famous Players

OVER 600 REELS

Because the great earning power of Mutoscopes depends largely on the unusually attractive line of reel subjects, we have been exceedingly particular about players and subjects for these reels. None other than attractive models, recognized stars and unusual comedians are shown. Among the many players are such popular stars as Reginald Denny, Charlie Chaplin, Wm. S. Hart, Sid Chaplin, Jack Dempsey, Douglas Fairbanks and others of renowned fame.

These reels are extremely attractive in every respect. The original pictures are taken with the same type of cameras and processes as are used for the big shows. The film is cut and edited with such great care that nothing but real, live action is shown. Mutoscope reels are not made of celluloid or any other hazardous material so they can be used with perfect safety everywhere.

*Over 600 Reels
For Your Choice*

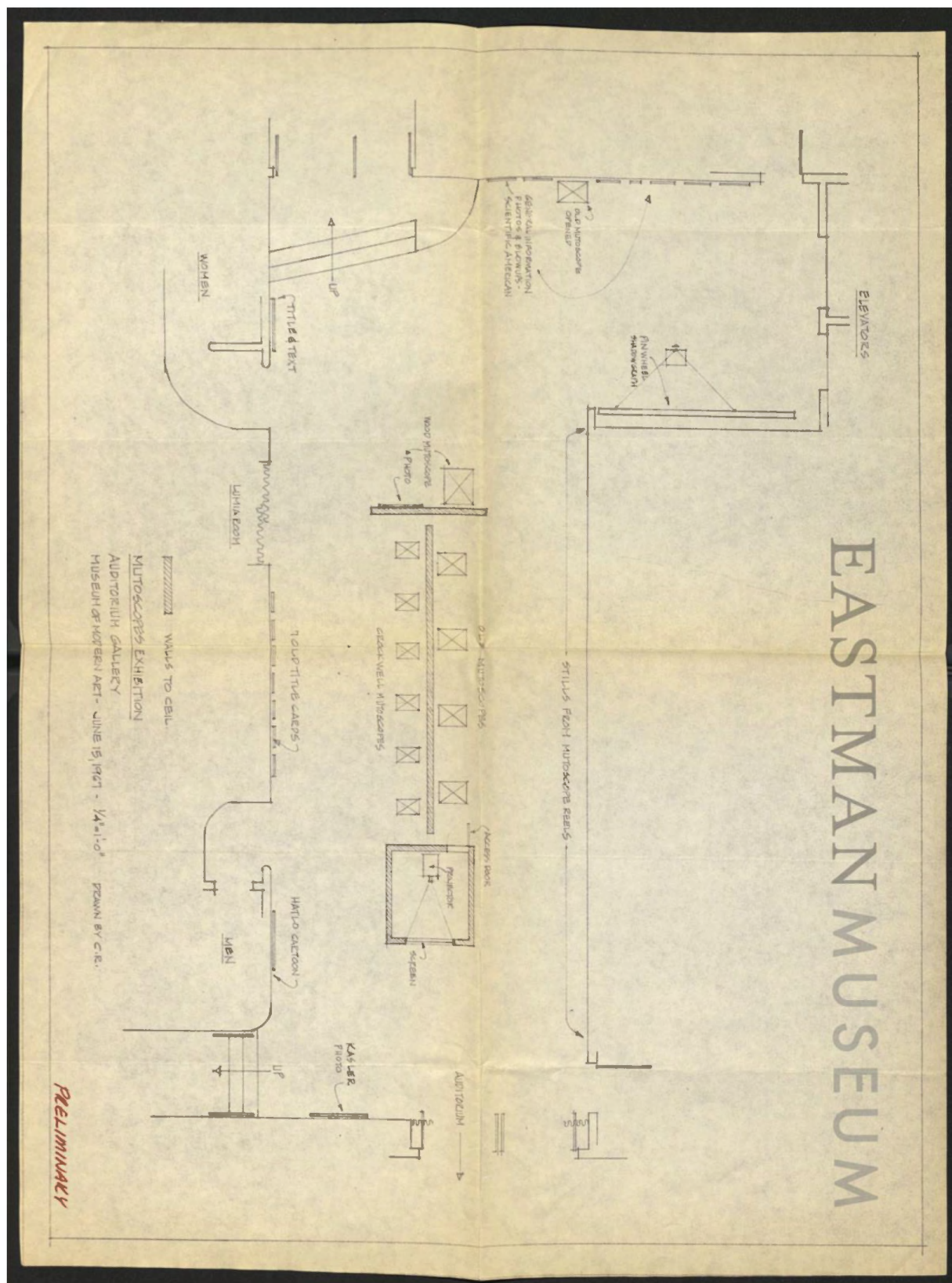
This company has taken hundreds of complete scenes at our own studios, has bought hundreds of thousands of feet of film of popular stars and has redeveloped these striking subjects into safe and sane Mutoscope Reels. Thus there is a choice of over 600 excellent subjects, all modern in their make-up and appeal.

Good subjects are constantly added to our extensive reel library. We will gladly send you a complete list of these many subjects.

INTERNATIONAL MUTOSCOPE REEL CO., INC.
445-57 WEST 114 STREET, NEW YORK, N. Y.

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Graph 11. Advertisement of International Mutoscope Corporation (The Penny Arcade Headquarters)



Graph 12. Preliminary design of Mutoscope Exhibition at MoMA (George Eastman Museum)



Graph 13. Pexiglas Mutoscopes in "Mutoscope" Exhibition at MoMA (George Eastman Museum)



Graph 14 & Graph 15. Images of Mutoscope Exhibition at the Museum of Modern Art (Museum of Modern Art)



Graph 16. Image of 1972 “Mutoscopes Exhibit” at Smithsonian National Museum of History and Technology (now known as the National Museum of American History.)⁶⁵

⁶⁵Smithsonian Institution Archives, Acc. 11-009, Image No. 72-8515.



Graph 17 & 18. Images of *Color Wheel No.3* by Douglass Crockwell (George Eastman Museum)