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The Professional Standard:
Bell & Howell and the Evolution of the Motion Picture Camera

This paper derives in part from research done for my book *Engineering Hollywood*, but looks further into this earlier period of the development of film technology. I had hoped to be able to do more for this, but given the circumstances, I am happy to present what I have and hope to engage in a conversation about what can be gained by looking more at technology not just as something that contributes to film aesthetics, but that is a major part of the infrastructure that makes the motion picture industry possible.

Many of the earliest motion picture producers, both in Europe and the United States, such as Lumière, Pathé, and Edison, had been both technology manufacturers and motion picture producers, but by 1915, technology manufacturing and film production had largely become the purview of separate companies and really separate industries. Around that time, when the Society of Motion Picture Engineers was formed, there were hardly any members who had anything to do with actual film production, and indeed, they would spend the next decade and a half struggling to form any kind of significant relationship with the production side of the business.

This was a marked contrast to the previous era, in which the first attempt at organizing the industry in 1908, the Edison-led Motion Picture Patents Company (MPPC), was a patent pool. The MPPC had attempted to restrict those outside the organization from producing motion pictures by having an exclusive contract with Kodak for film stock and by arguing that

the European or self-made motion picture cameras with which most companies outside of the Trust operated violated the patents of the major producers. As Robert Anderson has argued, the MPPC was patterned on the efforts of other industries such as electronics in which companies such as General Electric “merged with numerous small firms in order to control their patents and prevent competition.”ⁱ The organization was limited in its success at stopping independents from producing and the government disbanded it in an antitrust case in 1915. But the MPPC and its General Film Company had begun the process of standardizing and classifying the tools and techniques of the industry, mostly with regards to the distribution and exhibition ends of the business. Little had been accomplished on the production side, which remained largely artisanal in its practices.

The efforts at standardizing production equipment, such as cameras, would come less from a trade organization such as the MPPC, and more from dedicated manufacturers such as the Bell & Howell company which was founded in the year before the MPPC was formed. Anticipating the separation between technology making and filmmaking, Bell & Howell of Chicago began in 1907 as a manufacturer of film perforators and printers. They added a camera two years later as a part of their strategy to standardize tools across the motion picture field. All of their various machines were compatible with each other, allowing the company to advertise their commitment to efficiency and economy while also requiring companies and workers to use their entire line of products. Through their marketing throughout their first decade, the company was able to convince producers that investment in standardization of their filmmaking equipment was key to their success – and central to this was buying the expensive equipment that Bell & Howell produced.

At the same time, as the role of the cameraman was fully separated from the director and increasingly professionalized, the job came to require the purchase and maintenance of their own motion picture camera. By 1915, it was preferred that this camera be a Bell & Howell which retailed for \$1080, more than the average American salary. By looking at the first decade of the Bell & Howell company and its signature camera, this presentation shows how the centrality of these tool of film production reinforced the increased values of standardization and professionalization as the industry grew into its mature form.

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Scholars generally agree that the spectacle of motion picture technology was key to the period of the cinema of attractions, yet the typical history tells us that as narrative took hold of the medium in the first decade of the 20th century, technology was subsumed into an increasingly “invisible” style.ⁱⁱ But the fascination with the increasingly complex technology of the medium never fully died and showed a marked increase in the early-1910s, just at the moment when the studio system began to take shape.ⁱⁱⁱ The producers were eager to promote their recent investment in cutting-edge facilities, not only to assure exhibitors of their commitment to regularized production, but also to show audiences how much they cared about the quality of their products. The innovative technology, quality materials, and perfectly controlled environments they boasted about did not come cheaply, but they did project a notion of permanence and stability heretofore unheard of in the fly-by-night days of early film production.

The discourse around the motion picture plant as an industrial factory received particular attention in the exhibitor publications, where the efficiency of film stock production

was given emphasis. Exhibitors were particularly concerned with material film production, as the manufacturers' ability to deliver new prints on time determined their theaters' competitiveness in a market where programs were changed multiple times per week. A profile of David Horsley's Centaur Film Company plant in *Moving Picture World* not only focuses on the various facilities, but also on the cutting-edge technology found within. Printers, perforators, winding, developing, washing, tinting, and toning machines, vacuum cleaners for keeping dust out of the air, water filters, and boilers are all features of the plant.

These behind-the-scenes discourses on motion picture production in the U.S. in the 1910s demonstrated the move away from an artisanal view of motion pictures, equated with theatrical production, toward a discourse of systematic efficiency. By doing so, the motion picture producers embraced the technological base of the medium, while equating their practices with industrial production and the factory rather than artisanal craftsmanship and the studio. The motion picture industry conceived itself within its publicity using terms of scientific management and assembly line production despite the clear differences between its operations and that of a manufacturing plant. In doing so, the producers were positioning themselves within the prevailing business rhetoric of the era. It was in 1913 that Henry Ford installed the first moving assembly belts in his plants, and his production innovations were widely publicized throughout the period.^{iv} Only two years earlier in 1911, Frederick Winslow Taylor had published *The Principles of Scientific Management*, in which he applied the scientific study of motion and time to increasing efficiency in manufacturing and production. Taylor's ideas and Ford's practices dominated discourses on industrial production in the 1910s.^v Likewise, motion picture

industry and fan publications described the leaders of the industry in much the same way the mainstream press discussed Ford, as innovators of cutting-edge, efficient production practices.^{vi}

This context is important to this narrative because the most factory-like work happening within these motion picture plants was in the perforating and printing of the film stock, before and after production, respectively. And in any studio that wanted to be taken seriously, that printing and perforating was increasingly done on Bell & Howell machines. By 1913, a studio, whether it was Bison, Crystal, or Bosworth, could not claim to have the most up-to-date, efficient facilities if they did not include Bell & Howell machines. Thus, this company became a major contributor to the systemization and standardization of the motion picture industry despite never being involved in the production of motion pictures.

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The narrative of Bell & Howell's dominance of these and other aspects of the motion picture industry in the early 1910s is one that shows them repeatedly gaining a foothold in one tool, then introducing another which was compatible and therefore seemingly necessary. They first became indispensable in the industry not with printing and perforating, but with transformers. Ads for their solderless terminals abound in the trades from 1909 to 1912, promoting a tool which would necessarily make anyone who wanted to run high powered studio lights and projector bulbs a Bell & Howell customer.

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However, perforators became the main source of their ability to take over more and more aspects of film production. Film manufacturers such as Kodak did not put perforations on their raw stock. So it was up to producers to get the holes put into the stripes, which was

absolutely necessary for pulling the stock through the camera and the projector. The company gained an advantage in the field through the “accuracy” of their machinery – an entirely mechanical process, but as they put it in their *Standard Film Perforator* brochure, one that was “the first requisite to the making of quality pictures.”^{vii} There was no standard perforation size at the time, and if your perforations were inconsistent or incompatible with any of your equipment, it made the equipment useless. Getting Bell & Howell perforation machines into every major lab made their gauge the standard, so the cameras, lab machinery, and projectors all had to conform to the Bell & Howell standard gauge.

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Using the company’s perforators made it an obvious choice to then use their printing machines and film reels, as they were all standardized to the same gauge. By late-1913, *Motion Picture News* asserted that all of these machines, by this time were “in universal use” and “deemed by many the best in the market.” Throughout 1913 and 1914, they added rewind and splicing machines to their line of compatible products.

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The company had produced a camera as early as 1909, which they sold to various local production outfits. After gaining feedback on this early model, in 1912, they developed the camera that would become the industry standard over the next decade, the Bell & Howell 2709. This was the first metal camera, and used register pins which kept the film steady, especially with the perfectly evenly spaced perforations created by the Bell & Howell perforator. It had an accurate frame counter, which was key to precise effects such as double exposure and

dissolves, as well as its more distinctive and recognizable feature aesthetically – the rotating turret of lenses.

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Given that the Bell & Howell company archive seemingly vanished a few decades ago, we can only speculate about the strategic goals of the company—but their advertising in the trades and the rhetoric in their pamphlets that I found in the Smithsonian's Trade Literature Collection can give us some insight. Despite having this model available as early as 1912, they did not run many advertisements or attempt to penetrate the market right away. I see two reasons for this, they were still building their dominance in other film tools and their cameras were far more expensive than any others. The most common camera at that time was a Pathé, which was listed by G. Gennert camera at a fairly steep \$550 (where lesser cameras ranged from \$55-\$250). The Bell & Howell retailed for \$1080. On a side note - While the standardization across their line of products was no doubt a major incentive from the point of view of producers, like all American things ascendant in the motion picture during this period, we cannot discount the role of the war in Europe as a contributor to Bell & Howell's rise and Pathé's decline.

With the Pathé as the industry standard by which all camerawork was judged, the more expensive Bell & Howell needed to be seen as a necessity before it could be widespread. Another reason for the seemingly slow adoption is the painstaking and largely artisan process of making motion picture cameras. These cameras were not shooting off an assembly line. To give a sense of the pace of construction, in the early 1920s when Mitchell began to take the market from Bell & Howell, they were able to produce and sell around 30 cameras per year

with their factories operating around the clock.^{viii} The complexity of the tool, the precision required for construction, and the limited market for them all contributed to this more artisanal production process. In contrast, a single large processing lab, such as Willat could boast in 1915 of having 18 Bell & Howell perforators and 45 of their printers. The market for high-end professional cameras was just smaller. It is estimated that from 1912 to 1958, when they stopped making the 2709 camera, around 1200 were made (an average of 25 per year).

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The customers who Bell & Howell needed to market its cameras to was also changing. While in the early days of the industry, cameras were made or bought by the production companies, by the mid-1910s an experienced cameraman was expected to maintain his own professional kit. They were prohibitively expensive and yet were a requirement for an assistant cameraman to be promoted to a second or first cameraman.^{ix} While the cinematographers, as they were taking to calling themselves, had significant sway over the types of lights used and the laboratories the film would be sent too, these were ultimately decisions approved by the production companies. But the cameramen had much more control over the cameras used on the set, being their own personal property. While we don't have a definite answer to why this change occurred, it looks like a combination of cameramen seeking to create a competitive advantage for themselves on the job market and their interest in working with a tool with which they were familiar and comfortable. Once some cameramen began owning their own, the companies began to expect it, making it a requirement for them all.

However, Bell & Howell was not always adept at adjusting their rhetoric in ways that would appeal to cameramen rather than producers. They first tried to market their cameras as

they did every tool they had created up to that time – as a part of a set of compatible products designed to work together. One pamphlet describes “The Bell & Howell Standardized Line for the Efficient Processing of Motion Picture Film” which included the Standard Film Perforator, the Standard Cinematograph Camera, the Standard Continuous Feed Film Printer, the Standard Film Measuring Machine, and the Standard Film Splicing Machine. Here the camera is listed as a machine, no different from the others, that were used to efficiently and proficiently process a product. They are not differentiating between how a cameraman uses a camera and how a lab perforated and prints film stock.

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A 1915 pamphlet with the self-explanatory title *As to the Best Means of Taking Motion Pictures: Opinions of Users of the Bell & Howell Camera Concerning the Efficiency of that Instrument, What Others Say About What We Do*, set the tone for how cameras would be marketed to those using them for the coming decades. It consisted of personal testimonies from representatives of the American Film Manufacturing Company, Essanay Film Company, Thomas Ince’s New York Motion Picture Corporation, and Education Film Company as well as filmmakers Hobart Bosworth and Robert Flaherty.^x

That cameras were purchased on an individual basis meant that the personal endorsement of individual filmmakers and cameramen was an important aspect of their advertising. Yet in the mid-1910s, even these personal endorsements addressed the contemporary importance of efficiency and standardization. President S. S. Hutchinson of American emphasized their efforts to “perfect our processes” by “standardizing our business as far as camera work, perforating and printing are concerned.” Bosworth insisted that his

cameraman George Hill had shot over 200,000 feet of negative in “all altitudes, humidities, and thermometric changes” and experienced not “a foot of static.” In an essay on the back of the pamphlet titled “Inefficiency vs. Economy” the company boasted that the quick focusing on the Bell & Howell camera saved an hour of production time each day, adding up to a very specific savings of \$6,195 a year.

This rhetoric of efficiency was intended to make the \$1080 price tag for the camera seem like a bargain.^{xi} This argument for the cost benefit of using Bell & Howell’s pricy camera was aimed at the producers who would be the beneficiaries of more efficient production schedules that cut down on wasteful use of light and power. But, unlike printers and perforators, the producers increasingly were not buying the cameras. Rather, by standardizing their tools and making a camera like the Bell & Howell the industry standard, companies such as American, who at that time might have purchased the cameras, were nonetheless setting a standard that would put a significant burden on future cameramen to purchase such an expensive tool to be perceived as professionals. The ownership of an expensive, top-of-the-line motion picture camera, which only got more expensive throughout the 1920s, became the entrance fee for anyone aspiring to move beyond the level of assistant cameraman. A generous first cameraman might give or cheaply sell his old Pathé to his assistant when he bought a new Bell & Howell. This practice only ended with the introduction of sound when the price of cameras ballooned to well over \$3000 with all the motors and silencing devices required.

In mid-1915, *Moving Picture World*’s Carl Louis Gregory proclaimed the Bell & Howell camera “one of the very best” of American built cameras, yet unable to take over the market from Pathé since “advance orders will keep their factory going to capacity until the first of next

year.” There had been no change in the camera in the previous three years contributing to its sudden popularity. Yet the combination of word of mouth and pressure to conform to the equipment standards of the major producing companies had finally created this demand. By 1922, Bell & Howell claimed that 95% of American feature films were shot on their cameras, including original models more than a decade old and still in operation. By that time, it also was standard to have it in studio contracts that not only should the cameramen provide their own cameras, but they were required to be Bell & Howells.^{xii}

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As we can see, this equipment company played a significant role in improving the objective quality of filmmaking in the transitional era – greatly contributing to the increased steadiness and clarity of pictures in that period. Likewise, their efforts to corner several small markets within the industry, contributed to standardization of practices dealing with film itself during this time. We often look on the contributions of pioneers such as Thomas Ince as forces for standardization of production practices in story construction and physical production, while overlooking the technology which had just as much to do with the increase in stability, reliability, and efficiency during this period. It is important for us to recognize the motion picture industry not just as one that produces, distributes, and exhibits motion pictures, but also one that includes a community of technology manufacturers that cater to the very specific technical needs of filmmaking.

ⁱ Robert Anderson, "The Motion Picture Patents Company: A Reevaluation," in *The American Film Industry*, ed. Tino Balio (Madison: University of Wisconsin Press, 1976, revised 1985), 141.

ⁱⁱ See Charlie Keil, *Early American Cinema in Transition: Story, Style, and Filmmaking, 1907-1913* (Madison: University of Wisconsin Press, 2001) and David Bordwell, Janet Staiger, and Kristen Thompson, *The Classical Hollywood Cinema: Film Style and Mode of Production to 1960* (New York: Columbia University Press, 1985).

ⁱⁱⁱ Previous to this date, behind-the-scenes rhetoric often equated motion picture production to the theater, such as in the regular *Moving Picture World* column "Studio Saunterings" by Louis Reeves Harrison. See for example: Louis Reeves Harrison, "Studio Saunterings." *Moving Picture World* 11, No. 6 (February 10, 1912): 465; *Moving Picture World* 11, No. 7 (February 17, 1912): 557. *Moving Picture World* 12, No. 2 (April 13, 1912): 127.

^{iv} See: David E. Nye, *America's Assembly Line* (Cambridge: The MIT Press, 2015). It is also notable that Ford opened a factory in downtown Los Angeles in 1913, "Ford Factory Now Nears Completion," *Los Angeles Times*, November 2, 1913, VII5.

^v Siegfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (Oxford University Press, 1948), 31.

^{vi} See for example: Thackeray P. Leslie, "Lubin of Lubinville: From Optician to Millionaire Picture Manufacturer," *Movie Pictorial* 1, No. 9 (July 4, 1914): 12; Monte M. Katterjohn, "J. Stuart Blackton: The Belasco of the Motion Picture Play," *Movie Pictorial* 1, no. 10 (July 11, 1914): 10; F.H. Richardson, "The Home of Vitagraph," *Moving Picture World* 19, no. 4 (January 24, 1914): 401.

^{vii} Bell and Howell Company, *Standard Film Perforator* brochure (no date, est 1915-1916), NMAH Trade Literature Collection.

^{viii} "Mitchell Increases Production Program; to Built New Plant," *American Cinematographer* 4 no. 3 (June 1923): 22.

^{ix} *Statistics of Income for 1927*, Treasury Department, Bureau of Internal Revenue (Washington: United States Government Printing Office, 1929) <http://www.irs.gov/pub/irs-soi/27soirepar.pdf>.

^x Bell & Howell Co., *As to the Best Means of Taking Motion Pictures: Opinions of Users of The Bell & Howell Camera Concerning the Efficiency of that Instrument, What Others Say About What We Do*, (Chicago: Bell & Howell Co., stamped May 5, 1917), NMAH Trade Literature Collection. The quotes are dated and the latest one is March 24, 1915, so it is more likely this pamphlet is from 1915.

^{xi} According to dollartime.com's inflation calculator, this equates to more than \$25,000 in 2016.

^{xii} Bell & Howell ad, *American Cinematographer* 2, no. 26 (February 1, 1922): 12.