# Crafting the Flickerscape of Early Cinema

By Guy Edmonds

(guy.edmonds@plymouth.ac.uk)

The Flickerscape is a term I use to describe the situation in which a large variety of experimental projection technologies were let loose upon the perceptions of early film audiences gathered in a variety of different locations. Key conditions of the flickerscape are lighting technologies and projection environments – even to some extent film content - but also, plainly enough, the specifications of the device which created the flicker, the shutter. In this paper I look at examples of shutter design from the early cinema period which challenge the received wisdom of widespread adoption of a three bladed design as a definitive solution to the elimination of flicker (and thus the diminution of the flickerscape).

Rather, I propose a kind of flicker management as one of the techniques of early cinema exhibition and will endeavor to shed some light -intermittent or not - on attempts to craft audience response to the new technology by the pioneer apparatus designers and operators.

The paradigm that I assume for this research is one of a feedback loop between pioneer showmen and their audiences, one in which perceptual responses to mechanically produced stimuli formed the basis of the research and development effort applied to the fledgling medium. This may seem an obvious point, but it is important to state given that most film history is concerned solely with the production and reception of film texts and pays little regard to the means of delivery of that text. In the EC period, when methods of delivery were still

experimental and provisional, it is particularly appropriate to give due consideration to what I would characterize as the relation of the mechanical and the perceptual.

In early cinema, although distinctly noticeable, flicker was not a stable entity. It varied in frequency and intensity and consequent perceptual impact on audiences. Though reported widely and named as a single phenomenon, its meaning, too, was unstable, being sometimes bound together in popular reception with other forms of mechanical instability.[1] Reportable flicker had an onscreen and an environmental presence which stimulated the spectator's consciousness and constantly alluded to cinema's direct connection to our nervous system. It militated against the immersive quality of later forms of cinema in which flicker had been subdued to unreportable levels. The shutters that I discuss here are a crystallization of this negotiation of the terms of cinema experience as it took place between technologists and audiences. Intriguingly, it is a dialogue that seems to have continued long after an adequate solution for reportable flicker was found.

The shutter is a deceptively simple component. Designers actually had many elements with which to work. These included the number of blades, their form and arrangement, the blade material, its opacity or translucency and its colour, and functional considerations such as the ability to vary the sector of the blade.

## The ghost and the darkness

No shutter or too little shutter would lead to streaks in the projected image called ghost or rain. Too much shutter would result in a dark picture, and waste the

[1] See for example, the BJP editor, Thomas Bedding, a technically literate, specialist author who, writing in 1898, conflated flicker from the projector shutter with inaccurate perforation, misalignment of the film frame in projection and mechanical instability in the camera and
Projector. (Bedding, 1898, 659)

valuable, impactful, commodity of light which powered the projected image. Maintaining the balance between ghost and darkness, while also trying to reduce perceivable flicker, exercised the minds of film pioneers. [2]

Cecil Hepworth devoted a chapter to *'The Shutter'* in his 1897 book, *Animated Photography*. In it he maintains that the first line of defence against flicker is the speed of the pull down. Once the 'unalterable limits' of the mechanism have been reached, however, the second line of defence is to introduce alterations to the shutter. With typical humour, he summarises the multiplicity of early forays into this *terra incognita*.[3] **[show text from Hepworth].**

Although his list seems comprehensive, Hepworth does not at this point mention the coloured tinting of blades or, more crucially, the number of blades. What we can see retrospectively is that all the ideas listed by Hepworth were concerned only with modifying the intensity of the light rather than the frequency of its interruption.[4]

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[2] In one of cinema's many substitutions, the 'ghost' of the images' descent is replaced with the darkness of the shutter blade. The rapid transition from the bright image to the dark of the shutter produces a flash perceivable to a human spectator if it is not sufficiently rapid to elude the sensitivity of their visual system. It is ironic that the contrasting darkness serves to make the consecutive pulses of light more visible but in the trade-off between flicker and ghost, the flicker was still the least objectionable in most cases.

[3] 'It may safely be said that upon no part of the cinematograph does so much diversity of opinion exist as upon the shutter. Some people contend that the lens should be absolutely covered during every instant that the film behind it is in motion; others go so far as to say that there is no need for any shutter at all. Some seek a middle course by making the shutter of some translucent material, such as semi-opaque celluloid of a ground-glass appearance; others pierce a few large holes in an opaque shutter, while others, again, favour a number of small ones. Then some carry it a step farther, and introduce perforated zinc or wire gauze in their efforts to minimise the flicker without destroying the brilliancy of the effect upon the screen. […] Some serrate the edges; some don't. Many like it in front of the lens, while many more say it should be behind, and many more still put it between the film and the condenser. And so each one goes his own way, which is different from all the others. But there is one common attribute of all classes of shutter or no shutter - one tie which binds all systems together in an indissoluble bond of brotherhood; and that is that each and every description of kind or shape or place or absence of shutter is positively the only one that gives the best results, and by its aid "the flicker so noticeable in most machines," etc., etc.' (Hepworth, 1897, 52)

[4] Maclean's update appended to the 1900 edition was similarly unaware of flicker frequency as an issue but certainly mindful of luminance: 'in order to reduce flicker to a minimum, the movement of the film should be accomplished in as short a time as possible; the film should be free from staring, blank, high lights; and the illuminant should not be excessively powerful.' (Hepworth & MacLean, 1900, 113)

Hepworth continues his account by giving a detailed description of his own investigation of issues surrounding shutter design which is in itself fascinating evidence of the experimentation and analysis carried out by film pioneers. He reports on trials with a conventional single opaque blade, no shutter, a translucent blade and a perforated blade. While noting the issue of the highlights and shadows of film content, he finds the absence of a shutter and the translucent blade the least satisfactory options. The latter 'illuminates the whole room in a series of flashes' and fogs the picture 'with a flood of grey mist that blocks out all the brilliancy'. (1897, 55). Following the result of the experiments described in his book, Hepworth advocated his own design of shutter as a DIY option to his readers. Potentially, it could have been widely disseminated due to its appearance in print and its continued citation in later works.[5]. **[show Hepworth shutter design]**

Although Hepworth's preference tended towards perforation, the alternative of translucency was by no means ignored and had surprising lasting power, as I will show in the later section describing accessory shutters in the 1910s.

## 1903: three blades are better than one

The patent record provides definitive proof of the arrival at least by 1903 of the concept of the multiple blade shutter. Given the importance of the multiple blade shutter as a basic component of the standardised cinema experience, it is a significant moment and has been recognised as such especially by Charles Musser in the sense that the reduction of flicker to unreportable levels which it made possible opened the way for longer form film and more profitable film exhibition. [6]

[5] (Brown, 1905), (Bennett, 1911)

[6] 'With the rise of the story film coinciding with the introduction of the three-blade shutter (1903), which reduced the flicker effect, the spectator potentially achieved a new level of sustained attention.' (Musser, 2007, 405)
Before the introduction of the three-blade shutter for projectors in 1903, traveling exhibition was logistically challenging and often of limited profitability. (Musser, 2005, 341)

In fact, two US patents of 1903 describe the advantages of multiple blade shutter in increasing the flicker frequency of film projection and consequently rendering flicker less visible. One is by Albert Smith of Vitagraph fame and the other by John Pross on behalf of his employer, the American Mutoscope and Biograph Company (AMBC).[7] In this paper I will not address their relative merits nor the entertaining legend associated particularly with Smith's design. Suffice to say that Pross's simpler idea is the most recognizable as the now familiar classic design of the three-bladed shutter with three equally-spaced blades of 60-degree sector.[8] **[Show Figure 3 of his March 10th 1903 patent]**

Elsewhere, a European debut for the three-bladed shutter is ascribed by Deac Rossell to the German travelling showman, Theodor Pätzold, as a one-off adaption to his Messter projector. His innovation was quickly taken up by Max Gliewe, Oskar Messter's engineer, and incorporated into the Messter Modell XI projector of 1902.[9] In this way, the heuristic process of the exhibitor/tinkerer working in the worldwide open 'laboratory' of early cinema is seen to give rise to more or less simultaneous solutions.

My main concern with the research of Musser and Rossell is the danger of an assumption, made retrospectively from the position of its eventual near-universal adoption, that once summoned into existence by Pross, or Smith or Pätzold, the

[7] Smith's 1903 patent used a double shutter, the smaller internal blade of the concentric pair rotating eight times faster than the larger cover blade. Pross' patent is No. US722382A, 1903. (Pross, 1903)
[8] Pross describes his invention as a 'departure from hitherto accepted theories' in which efforts to reduce flicker had concentrated on minimising the period of change and maximising the exposure. Pross' research also showed that equality of the closed and open sections of the shutter is advantageous. It is a finding which others such as Proszynski would reiterate, but which in practice was often compromised, the anti-flicker blade(s) often being made with a smaller sector than the cover blade in a bid to achieve a brighter image. (Proszynski, 1913)
[9] Rossell makes this creditable claim at least three times. (1998a, 32 note 5); (2001, 52); (2014, 337, note 45) on the basis of the same secondary source: (Ilgner & Linke, 1994) Unfortunately, Ilgner and Linke do not give their source and apparently there is no known documentation of the Modell XI. 'Von dem ab 1902 hergestellten Modell XI sind keine Unterlagen bekannt.' (Ilgner & Linke, 1994, 105) A Modell XII from 1904 with three-bladed shutter does exist, however, and is illustrated in their article, although in such a way as to hide the shutter. (Ilgner & Linke, 1994, 104).

multiple blade shutter was seen as a panacea and spread rapidly throughout the world's screens. This is certainly not the impression received from a host of references to other forms of shutter design that continue to appear for the remainder of the early cinema period and longer.

## Post 1903: a continued belief in translucency

Some anomalous discoveries in the apparatus archive demonstrate alternatives to the multiple blade shutter existing well after 1903. I'm going to concentrate on an unusually complicated, mostly translucent, shutter carrying the number of a 1916 patent and part of a Walturdaw projector present in the Eye Filmmuseum collection. **[But I will also briefly show you a piece of a violet tinted shutter blade from a Bioscope of c. 1908 as further evidence of a forgotten practice.][10]**

Neither item bears any resemblance to the orthodox three-bladed shutter supposedly in use from 1903 despite both being of a later date. They point, rather, to a continued belief in the crafting of light in terms of luminance rather than frequency.

The Branson patent shutter in the Eye Filmmuseum apparatus collection is attached to a Walturdaw projector, possibly up to ten years older.[11] It is not known at which point the shutter was fitted to the projector but on the evidence of at least one Walturdaw catalogue it would seem not to have been part of the initial commercial

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[10] ***Violet fishtails:*** As mentioned, a single translucent cover blade was a short-lived feature of some projectors of the late 1890s, although most were opaque. However, by 1903, the new Bioscopes made by Charles Urban's freshly established company revisited translucency by adding a second blade opposite an opaque cover blade. Unlike the earlier translucent blades it was now also tinted violet.
Despite apparent widespread use, at least in the UK, there are hardly any surviving violet blades. Of the 24 Bioscopes encountered during my research only no. 1351 retains a small fragment.
Importantly, it would seem that violet fishtails were not seeking to eliminate flicker at the expense of a bright image but maintain a balance between flicker and luminance. Flicker was not so despised that its subjugation to unreportable levels merited a dull picture.

[11] Eye catalogue number: APP358. The catalogue entry is for the projector and does not separately mention the shutter.

offering of the projector. My first impression of the shutter was one of a fussily complicated and slightly mysterious version of a familiar device. It was curious, to say the least, to find an example of a shutter from the late period of early cinema that carried a translucent cover blade, something already disparaged by Hepworth in the 1890s. Its embossed patent number led directly to a **copy of the 1916** patent which indicated that the blade was, however, designed not to be entirely translucent but to be tinted, 'either being formed of a tinted transparent medium or by the superposition of a tinted film'. (Branson, 1917) **[show picture and describe parts]**[12]

According to his patent, Branson's aim with this semi-transparent cover blade was to 'avoid the great wastage of light' incumbent upon use of an opaque blade for the period of picture change. It is, in fact, nonchalant about the issue of flicker. The desire is to give brighter illumination, 'without undue flicker', a phrase which certainly seems to indicate a tolerance of some flicker. Rather than obstructing the light, he wished to scatter it, thus subduing the harsh exchange of light and dark produced by an opaque blade and the correspondingly intense flicker. He is aware of the issue of ghosting raised by the use of a translucent cover blade and proposes a solution.

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[12] In later consultation with Nick Hiley, I was made aware of a second example of the Branson shutter in his collection which bore an untinted translucent cover blade made from mica. On a return visit to the Eye Filmmuseum depot, it was possible to examine and photograph the shutter in more detail. I could therefore confirm the presence of a composite cover blade made of both mica and plastic with such 'ribs, flutings or corrugations' (Branson, 1917) as mentioned in the patent. The detail of these layers of material was virtually invisible in the half-light of the depot when not specifically looking for them. On very close inspection, a tiny trace of violet was still visible on the blade, though most had faded to nothing.[12] The cover blade was thus revealed to be a cocktail of once coloured mica and transparent striated plastic, the complete 'recipe' for which only survives on the Eye example, and in faded condition, at that.
Branson's design also features an 'intermediate' or 'auxiliary' blade which is adjustable and can be rendered opaque, in a confusing reversal of the practice established by the Bioscope and other machines of an opaque cover blade and a violet tinted 'anti-flicker' auxiliary blade. The Branson shutter is adjustable by virtue of two smaller sectors attached to each side of the auxiliary blade. These sectors are missing from the Eye example but present on the Hiley example which, in turn, has only the untinted mica layer of the cover blade present. In fact, due to these losses, only between them can these two shutters be considered a fully complete example.

> To prevent the appearance of misty streams of light on the screen picture […], I provide the surface or surfaces of the blade with suitable ridges, prisms, or other corrugations, or vary the thickness of the material in different parts of the blade. (Branson, 1917)

It is difficult not to conclude that the spread of light indicates a weakness in Branson's design that would result in a loss of contrast in the projected image which would affect its overall impact. Hepworth's experiments of 1897 had already found translucent materials for shutters unsatisfactory. Hepworth preferred the flicker of an opaque blade to the fog of a translucent one. (1897, 55)

On the evidence of the patent record, Branson was by no means alone in his experiments with the translucency of the shutter.[13] In fact, Branson's patent had to be amended to avoid similarities with Edward Halford's earlier claim of 1914 which involved a semi-transparent masking blade composed not of mica, glass or plastic but of 'gelatinous or fibrous silk' (Halford, 1914). It was matched with fully transparent but coloured anti-flicker blades. Contrary to the expected spread of light, Halford claimed that 'the colored transparent light balancing blades prevent any appearance of milkiness in the projected picture.' Although describing himself as an 'inventor' in 1914, Halford's previous profession of Clothier must have been connected to his imaginative, tangential approach to cinema technology, just as Branson's work as a Kinematograph Operator had presumably informed his design.

Through designs such as these which experimented with translucency, the shutter's light bearing qualities as well as its light slicing function were investigated. Contrary

[13] See for example, William Diggle's 1919 patent (No. GB135711A) for a transparent cover blade of wire gauze, silk, linen or cotton possessing the similar motive that 'there shall be no dark moment on the screen.'(Diggle, 1919) Like Branson, Diggle's profession was Kinematograph Operator.

perhaps to our current understanding, flicker's relation to luminance was sometimes addressed more thoroughly than its relation to frequency. In place of the binary opposition of light and dark, on and off, I therefore reveal an expanded role for the shutter of providing a variable admixture of muddled light. The evidence for this view derives from an assessment of the patent record but also importantly includes the material traces of shutters in the expanded archive, thus an archaeological examination of surviving hardware. These sources give a more nuanced view to the flicker reductionist perspective of contemporary manuals and trade catalogues which has tended to survive as the orthodox view into the present day and challenge the notion that eradication of flicker was a monolithic goal of cinema pioneers. They suggest a greater diversity of cinema experience available for a longer period. An experience in which flicker could be tolerated and even playfully engaged with.

I conclude with the words of Czech critic Vaclav Tille writing in 1908,

> 'In those silent, nimbly and playfully flickering swarms of shadows there is something astonishing and alluring, something that so vividly evokes in the soul the impression of our own dreams, mysterious and unimaginable images that flash on and off inside our consciousness.' (Anděl & Szczepanik, 2008, 90)

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