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Moving Image and Sound: Basic Issues

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**Granddaddy Small-Gauge:  
The Half-Life and Total Death of 17.5mm Film**

**Edison Invents the Standard...but Doesn't Mean To**

In 1889, Thomas Alva Edison invented the Kinetoscope, a viewing apparatus housed in a furnished cabinet that allowed one to watch – through a “peep-hole” - a short film continuously looped through a mechanism of reels, light, and lenses.<sup>1</sup> The device activated with the drop of a nickel into a slot, and played moving images of women dancing, dogs doing tricks, or funny skits shot in the Edison “Black Maria” Studio.<sup>2</sup> Edison introduced the machine to the public at the World Fair in Chicago in 1893 and within a year, “Kinetoscope Parlors” can be found all across the United States.<sup>3</sup>

The Kinetoscope utilized the same 35mm film format used to this day, but Edison never meant it to be an industry standard. Patented from the beginning, sprocket holes and all, the format - until a court order overruled the patent in 1902<sup>4</sup> – was only functional in Edison-built cameras, projectors, and processing machines.<sup>5</sup> This forced other film studios to develop their own self-styled viewing machines, creating a

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<sup>1</sup> Dirks, Tim. Film History of the Pre-1920s. 17 11 2010 <<http://www.filmsite.org/pre20sintro.html>>.

<sup>2</sup> Talbot, Frederick Arthur Ambrose. Moving Pictures: How they are Made and Worked. Philadelphia: J. B. Lippincott Company, 1912.

<sup>3</sup> (Dirks)

<sup>4</sup> Musser, Charles. Before the Nickelodeon: Edwin S. Porter and the Edison Manufacturing Company. University of California Press, 1991.

<sup>5</sup> (Talbot 33)

quagmire of un-interoperable gauges (comparable to the digital file-formats that flood the Web market today). But, as we shall see, the success of the Kinetoscope inspired a wealth of bootleg moving picture machines overseas, and filmmakers had to adapt to the gauge if they wanted their films to be seen by a large audience. Industry pioneers eventually learned to bypass patent issues by perforating their stock with varied styles of sprocket hole, as we shall see in the development of the 17.5mm film.

Though by 1898, 35mm was widely accepted as a standard film gauge,<sup>6</sup> this did not stop glory-seekers from racing to invent an “amateur” format for smaller, portable, more accessible equipment. The first such opportunist took a cue from Edison himself for the Kinetoscope film was trimmed from 70mm stock supplied by George Eastman.<sup>7</sup>

### **Nobody Cares A Thing About What Birt Acres Does...Ever**

While popular, the Kinetoscope was taken as seriously by the public as any pinball machine and Edison – undervaluing its potential - didn’t bother to apply for a British patent.<sup>8</sup> A year after its debut at the World’s Fair, an engineer in London name Robert W. Paul was – quite legally - building and profiting from copies of the machine.<sup>9</sup> When the Edison Corporation found out, they refused to sell Kinetoscope films to any Brit without a verifiable Kinescope-built machine, motivating Paul to invent a camera and produce his own films.<sup>10</sup>

He engaged photographer Birt Acres into the development. Acres, employed by a company that processed photographic paper, used his resources to devise a

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<sup>66</sup> (Enticknap 48)

<sup>7</sup> Spher, Paul C. "Unaltered to Date: Developing 35mm Film." Fullerton, John and Astrid Soderberg-Widding. Moving Images: From Edison to Webcam. Indiana University Press, 2000.

<sup>8</sup> (Talbot 33)

<sup>9</sup> (Talbot 34)

<sup>10</sup> (Talbot 35)

“mechanical means of printing on bromide paper from glass negatives a number of copies of a subject at a very rapid rate.”<sup>11</sup> Acres established a company that produced and developed 35mm film called The Northern Photographic Works and - once the “Paul-Acres” camera was working order - the English film industry was born.<sup>12</sup> Both men spent most of 1895 producing short subjects for their English version Kinetoscope, trumping all efforts by the Americans to corner the English market.<sup>13</sup>

The partnership, however, was inflicted with battles of ownership; the men parted just two years after their initial meeting.<sup>14</sup> This is unfortunate for despite his efficiency as an inventor, Acres failed as a showman, a businessman, and as a friend to both.<sup>15</sup> The historical record presents a man who worked obsessively and alone. After his experience with Paul, Acres appears to have never trusted a partner again, one that could have provided him with the much needed presence of a promoter. Instead, the inventor jumped from one “first” to the next, abandoning his efforts as soon as they were trumped by a slicker, sparkier operation. And it was no different for his last major achievement: the amateur movie camera.

Two factors lead Acres to invent the first small-gauge film stock machinations on record: the need for portability and an untapped amateur market. In addition to his work in chemical processing, Acres was a reporter who travelled often to capture events on still and moving image<sup>16</sup> (the Paul-Acres camera ability to be moved around in outdoor locations suggest this was a goal of his inventions from early on). Acres was also a

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<sup>11</sup> (Talbot 36)

<sup>12</sup> Herbert, Stephen and Luke McKernan. Who's Who of Victorian Cinema. BFI Publishing, 1996.

<sup>13</sup> (Herbert and McKernan)

<sup>14</sup> (Herbert and McKernan)

<sup>15</sup> (Herbert and McKernan)

<sup>16</sup> (Herbert and McKernan)

major player in the amateur photography movement that took hold of Britain in the early 1890's, and was attuned to the potential market of hobbyist filmmaking.<sup>17</sup>

In 1898, Acres received a patent for a product called "Improvements on the Cinematic Apparatus,"<sup>18</sup> *to place animated photography within the reach of everyone*, according to the handbook. The Birtac, as it would be called, was a combination camera, projector, and photographic printer of a film stock half the size of the 35mm standard. This multi-functionality anticipated the problems amateurs would have developing and showcasing their exposures from a mere camera. It also characterized the amateur film market for the decade to come. The logic that led Acres to establish the 17.5mm film format is easy to assume: smaller gauge means smaller equipment, and the calculations of all currently existing equipment merely halved for his amateur apparatus.

Authors of academic papers on small-gauge film often refer to the process of cutting 17.5mm film as a "slitting" of already-existing 35mm film stock; but that is an understatement. According to the Encyclopedia of Early Cinema, stock firms like Acres' Northern Photographic Works generally purchased celluloid base and applied their own emulsions. "Until about 1900, raw film was usually cut specially to order for customers, who then perforated the film to their own specifications."<sup>19</sup> Acres' apparatus for producing wholesale strips of 35mm film was definitely calculated and aligned for the larger gauge. Thus, a separate machine must have existed for the process of cutting existing 35mm film lengthwise, as it was in Edison's studios. Indeed, Albany Ward,

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<sup>17</sup> Singer, Ben. "Early Home Cinema and the Edison Home Projecting Kinetoscope." Film History 1988: 37-69.

<sup>18</sup> Acres, Birt. The Birtac for At-Home Animated Photography. Handbook. Barnet: Northern Photographic Works, Ltd, 1899.

<sup>19</sup> Rossell, Deac. "Celluloid." Encyclopedia of Early Cinema 2007.

owner of a chain of theatres in London in the 1910's, remembers visiting Birt Acres as a young man: "...he had a workshop which was fitted up with lathes (foot treadle driven), etc, as he did the whole of his base film production, importing the rolls of celluloid from America about 36" wide, or it may have been a metre (40") wide, which he cut up on the lathe often spoiling a considerable quantity." <sup>20</sup>

Acres demonstrated his new machine before the Photographic Club on the 26 October 1898.<sup>21</sup> Shortly after, a piece on The Birtac appears in a camera club periodical called The Process Photogram: "In imagination he sees a time when the Birtac will be as well known as the Kodak, and when the verb "to birtac" will appear in every dictionary. He dreams of a day when every pretty maiden and every love-sick swain who goes to a picnic will carry a Birtac for recording such incidents as the sitting down of the lavender-trousered gentleman in the midst of the custard...."<sup>22</sup>

The slightly mocking tone of the piece suggests the photographic community was not convinced of a market for filming and viewing mundane activities. With little support from the society of London photographers, and an innate inability to reach out beyond his scope, Acres' machine would go down in history as a mere prototype. His invention is soon overshadowed by smaller, cheaper versions produced by esteemed entertainers.

### **Britain still gets the golden "first"**

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<sup>20</sup> Cook, Patricia. "Albany Ward and the development of cinema exhibition in England." Film History 1st July 2008.

<sup>21</sup> Jay, Bill. "Birt Acres: "the first Englishman successfully to produce and publicly show animated pictures."." 1973. Billy Jay on Photography. 17 11 2010  
<<http://www.billjayonphotography.com/Birt%20Acres.pdf>>.

<sup>22</sup> Warden, H. Snowden (ed.). "Trade Section." The Photogram 1898.

Charles Urban was a “powerful, ebullient personality” who managed Edison’s London agent, The Warwick Trading Company.<sup>23</sup> Clearly aware of the existence of The Birtac, he commissioned a pair engineers – Alfred Darling and Alfred Wrench – to produce a product similar to the machine for the amateur market.<sup>24</sup> Like The Birtac, The Biokam was also a combination printer, projector and camera, with the added bonus of a having a variable shutter. Darling and Wrench retained Birtac’s sensible 17.5mm format, but opted for a “longitudal” center-perforation to Acres’ left-sided squares, maximizing image real estate.<sup>25</sup>

Urban paid T.C. Hepworth, a well-known magician and “magic-lanternist”<sup>26</sup>, to promote the product and interest and sales were considerably higher amongst those in the photography trade. An article in a volume of “The Photographer Dealer” from 1899 gushes over the “excellent Voigtlander lenses” and “ingenious” method of loading film in daylight (though the same method was utilized by The Birtac the previous year). The article provides an education in the processing Biokam 17.5mm film, sold by The Warwick Company in 25ft rolls and “tipped with an additional 6 inch strip of matte surface celluloid, free from emulsion, which is equivalent to ground glass, and upon this the subject to be photographed can be accurately focused.” The company also attempted to bridge the gap between experienced amateurs and “press the button types,” or those who did not care to make use of the processing feature of The Biokam, by providing a service that developed negatives and prints.<sup>27</sup>

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<sup>23</sup> (Herbert and McKernan)

<sup>24</sup> (Herbert and McKernan)

<sup>25</sup> Unknown. "The Buyer's Guide." The Photographic dealer and D. & P. trade review March 1899.

<sup>26</sup> (Herbert and McKernan)

<sup>27</sup> (The Photographic dealer)

For a time, The Biokam did manage to reach an audience that was not already deeply involved in the photography movement. The most illustrative examples are the films of Alexander Shiryayev, a member of the Russian Imperial Ballet. Shiryayev obtained a Biokam on a trip to London simply record to his company's dances (and, indeed, some our earliest moving images of famous dancers, such as Anna Pavlova, are available on 17.5mm film).<sup>28</sup> Creative, visually motivated, quick-to-learn, Shiryayev went on to become a master of the medium. A great fan of George Melies and the "trick" film, "...he used puppets with flexible joints to plan and analyze movement," writes Peter Lord, the co-founder of Aardman Animations, "then he had the brilliant idea to animate the puppets frame-by-frame - exactly the same technique that we use to bring Wallace and Gromit to life."<sup>29</sup> A cache of Shiryayev's fantastical, otherworldly, small-gauge films were discovered in the mid-nineties, preserved in a digital format, and screened for the first time at the Pordenone Silent Film Festival in 2008.

### **The Battle of the Perforations**

Once the Biokam broke water, an influx of 17.5mm amateur cameras appeared on the market between 1902 and 1916. While few of these cameras had any great success in sales, everyone seemed to agree it was only a matter of time before the public came around. The race began to find the perfect alchemy of format, equipment, price, and features that would attract a viable amateur movie market. Little is known about most of these brands – Clou (Austria, 1920), Ikonograph (US, 1905), The

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<sup>28</sup> [Bioscopic](http://bioscopic.wordpress.com/?s=Alexander+Shiryayev), 22 October 2008. 02 10 2010 <<http://bioscopic.wordpress.com/?s=Alexander+Shiryayev>>.

<sup>29</sup> Lord, Peter, "The Start of Stop-Frame: Animation's Great Lost Pioneer", *The Guardian*, Friday 14 November 2008

Dusokop (US, 1915) - other than they flickered briefly in existence.<sup>30</sup> What we do know is that the size, shape, and placement of perforations ranged widely: “This was also a way for them to avoid interchangeability and thus protect their own products,” explains Martina Roepke in her paper “Tracing 17.5mm practices in Germany (1902–1908).”<sup>31</sup>

Roepke provides a vivid account of a particular 17.5mm system from this era: the Kino, developed by a highly-regarded German company, Ernemann, still making movie cameras as of 2010. The Kino is a stunning removal from the boxy, awkward British machines. Shiny, sleek, and only 36 ounces, the Kino prided its “scientific” design and Ernemann took care to market the device to “wealthy and technologically interested individuals.”<sup>32</sup> The Kino is worth noting not just for its departure from the cumbersome multi-functionality of previous amateur moving picture cameras, but also because the Ernemann Company amassed a catalog of films shot by a Kino camera for public distribution. The titles were sorted by subject ranging from “Scientific Films,” to “Gentleman’s Evenings” and set a precedent for a “film exchange program” that would go on to characterize the amateur (and later, home-rental) markets. Unsurprisingly, this results in 17.5mm being THE gauge associated with pornography in Germany at the time.<sup>33</sup>

### **The Road to Safety**

In tracing the market history of 17.5mm systems we see sales consistently stall once the wealthy hobbyists have purchased their fill. This is partially due to the “battle of

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<sup>30</sup> Brown, Harold. *Technical Glossary of Common Audiovisual Terms*. 2002. 10 2010 <[www.nfsa.gov.au](http://www.nfsa.gov.au)>.

<sup>31</sup> Roepke, Martina. Tracing 17.5mm Practices in Germany (1902-1908). *Film History: An International Journal*, 19 (4), pp. 344-352.

<sup>32</sup> (Roepke 348)

<sup>33</sup> (Roepke 350)



the gauges”<sup>34</sup> that persisted amongst makers, as well as the high cost of developing a print from a negative; investment seemed like a risky idea for the layman with a little money saved. Another explanation is the public’s growing knowledge of nitrate films’ alarming flammability.

Just a few years into the 20<sup>th</sup> century, enough studio-related fires were reported in the news for families to be wary of hooking up a “gas lantern” into their home for projecting movies.<sup>35</sup> Advertisements appear touting the “safety” of their systems and tone aimed to convince their hastily made, mail-order projectors were little more than toys.<sup>36</sup> It wasn’t until 1912 when both Pathé Freres and Edison introduced safety film to the amateur market. At 28mm and 22mm respectively, both companies developed gauges that could not easily culled from nitrate stock – like 17.5mm. However, according to Ben Singer, these formats came at an awkward time when small-time exhibitors weren’t buying the new formats due to lack of bulk material that they could find in 35mm. “But since shortcomings in the physical properties of non-flammable film prevented the industry from adopting it as the standard for professional exhibition, the makers of these small projectors were forced to continue using the nitrate films that were so unattractive to non-professional users. Faced with this predicament, none of these ventures survived.”<sup>37</sup>

For the next few years, the amateur movie industry continues to stagnant, struggle, and experiment with various film formats (though 28mm continued to be

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<sup>34</sup> (Roepke 349)

<sup>35</sup> (Singer 40)

<sup>36</sup> (Singer 40)

<sup>37</sup> (Singer 45)

popular until WWI and quite a few films survive).<sup>38</sup> In 1917, a new camera company in Rochester, NY – Movette – produces a postcard-sized, 17.5mm camera that used a nitrate negative housed in a cartridge, but developed on an acetate print.<sup>39</sup> The company, quite aware that it straddles two worlds by combining “professional” nitrate film with “amateur and safe” prints (the quotes are mine), launches a massive ad campaign, saturating every periodical from *Boy’s Life* to *Scribner’s* magazine, with full-sized ads crying “Movette will Get You.” Despite tapping such untapped markets as the Women’s Christian Temperance Union - who purchased a Movette to take “pure” movies to educate the children in the church<sup>40</sup> - Movette files for bankruptcy in 1921.<sup>41</sup>

And not a moment too soon. George Eastman’s Kodak labs had been working on safety film since 1906 - and supplied Edison for his 22mm Home Kinetoscope stock - Kodak had yet to be directly involved in the home movie market. Eastman is, however, intrigued by a proposal presented to him by a physicist in his lab, John G. Capstaff in 1919. Capstaff and his team had been working on a process for reversal film, or, a negative that is turned directly into a print.<sup>42</sup> Eastman approved of the project, but remained adamant that only safety film is in any amateur system developed by Kodak. He rejected the 17.5 system Capstaff’s team had been working on as it was too easily derived from 35mm nitrate film.<sup>43</sup> They instead decided on a slightly smaller gauge, a similar compact size that had yet been used in the amateur world. Introduced to the

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<sup>38</sup> "Movette Will Get You Advertisement." Popular Mechanics February 1917.

<sup>39</sup> (Brown)

<sup>40</sup> Parker, Alison Marie. Purifying America: Women, Cultural Reform, and Pro-Censorship Activism, 1873-1933. University of Illinois Press, 1997.

<sup>41</sup> United States. Circuit Courts, United States. District Courts, District of Columbia. Court of Appeals, United States. Circuit Court of Appeals, United States. Commerce Court. The Federal reporter: with key-number annotations. St. Paul: West Publishing Co, 1922.

<sup>42</sup> Swanson, Dwigh. "Inventing amateur film: Marion Norris Gleason, Eastman Kodak and the Rochester scene, 1921-1932." Film History 1 April 2003.

<sup>43</sup> (Swanson)

world in conjunction with a compatible camera from the esteemed Bell & Howell, 16mm reversal film would take over the market in 1926.

The story of the 17.5mm film, however, does not end there. “In 1926 the Pathé company launched a new 17.5mm safety film, presumably as a competitor to 16mm, as their smaller 9.5mm gauge had already begun to sell rather well.”<sup>44</sup> The Pathé -Rural was originally designed to project educational films in agricultural France; the gauge was agreed upon over factors of economics and the need for a projection quality not available from their 9.5mm Pathé Baby.<sup>45</sup>

The format was popular for the production of “chaste” films projector by churches (indeed Pathé placed a bid with the Catholic Church). While most films were produced by the Educational Library, Pathé was able to obtain a struck-down prints of feature films and Disney cartoons from the UK and the US.<sup>46</sup> P

Pathé hung on to the format for 2 decades, adding sound in 1933, As Germany had standardized 16mm film, it’s censorship of France during WWII could not handle 17.5mm. “17.5mm projectors had to be disposed of or converted. At the Liberation, film education took up 16mm, then universally adopted.”<sup>47</sup>

The 17.5mm films produced by Pathé during this era are the most widely available in institutional archives and the home of collectors. Grahame Newnham, a retired collector in the UK, maintains a website of technical, historical, and contextual information on these films. Communicating with other enthusiast, he maintains a list of

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<sup>44</sup> Newnham, Grahame L. Grahame N's Web Pages: The Seventeen-Five Pages. 26 April 2010. October 2010 <<http://www.pathefilm.freeseerve.co.uk/175seventeen.htm>>.

<sup>45</sup> Taillibert, Christel. PATHÉ RURAL OR THE UPS & DOWNS OF 17.5mm. Ed. Marty Stevens. January 2003. October 2010 <<http://www.pathefilm.freeseerve.co.uk/175frtrans.htm>>.

<sup>46</sup> (Taillibert)

<sup>47</sup> (Taillibert)

17.5mm films available in the homes of collectors, a valuable resource for archivists on the hunt to obtain such treasures. In his catalogue of 17.5mm silents available for projection on the UK version of the Pathé Rural many of the titles are noted as “partially tinted,” which sheds some light on the perspective of 17.5mm film as being simply 35mm film for a smaller venue.

Of all the small-gauge formats that lived and died during the era prior to the introduction of 16mm film, 17.5mm endured the longest suffered the most perforation styles changes than any other. Because of the interoperability of so many different brands, the film that do survive can only be viewed after proper scanning and digitization (none are currently available on public archive sites), and indeed many films were simply tossed with the equipment became obsolete. In recent years, interest in the cultural context surrounding the gauge has been gained momentum, such as Roepke’s investigations into its use in German pornography. Investigations, to, into the role of women as pioneers in the industry has unearthed the knowledge that many were using the 17.5mm camera.<sup>48</sup>

Much remains to be discovered about the more obscure usages and movements that surrounded this controversial, yet high-quality system of amateur filmmaking. But where the biography of the 17.5mm film serves us best today is as a cautionary tale for the formats of any new medium used by professionals and amateurs alike. The digital world is currently struggling with the same issues of interoperability of file extensions between different types of software. Exacerbated by the instincts of companies to protect their brand by corralling of customer loyalty. If the 17.5mm sets any precedent,

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<sup>48</sup> Papers are showing up on the schedule of conferences, such as Visions of Laura Eugenia Bayley: Film Pioneer and the 17.5mm, by Claire Watson, but there is little published on the subject of women and 17.5mm film.

the market will settle on the formats that are most interoperable with the least chance of corruption or damage. But cautionary or not, like any teenager find his or her voice in the world, new technology will always find itself stuck in an awkward period and story of 17.5mm celebrates this growing pain where it cannot circumvent.

### **Works Cited**

Acres, Birt. The Birtac for At-Home Animated Photography. Handbook. Barnet: Northern Photographic Works, Ltd, 1899.

The original Birtac handbook has been scanned is available online. The book helped determined if Acres meant his camera to be for amateurs to make fictions films, or actual home movies for families.

Bioscopic. 22 October 2008. 02 10 2010  
<<http://bioscopic.wordpress.com/?s=Alexander+Shiryaev>>.

A daily-updated blog on the state of silent film today; an unknown contributor blogged about his trip to the Poderone festival which is how I heard of Alexand Shiryaev.

Brown, Harold. Technical Glossary of Common Audiovisual Terms. 2002. 10 2010  
<[www.nfsa.gov.au](http://www.nfsa.gov.au)>.

From Australians Film and Sound Archives; I often referred to these charts that list the year, make, and perforation style of every film gauge. It is also the list used on Wikipedia's Film Gauge page.

Cook, Patricia. "Albany Ward and the development of cinema exhibition in England." Film History 1st July 2008.

An article about the early days of exhibition, it is also provides the only anecdotal information I could find on the process of cutting 17.5mm film in Birt Acres workshop.

Dirks, Tim. Film History of the Pre-1920s. 17 11 2010  
<<http://www.filmsite.org/pre20sintro.html>>

A film historian has put up this website that I often referred to in order to fact check common knowledge cinema history (such as the invention dates of the Kinetoscope).

Enticknap, Leo. Moving Image Technology: From Zoetrope to Digital. London: Wallflower Press, 2005.

Referred for information on standardization in the 35mm film format

Herbert, Stephen and Luke McKernan. Who's Who of Victorian Cinema. BFI Publishing, 1996.

The writers have put their encyclopedia online and I referred to it often, a priceless resource on this era in Britain. In any future usage of this paper, the citations should be redone with website formats.

Jay, Bill. "Birt Acres: "the first Englishman successfully to produce and publicly show animated pictures."." 1973. Billy Jay on Photography. 17 11 2010 <<http://www.billjayonphotography.com/Birt%20Acres.pdf>>.

Bill Jay is an essayist and historian on photography, his archives are available online and I used them to crosscheck the dates Birt Acres presented his camera and found his to be more detailed than what was available on other early-cinema sites.

Lord, Peter. "The Start of Stop Frame." Guardian 14 November 2008.

Wonderful short piece for The Guardian on the films of Alexander Shiryayev by an animator in awe of his technique.

Mechanics, Popular. "Movette Will Get You Advertisement." Popular Mechanics February 1917.

Popular Mechanics from most decades of its existence have been scanned by Google Books where one can find technology advertisements from just about every piece of equipment every made from this time period.

Musser, Charles. Before the Nickelodeon: Edwin S. Porter and the Edison Manufacturing Company. University of California Press, 1991.

Newnham, Grahame L. Grahame N's Web Pages: The Seventeen-Five Pages. 26 April 2010. October 2010 <<http://www.pathefilm.freeseve.co.uk/175seventeen.htm>>.

As a collector, Newnham's website is the most useful for the images of film stock I could not find anywhere else, particular the Duoskop. I also found Tailbert's paper on the Pathe Rural on this site. Newnham's facts themselves are suspect and I tried to avoid them in other areas of the paper not related to his own collection.

Parker, Alison Marie. Purifying America: Women, Cultural Reform, and Pro-Censorship Activism, 1873-1933. University of Illinois Press, 1997.

The results of a search for the usages of 17.5mm film in American popular culture. I was interested in finding out who these people were who DID purchase 17.5mm film.

Roepke, Martina. "Tracing 17.5mm Practices in Germany (1902-1908)." Film History: An International Journal 2007: 344-352.

Little is written about this subject in English and Roepke does a great job connecting various 17.5 mm practices back to the marketing strategies of Ernemann.

Rossell, Deac. "Celluloid." Encyclopedia of Early Cinema 2007.

Rossell is quite a name in this subject and the much of the book is available online. This was the first place where I found any information on the processes of the Northern Photographic Works.

Singer, Ben. "Early Home Cinema and the Edison Home Projecting Kinetoscope." Film History 1988: 37-69.

A Film History article that focuses on the Home Kinetoscope, establishes the attempts of 17.5mm companies to present their products as toys, and the fears of potential buyers on the dangers of Nitrate.

Spher, Paul C. "Unaltered to Date: Developing 35mm Film." Fullerton, John and Astrid

I had to rewrite a paragraph on how 35mm was cut from Eastman's stock after reading this article. While most sources say Edison simply cut the film in half, the very well-sourced article finds a very different reason for arriving at the format...way to technical to go in here. For all due purposes, I changed phrases from "cut in half" to "trimmed from"

Soderberg-Widding. Moving Images: From Edison to Webcam. Indiana University Press, 2000.

Swanson, Dwigh. "Inventing amateur film: Marion Norris Gleason, Eastman Kodak and the Rochester scene, 1921-1932." Film History 1 April 2003.

A short article that focuses on Eastman's lab and the cliché that surrounded it; provided the rarely written about find that reversal film was original meant for 17.5mm.

Taillibert, Christel. PATHÉ RURAL OR THE UPS & DOWNS OF 17.5mm. Ed. Marty Stevens. January 2003. October 2010  
<<http://www.pathefilm.freeseve.co.uk/175frtrans.htm>>.

The only reliable, secondary source in English I could find regarding the end of 17.5mm by the Nazi control of France.

Talbot, Frederick Arthur Ambrose. Moving Pictures: How they are Made and Worked. Philadelphia: J. B. Lippincott Company, 1912.

Thank god for GoogleBooks, or I never would have found this gem. All principles in this paper: Edison, Paul, Acres, were still alive with this book on moving pictures was written. It is how I learned of Edison's failure to apply for a British patent and the comic relief that followed.

United States. Circuit Courts, United States. District Courts, District of Columbia. Court of Appeals, United States. Circuit Court of Appeals, United States. Commerce Court. The Federal reporter: with key-number annotations. St. Paul: West Publishing Co, 1922.

Also scanned on GoogleBooks. Movette was one of the few companies that I could find both the beginning and end of their lifespan.

Unknown. "The Buyer's Guide." The Photographic dealer and D. & P. trade review March 1899.

A London guide for photo enthusiast from the Birtac/Biokam era. Gushes over the new Biokam, and goes into detail about the process of developing the film.

Walters, Jonathan. EarlyCinema.Com. March 2002. 14 10 2010  
<[http://www.earlycinema.com/pioneers/acres\\_bio.html](http://www.earlycinema.com/pioneers/acres_bio.html)>.

Warden, H. Snowden (ed.). "Trade Section." The Photogram 1898.

Another blessedly scanned photo-enthusiast periodical on Google Books. Both the Photogram and The Photographic Dealer were instrumental in conjecturing the response to the amateur moving market.