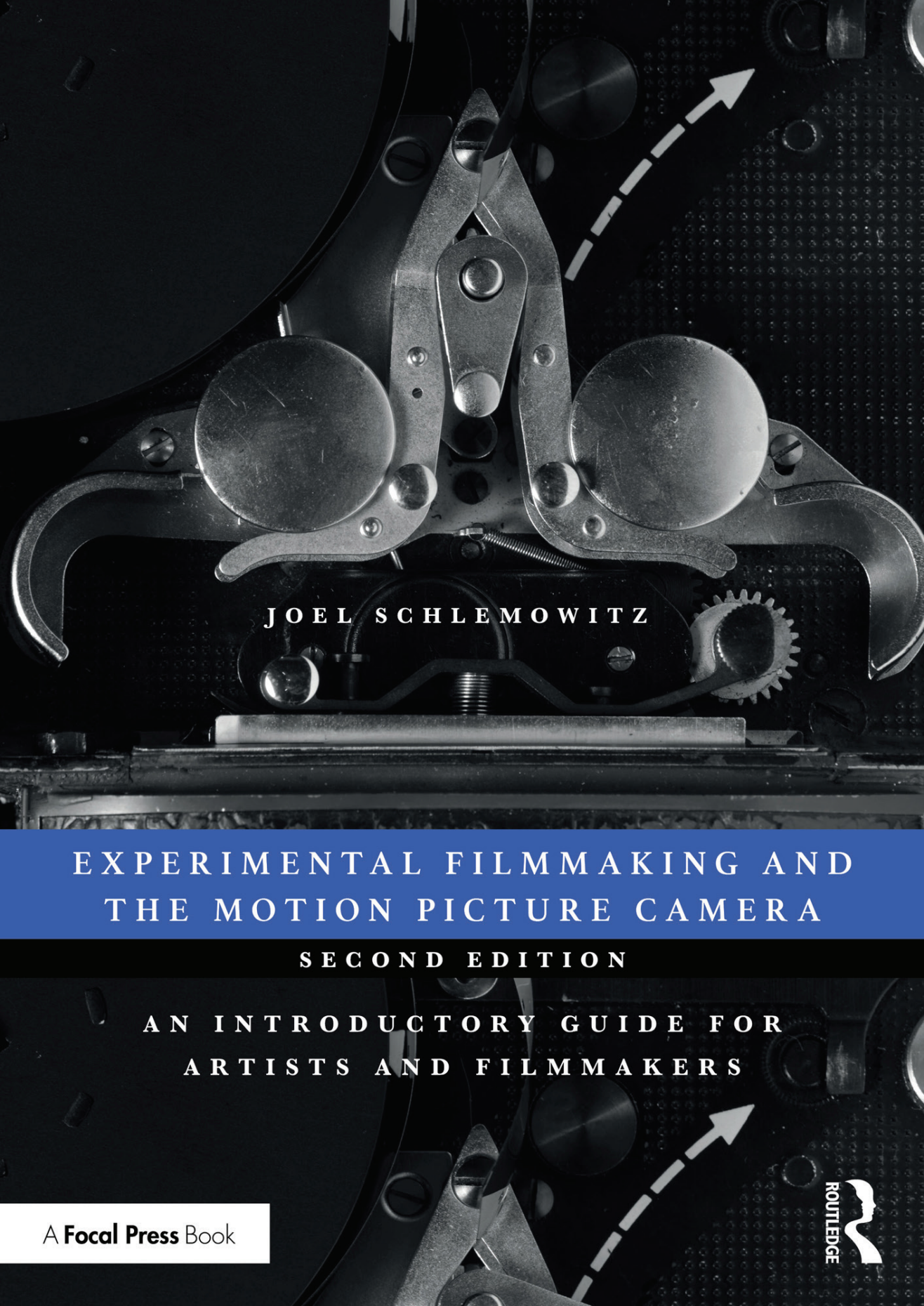

JOEL SCHLEMOWITZ

EXPERIMENTAL FILMMAKING AND THE MOTION PICTURE CAMERA

SECOND EDITION

AN INTRODUCTORY GUIDE FOR ARTISTS AND FILMMAKERS

A Focal Press Book

ROUTLEDGE

Experimental Filmmaking and the Motion Picture Camera

This book functions as an introductory guide to experimental filmmaking and the motion picture camera. This new and updated second edition surveys the latest practical methods of experimental film production, as well as the history, theory, and aesthetics of experimental approaches.

Author Joel Schlemowitz explains the basic mechanism of the camera before going on to discuss slow and fast motion filming, single-frame time-lapse, the long take, camera movement, workings of the lens, and the use of in-camera effects such as double exposure. A comprehensive guide to using the 16mm Bolex camera is provided, and taking exposure readings with the Sekonic light meter is also covered in this edition. Strategies for making films edited in-camera are covered, as well as a range of equipment beyond the basic non-sync camera, with comparison of the features and capabilities of a variety of 16mm film cameras. The movie diary and film portrait are examined, along with the work of a range of experimental filmmakers including Stan Brakhage, Rudy Burckhardt, Paul Clipson, Christopher Harris, Peter Hutton, Takahiko Iimura, Marie Losier, Rose Lowder, Jonas Mekas, Marie Menken, Margaret Rorison, Guy Sherwin, and Tomonari Nishikawa.

This is the ideal book for students interested in experimental and alternative modes of filmmaking. It provides invaluable insight into the history, methods, and concepts inherent to experimental uses of the camera, while providing students with a solid foundation of techniques and practices to foster their development as filmmakers.

Supplemental material – including links to films cited in the book – can be found at www.experimentalfilmmaking.com.

Joel Schlemowitz is an experimental filmmaker who works with 16mm film, shadowplay, magic lanterns, and stereographic media. He teaches experimental filmmaking at The New School, New York. His first feature film, *78rpm*, is an experimental documentary about the gramophone, and his short works have been shown at numerous film festivals, including the New York Film Festival, Tribeca Film Festival, and Ann Arbor Film Festival. For more information visit www.joelschlemowitz.com.

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Experimental Filmmaking and the Motion Picture Camera

An Introductory Guide for Artists and Filmmakers

Second Edition

Joel Schlemowitz

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Introduction

The purpose of this book is to provide a text for an introductory experimental filmmaking course. It is designed to fill a void with its emphasis on experimental approaches. Books on production techniques for introductory filmmaking courses are of a more generalist nature. Existing literature on experimental cinema tends to be non-technical, focusing on film history and theory. The exception to this deficit is Kathryn Ramey's *Experimental Filmmaking: Break the Machine*, a superb and comprehensive book on experimental film technique. However, its coverage of cameraless filmmaking, hand-processing, optical printing, and expanded cinema is premised on the assumption that the fundamentals of film production (how to load a camera, an understanding of exposure, lenses, and basic shooting techniques) are covered elsewhere in the filmmaking curriculum. This book covers these fundamentals from the experimenter's vantage, drawing upon my experience teaching an introductory experimental production course at The New School: "The Innovative Camera: Experiments in 16mm Filmmaking."

The organization of material for this book is tailored to this framework. Chapters have been arranged to track the progress during a 12- to 15-week semester in which students first learn how the equipment works and shoot their own short projects.

Chapter 1: the first chapter introduces the fundamental functions of the camera and the range of experimental capacities associated with the mechanism itself.

Chapter 2: time and exposure are the principal subjects of this chapter, including film speed, shutter speed, frame rate, and aperture settings.

Chapter 3: the lens is the subject of this chapter. At this point in the semester, having gained an understanding of the camera, exposure, and lenses, students will experience working on in-class shoots relating to optical experiments, single-frame sequences, and filming time exposures with the Bolex.

Chapter 4: in-camera effects, such as double exposure, are detailed in this chapter. Students will shoot in-class experiments with double-exposure and matte shots by this point in the term.

Chapter 5: by now, the time has arrived for students to go out and shoot on their own, so a comprehensive guide to the Bolex camera is the subject of the fifth chapter.

Chapter 6: this chapter provides guidance regarding the making of a three-minute single camera-roll film, edited in the camera. Creating experimental camera-roll films forms the basis of the experimental production course for which this book was written.

Chapter 7: the seventh chapter surveys a range of equipment beyond the basic non-sync camera. It is here to introduce students to the technological history of the camera and provide a base of knowledge from which to embark on further experimentation.

Chapter 8: the final chapter looks at the work of artists who have made the camera an intrinsic tool in their process by means of the film diary, the film portrait, and using the camera's

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photographic glimpses as a form of preservation of the tangible present for some unknowable future. While reading these last two chapters, students are working on finishing their projects as the term comes to an end.

The distinction between this book and the general-purpose filmmaking guide is not just the practical application of alternative techniques but also the range of examples of filmmakers who have made the camera a critical aspect of their working method. The films of Christopher Harris, Rose Lower, Marie Menken, and Guy Sherwin, among others, are provided as examples. This book is not, nor is it meant to be, a comprehensive survey of experimental filmmakers, owing to its principal focus on the camera. Production courses tend not to show very much work, leaving this to the purview of film studies courses. But experimental film production courses are more obliged to address students' lack of exposure to this work. The descriptions of films throughout the book are provided to assist the teacher, as well as the student, in finding work for screening in the classroom. Short films are the primary examples given. Online links to view many of the films described in this book can be found via *Experimental Filmmaking and the Motion Picture Camera*'s web supplement: www.experimentalfilmmaking.com

The objective for providing these examples also stems from a desire to not divide technical matters from aesthetic concerns. The concept for a project should not be conceived in isolation from the inherent qualities of the medium, because an ill-fitting pairing of concept and consequence may result. The filmmaker Sam Wells expressed this concern in a posting on the Frameworks Listserv[1] in 1999:

> FRAMEWORKS Experimental Film Discussion List
> Mon, 25 Jan 1999 17:54:08
> Subject: [FRAMEWORKS] Reverse/Negative: a comment …
> … I suppose there are two ways to consider the use of any photographic material. Either, you ask if _it_ can serve _you_ and therefore let you engage your subject with a minimum of fussy mediation …. Or, you approach the product not _only_ on the level of [its] servitude but as a kind of servant to its particular qualities, which … lead you into an engagement with what it – and its use can reveal to you – which is often more abstract ….
> Real world experience obviously falls between these two categories.
>
> –Sam Wells

It is therefore not just a matter of learning to use the techniques, equipment, and basic properties of the media but also what one can learn from them while working with these tools. The examples provided have been comingled with the technical content of this book to demonstrate the many ways in which this learning takes place. The diverse nature of the films reflects the innumerable directions such a conversation between the artist and the medium may take.

The primary medium for *Experimental Filmmaking and the Motion Picture Camera* is 16mm film. As with Ramey's *Experimental Filmmaking: Break the Machine*, the relevance of a text on analog film in an increasingly digital production environment is a response to young filmmakers' desire to experience working with "real film." Even if working with 16mm remains as a transitory occurrence, or is practiced as an avocation rather than as a professional occupation, the discipline and concentration of working in film will carry over into approaching other media. There is a particular combination of care and creativity gained from what film reveals to the filmmaker.

Working with 16mm film, one shoots not just with one's eye but also with one's hands. The hands hold the camera, manipulate the controls, turn the rings on the lenses, and push the button to release the spring. Shooting film (especially with a camera like the Bolex), one can be

physically aware of the momentum of the film through the camera, the release of the camera's spring tension, the machine subtly trembling one's hands. The film camera's subtle shuddering energy can affect one, as if transferring some of the spring's energy to the act of filmmaking – what the experimental filmmaker Marie Menken referred to as "the twitters of the machine."[2]

The prevalent idea of filmmaking is to see the function of the camera as a component coequal with all other facets of the process. It is the tool of cinematography, along with a movie's other ingredients, including screenwriting, directing, acting, set design, costumes, lighting, special effects, editing, sound design, and music. This dovetails with the notion of cinema as an aesthetic amalgamation, incorporating aspects of all the other arts in its production. Russian director and film theorist Sergei Eisenstein proclaimed, "the cinema is that genuine and ultimate synthesis of all artistic manifestations that fell to pieces after the peak of Greek culture, which Diderot sought vainly in opera, Wagner in music-drama, Scriabin in his color-concerti, and so on and on."[3]

If we momentarily adopt this analogy of the cinema as a grandly orchestrated endeavor – with the movie director in the role of the conductor, baton in hand – the filmmaker who journeys out with just a camera is more like the solo musician, creating the film without the need for a concert hall filled with production gear. The moving-image instrument invites virtuosity comparable to its musical kin: the aplomb and precision of Fritz Kreisler or the inextinguishable creative energy of Zeena Parkins. In 1960, Jonas Mekas wrote about what he termed "film troubadours" in his column in *The Village Voice*: "Every day I meet young men and women who sneak into town from Boston, Baltimore, even Toronto, with reels of film under their coats – as if they were carrying pieces of paper scribbled with poems …. They are the real film troubadours."[4] The solo filmmaker with a movie camera is very much the film troubadour, it would seem.

Pragmatically speaking, for filmmakers who place the camera at the crux of the creative undertaking, this pared-down process might be a question of economy: Just a camera, a light meter, a film roll, that's all that's needed. This approach allows the beginning filmmaker to commence working on projects with just the acquisition of the most basic implements of the craft, with the camera acting as the entryway through which creativity can be fulfilled in a complete fashion and on a personal scale.

Notes

1 Frameworks listserv, Jan, 25 1999. Not archived.
2 Mandell, Leslie (assisted by Paul Sitney), "Interview with Marie Menken," *Wagner Literary Magazine* no. 4., Gerard Malanga and Paul Katz ed. Staten Island, NY: Wagner College, 1963–64, p. 48.
3 Eisenstein, Sergei, "Achievement" (1939), in Jay Leyda ed. and trans. *Film Form Essays in Film Theory and Film Sense*. Cleveland and New York: Meridian Books, 1968, p. 181.
4 Mekas, Jonas, "On Film Troubadours" (1960), *Movie Journal: The Rise of the New American Cinema 1959–1971*. New York: Collier Books, 1972, p. 20.

1 Dream-vision of the pulldown claw and the hidden workings of the camera

This chapter covers how the motion picture camera was created, how it works, and filmmakers who make use of its fundamental aspects.

Three inventions, created in the nineteenth century, are unlikely kinsfolk. The common bond between these devices is a sequence of movement and stillness, repeating in quick succession. This trio of the mechanical age comprises the sewing machine, the motion picture camera, and the machine gun.[1] Perhaps the typewriter, with its spring-driven carriage advancing the paper between strokes of the key, may be considered yet another cousin of these inventions. Each of these was less an entirely new idea than a clockwork-drive version of its manual precursor: the sewing machine brought machine-age production to the handcraft of the seamstress, the mechanically reloading Gatling gun brought death on the battlefield to a scale of industrial mass production, and the motion picture brought the dreamy shadowplay and painted glass-slide phantasms of the magic lantern show into the photographic age.

Inventor Louis Lumière acknowledged the genealogical pedigree of the one device begetting the other; the camera's "pulldown claw," resembling the "presser foot" of the sewing machine, came to him as a mental image during a night of insomnia while fretting over the invention's development.[2] The terminology may be a bit inexact as far as this comparison is formulated; the presser foot of the sewing machine acting to halt the fabric so the needle may pass through serves a function like the motion picture camera's pressure plate. It is a component called the "feed dog," which seems to bear a greater resemblance to the critical component of the Lumière camera. On a sewing machine, the feed dog is a pair of thin saw-toothed plates coming up through slots in the bed of the machine. The teeth of the feed dog move the fabric to the location of the next stitch and withdraw as the needle penetrates the fabric once again. A rotating cam produces this series of movements. In Lumière's insomnia-induced solution, the mechanism of the camera is comprised of a pulldown claw (feed dog) grasping onto the film to move it to the location of the next exposure. The film is held still and steady by the pressure plate (presser foot) during exposure. The shutter opens, ushering in the lens-light (needle) to stitch an exposure onto the film's emulsion.

In its rapid, death-dealing chain of actions, the ammunition-laden machine gun belt advances a cartridge, coming to a halt in the firing chamber, where the firing pin engages with the bullet's primer. Just as the motion picture camera takes in light through the barrel of the lens, the firearm expels its projectile outbound through its barrel. In either case, the action is "to shoot."[3]

Many inventors played a role in the birth of cinema, in a patchwork of developments: Eadweard Muybridge's Zoopraxiscope, created in 1879, took the optical toys of the nineteenth century and added the photographic camera to create a looping series of sequential photographs. Inspired

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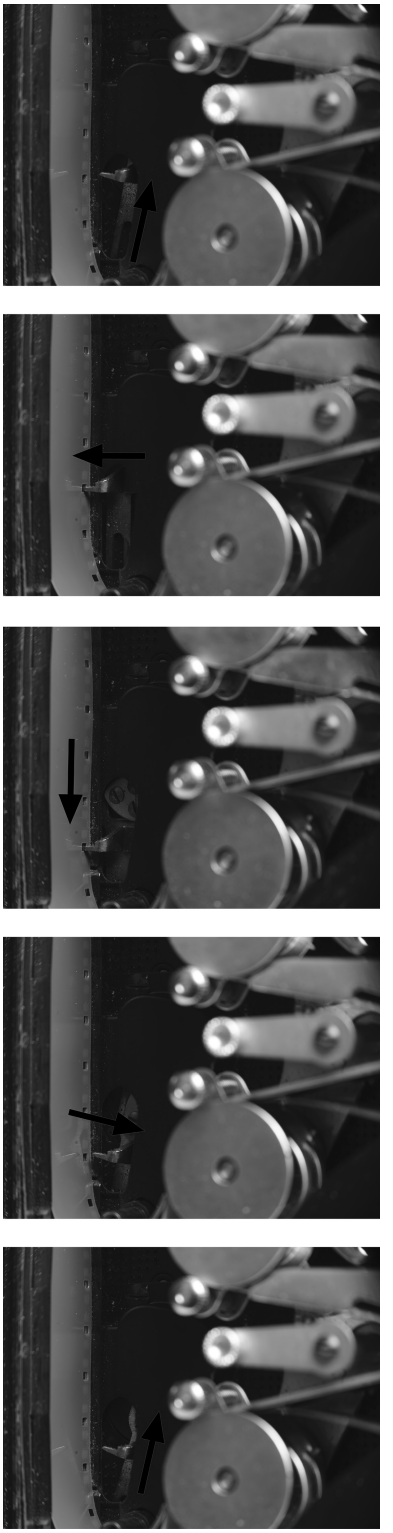

by Muybridge's device, Thomas Edison directed his employee William Kennedy Dickson to build a moving image companion to his audio-reproducing phonograph. This eventually became the Kinetoscope camera and its accompanying peep-show viewer, both patented in 1891 after years of experimentation.

In 1895, the German magic lanternist Max Skladanowsky adapted the use of dual glass slide projections of "dissolving views" to the task of moving photographic images, fashioned into two alternating loops, punched with perforations and grommets, and then projected on the screen in a device that seems more like some unruly Steampunk hallucination than a practical cinematic apparatus.[4] There was also the work of Louis Le Prince, whose unexplained disappearance on a train from Dijon to Paris in 1890 produced more of an unsettling mystery than a sustained place among the innovators of the motion picture camera. "Perhaps the question of priority, like the Loch Ness Monster, is best left alone,"[5] writes John Frazer on this jumble of rival claims.

But it was the brothers Lumière who saw opportunity where Edison had imagined unprofitability; the moving image projected to an audience on a screen, rather than the single-viewer Edison Kinetoscope peep-machine. The Lumières first presented this to the public in 1895.

The machine created by the brothers Lumière was not just a camera; it was a printer and projector as well – a whole system of production in one modular device. As historian and filmmaker Erik Barnouw described it:

> The *cinématographe* could be carried as easily as a small suitcase. Handcranked, it was not dependent on electricity. The world outdoors – which offered no lighting problems, at least during the day – became its habitat. It was an ideal instrument for catching life on the run – 'sur le vif' – as Lumière put it.
>
> A remarkable fact about this small box – a trim hardwood item of much elegance – was that it

Figure 1.1 The pulldown claw (I) of a non-reflex Bolex H16 camera with the pressure plate removed to better see the sequence of actions of the claw. The arrows indicate the movement of the claw as it advances the film between exposures, and then retracts, moving back into position during the exposure of the film.

Figure 1.2 The Lumière's cinématographe 35mm hand-crank motion picture camera. In the words of Erik Barnouw: "The cinématographe could be carried as easily as a small suitcase." Courtesy of the George Eastman Museum.

could, with easy adjustments, be changed into a projector, and also into a printing machine. This meant that an *opérateur* with this equipment was a complete working unit: he could be sent to a foreign capital, give showings, shoot new films by day, develop them in a hotel room, and show them the same night. In a sudden global eruption, Lumière operators were soon doing precisely this throughout the world.[6]

What also makes the Lumière apparatus so remarkable is how little the core elements of the motion picture camera have changed since the design of the *cinématographe* (except, of course, the separation of camera, contact printer, and projector functions into specialized machines). Once loaded with film, and the door of the camera is closed, the internal workings become concealed from view. Yet, if we might be shrunken down to Lilliputian scale and slip inside the metal enclosure, what would we witness therein? What aspects of the camera's core functions and particularities might be fodder for experimentation? Becoming acquainted with the motion picture machine also includes an understanding of how to avoid common mistakes, deciding how to choose between different cameras to achieve a particular outcome, and gaining a sense of the range of possibilities (from a more pragmatic standpoint) when making use of equipment readily on hand.

We will tour the camera, following the path of the ribbon of film, pausing now and then to address these other questions along the way. We will occasionally highlight the work of filmmakers who have made special use of some element of the mechanism.

The camera

The body of the camera itself is a light-tight box, the tightly fitting camera door containing a baffle around the edge to keep light from seeping in through the seam and fogging the film. Sometimes fogging of the film can happen due to some small crevice in the door. Typically, this will be seen on screen at the beginning or the end of a shot as a smudge of light upon the surface of the film, or as a red glow along the side of the image. To prevent light leaks from causing fogging, it is common practice to put gaffer tape around the camera door as an additional seal. Outdoors, in sunlight, this tends to make a difference, but it's not always as essential when filming in low light conditions, or when working with a camera you know to be sufficiently light-tight.

Supply reel (A)

The starting point for the film is the supply reel. In 100ft-loading 16mm cameras (like the Bolex, for instance), this is usually located on the top portion of the camera's inner chamber. The film is loaded onto a spindle from which the unexposed film is unreeled through the mechanism. When the film is supplied on a daylight spool, as is the case with a 100ft roll, the outer part of the film

is exposed to light. The spool, and the outer windings of the film itself, protects the film inside from being exposed. When the film is first loaded into the camera, the first seven seconds of film are the "flares" – the transition from the fully exposed to unexposed film. On screen, the effect is of undulating light washing over the image, transitioning from white through a veil of yellow, orange, and red (or shades of gray, in the case of black and white film). Sometimes the sprocket holes on the film allow some light to pass through, stenciling the outline of the sprockets onto

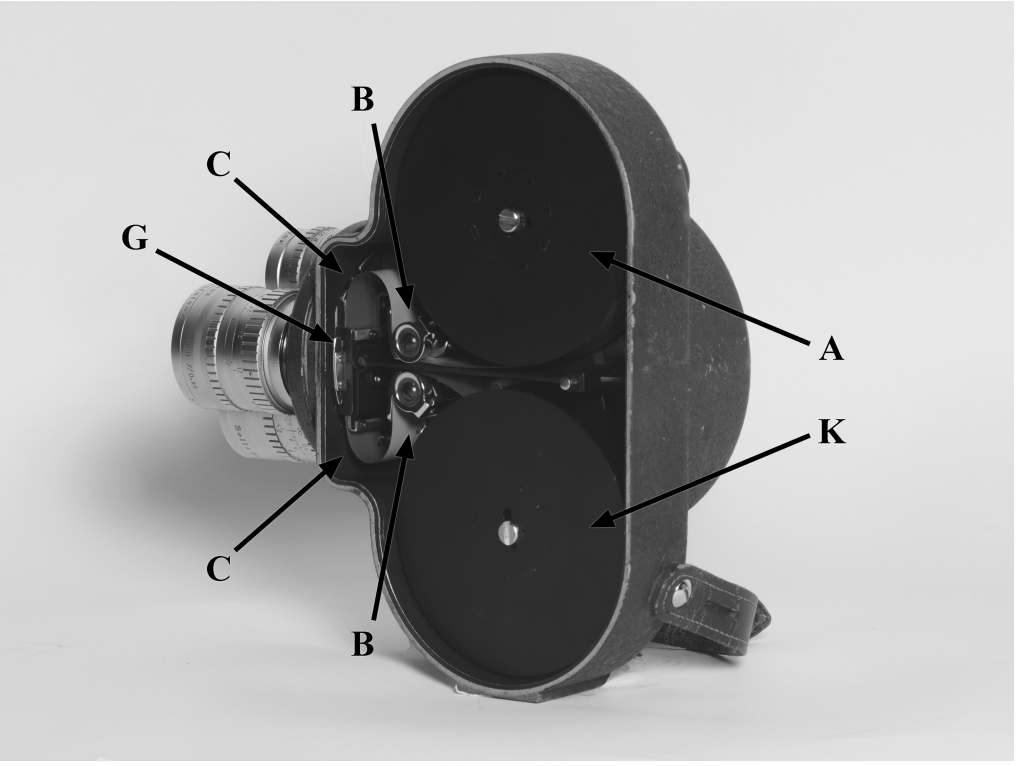

Figure 1.3 The components of the camera, as found inside of the 16mm Bell and Howell Filmo, with the door removed: supply reel (A), sprocketed rollers (B), loops (C), pressure plate (G), take-up reel (K).

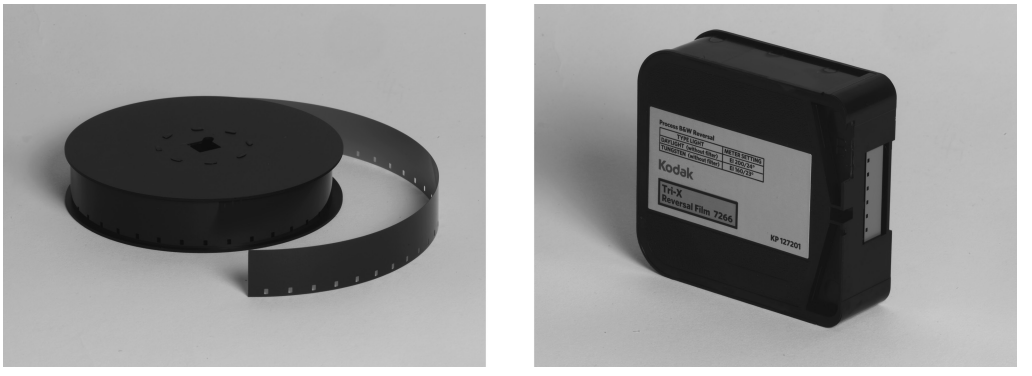

Figure 1.4 A 16mm daylight spool (left) and a Super 8 cartridge (right). The Super 8 cartridge contains the supply and take-up, along with the pressure plate.

the emulsion of the coiled up roll during the flares. To avoid losing a shot to the flares, the film is usually advanced seven seconds when 100ft daylight-loading spools are used.

Filmmakers who have used light flares as a technique include Christopher Harris, in his film *28.IV.81 (Descending Figures)* (2011), and Guy Sherwin, in *Window/Light* (2013). In both these cases, the camera door was opened at points during the filming, resulting in mid-roll camera flares momentarily obliterating the image. Camera flares can be used as a transition to end a sequence (with careful timing by the filmmaker to have the film run out at the right moment), which is seen in the portrait films of Marie Losier, such as *Tony Conrad, DreaMinimalist* (2008) and *Byun, Objet Trouve* (2012).

Film magazines

An alternative to the self-contained camera is the magazine-loading version. In the case of a magazine-loading camera, holding 400ft of film, the film comes supplied on a two-inch plastic core (a size referred to as a "camera core") with no protection from complete exposure apart from the metal can and an opaque black plastic bag inside. Film on a core must be loaded in darkness so as not to entirely expose the film to raw light. Magazines come in different configurations, based upon the camera: the twin-chambered "Mickey Mouse ears" magazine found on cameras such as the Auricon; the single-chamber magazine on the Arriflex S, M, or BL; the compact, coaxial magazine, with the supply and take-up chambers arranged side by side – the Arriflex SR, Aaton, and Éclair NPR and ACL are fashioned in this manner.

Magazines of 200ft can also be found in both 16mm and 35mm, but these are of limited usefulness (16mm film is no longer supplied in 200ft lengths, consequently needing to be wound down from 400ft rolls).

Figure 1.5 The 400ft coaxial magazine of the Arriflex SR, showing the take-up side of the magazine. Camera courtesy of The New School Film Office.

The magazine will typically have a core adapter for loading the plastic camera core the film is supplied on into the magazine. With the core adapter removed, the square spindle will accept a daylight spool instead, although this is usually avoided due to the additional noise produced by the spool scraping against the interior of the magazine compartment. When unloading the film, be sure the core adapter remains with the magazine. Sometimes the take-up will be equipped with a collapsible core and the film sent off to the lab coreless within the black plastic bag and can.

As the film leaves and re-enters the magazine, it travels through a slit or set of rollers arranged to prevent light from entering the magazine, known as a "light trap." Sometimes a "velvet light trap" is used, with black velvet making contact with the film to prevent scratching of the film's surface.

Sprocketed rollers (B)

From the supply reel, the film is propelled by a pair of sprocketed feed rollers located above and below the gate. On some magazine-loading cameras, like the Arriflex SR, these rollers may be located within the magazine itself. Some cameras have just a single roller; others have two. The rollers will propel the film in constant motion as the camera runs, distinct from the intermittent movement of the film as it arrives at the gate.

Loops (C)

As noted above, the film moves continuously from the supply to the take-up, but as the ribbon of film arrives at the gate, the film must come to a stop during the moment of exposure and then move again to advance to the next frame. This requires some form of transition between the film's constant movement from supply and take-up and the intermittent movement at the gate: the loops are the slack, allowing this to happen. They appear as short, curving lengths of film on either side of the camera gate and pressure plate. As Arnold Eagle, with whom I had studied, would say, "The film loops are there because the film cannot stretch, or else it would snap."[7] The two curved loops of slackened film will be seen to flutter as the camera runs.

The camera is designed for the loops to be of a particular size, and consequences can arise from the loops being larger or smaller: a loop that is too big may slap against part of the inside of the camera, causing scratching of the emulsion. Or in the case of a loop that is too small, the intermittent motion of the film at the gate may be impeded by the rollers tugging at the film and causing it to move during exposure. The consequence is a vertical smearing of light during exposure – especially noticeable in bright areas of the image – which might appear as a mistake but could hold possibilities for experimentation.[8]

An example of footage shot with bad loops is seen in the first few minutes of Bruce Baillie's *Castro Street* (1966). An engineer walks beside a diesel train, the scene cloudy with what seems to be early morning fog, but it could also be the blurring of the image due to the movement of the film during exposure – the white stenciled letters painted on the side of the train engine sending streaks of white downwards as a result of the bad loops. The inclusion of the seemingly spoiled footage, with its smudged, mist-like qualities, enhances the gradual build-up of the film's opening stages.

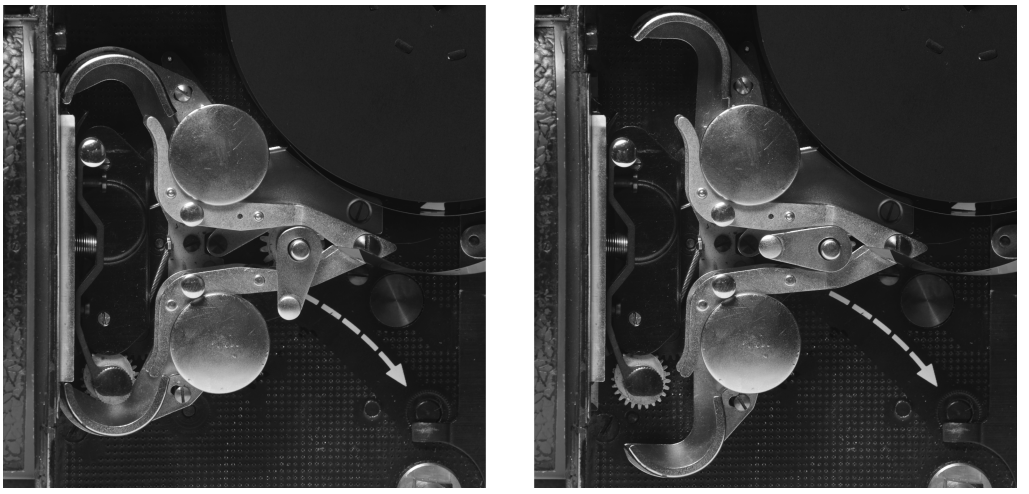

Figure 1.6 The loop formers (D) on a Bolex camera, showing the closed and open positions. Chapter 5 will cover the use of the loop formers when loading the Bolex.

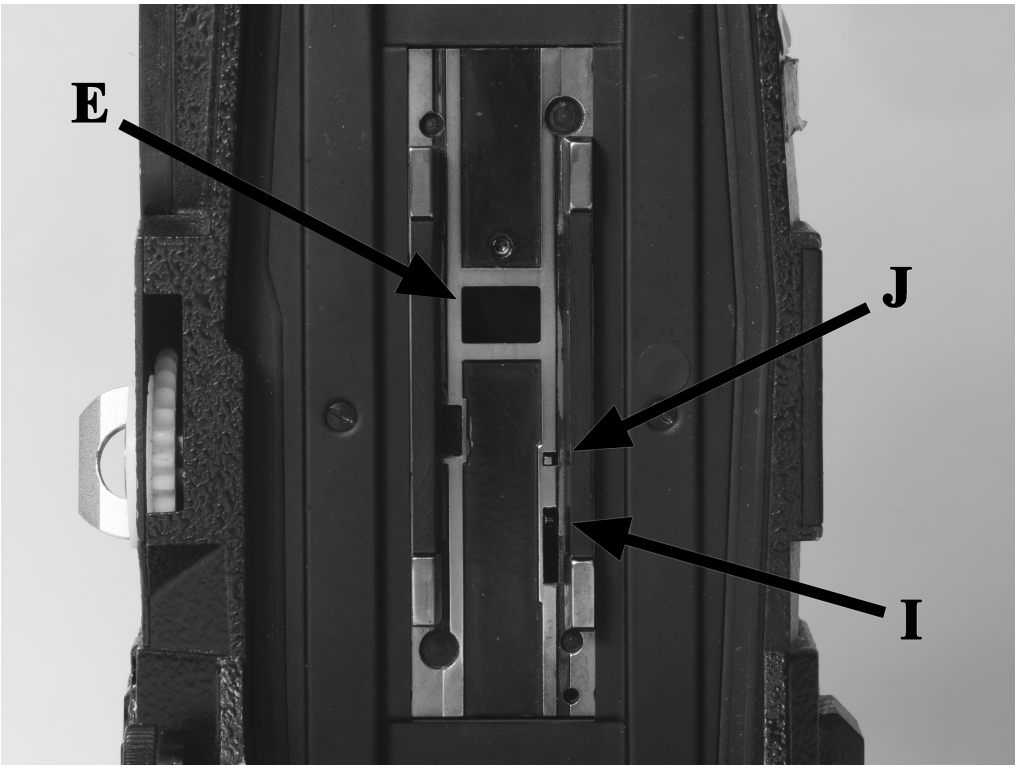

Figure 1.7 The components of the camera, continued. An Arriflex SR, with magazine removed. The gate (E), pulldown claw (I), registration pin (J).

The Bolex camera may experience collapsing loops if the pulldown claw has grown dull and the camera is run at 64fps (for slow motion) or used for single-frame shooting (for animation and time lapse). Even if a camera runs perfectly at 24fps, it may still have loop trouble at high speed or single frame. An example of a filmmaker making use of collapsing loops when shooting single-frame sequences on a Bolex camera can be found in the films of Jenny Perlin. Her animated works are made by creating drawings a little at a time before the lens, rather than the more traditional method of a series of drawings replacing one another. The loops in her Bolex camera shift out of place during single-frame sequences, resulting in a stuttering and trembling image; the dark lines on white paper, as well as the frameline of the gate itself, create a series of vertical smears from frame to frame as the film moves during the exposure time. She typically switches to shooting at 24fps at the end of a sequence, and the image steadies itself. The effect is not unlike seeing the pages of a flipbook fluttering from image to image.

Loop formers (D)

To aid in making the ideal-sized loops, some 16 cameras, such as the Bolex and Canon Scoopic, will have a pair of guides known as loop formers. The loop formers have two positions – open (for shooting) and closed (for loading). The film is run through the camera during loading, snaking its way along the path from supply to take-up. Once the loop formers have guided the film during loading of the camera, they are opened for shooting, allowing the loops to provide slack unimpeded.

Cameras without loop formers

16mm cameras like the Bell and Howell Filmo, various old home movie cameras, or magazine-loading cameras like the Arriflex SR are designed to have the loops above and below the gate made the correct size by hand. This is done by following a threading guide inscribed on the inside of the camera. In the case of the Arriflex SR, the loops are made by pulling out the film from the magazine to align with a notch before threading the film back inside to the take-up side of the magazine.

The gate (E)

The gate is the rectangular window allowing light to pass from the camera lens to the film's photosensitive emulsion. It acts as a rectangular mask, blocking stray light from exposing the frames above and below the gate.

Interestingly enough, there are instances where a bright source of light may seem to bleed around the edge of the gate and onto the neighboring frames. This is not actually light spilling around the edge of the gate but the light reflecting off the back surface of the base of the film, exposing the emulsion beyond the barrier of the camera gate as it ricochets and scatters. While the film might not seem very thick, as a three-dimensional object there is enough thickness for the light to scatter in this manner. This appearance of bending of the light around dark edges is known by the term halation. Color film is produced now with a black anti-halation coating on the back of the base to minimize the effect.

Boston-based filmmaker Saul Levine has produced a number of short films referred to as the *Light Lick Series*, making use of the phenomenon of light bouncing off the back surface of the film, with the camera shooting light directly from the sun. The pattern reveals the vertical movement of the strip of film in the camera: lower arc, white frame, upper arc. These are repeated