

The film and cameras that made “home movies” possible

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Issue 3
December 31, 2017

ABSTRACT

In 1923, Eastman Kodak Company introduced 16 mm motion picture film and a camera, the Ciné-Kodak, to use it. This brought to the general public the possibility of making their own motion pictures. The cost of this art form was further reduced when Kodak, in 1932, introduced 8 mm motion picture film and a camera, the Ciné-Kodak Eight, to use it. This article tells the story of that revolution, concentrating on some of the pivotal cameras that were involved. It follows the ongoing story until about 1957.

1. STUDIO MOTION PICTURES

By 1920 the United States had a robust, well developed motion picture industry. The productions were shot in elaborate studios using 35 mm film and large, heavy, and expensive cameras. To be able to see at the end of the day how the day's shooting had gone, the exposed film was developed, giving a negative. That then had to be printed onto positive stock, and that developed, to give a positive print that could be projected for review (the “dailies”).

In the early 1920s, most of the cameras were not driven by any kind of motor. but had to be continuously (and, hopefully, steadily) hand cranked for the duration of each shot. And in fact the 35 mm projectors used in motion picture theaters were also hand cranked at the time.

The 35 mm film used, both in the studio and for the release prints that were distributed across the country to theaters, was on the highly-flammable (one could fairly say, “potentially explosive”) cellulose nitrate base.

It is easy to see that this technology could not be practically adapted for use by amateur photographers to create motion picture records of the children at play or of boats sailing on the nearby lake.

2. THE REVOLUTION

2.1 16 mm motion picture film and cameras for it

In the United States, that changed abruptly in June, 1923 when Eastman Kodak Company introduced *16 mm reversal safety motion*

picture film and a camera to use it, a system practical (more or less) for use by amateur photographers for what came to be popularly known as “home movies”.

2.1.1 *The film*

This film was a black and white film. The word *reversal* film means that, by a clever integrated processing scheme, the original film yields a positive, directly suitable for projection. The word *safety* means that this film was not on a highly-flammable cellulose nitrate base but rather on an essentially nonflammable cellulose acetate base.

I do not have good information on the sensitivity of this film, but I have independently estimated that it was somewhere in the area of what we would today describe as ISO 4-5.

The actual “product” designation of the film was “Ciné-Kodak Safety Film”.

Not long after, Kodak introduced a *panchromatic* 16 mm film (“Ciné-Kodak Panchromatic Safety Film”). The term *panchromatic* means that the response of the film to different wavelengths of light generally follows the human eye’s luminance response. This leads to a representation of different colors in the black and white image that is considered more “realistic” than that typically given by the original type of 16 mm film, said to be *orthochromatic*.

I estimate that the sensitivity of this film was in the area of ISO 8-10.

In 1931, Kodak introduced a higher sensitivity amateur motion picture film, known as “Ciné-Kodak Super-sensitive Panchromatic Safety Film”. I estimate that the sensitivity of this film was in the area of ISO 15-20.

2.1.2 *The camera*

The camera introduced in June of 1923, along with the first 16 mm motion picture film, was called the Ciné-Kodak camera. We see in figure 1 a typical variety of it.

When the Ciné-Kodak Model B was introduced (in 1925), the Ciné-Kodak became known as the Ciné-Kodak Model A.

As with each of the camera “models” I will discuss here, the design and exact features varied over the years of production and between available variants.

The camera was housed in a robust die cast aluminum case. It weighed (loaded with 100 feet of film) about 7.5 lbs. The dimensions were approximately 8.5 in. long, 8.0 in. high, and 4.5 in. thick.

This camera had no motor, and, just as for the studio cameras of the time, needed to be hand cranked (“Two revolutions per second, please”) for the duration of a shot. This made working on a tripod (a substantial one, in fact) essentially mandatory.



Figure 1. Kodak Ciné-Kodak camera

The camera was initially available with either a 25 mm f/3.5 lens or a 25 mm f/1.9 lens; the lens was not interchangeable. The lens could be focused from 4 feet to infinity. In the early versions, there was a hinged door to cover the ports for the taking lens and the viewfinder when the camera was not in use (we see that in the photo).

Later versions (1927 on) were equipped for interchangeable lenses (the mount was unique to this camera). Only two lenses were available: the Kodak Anastigmat 25 mm f/1.9 and Kodak Anastigmat 78 mm f/4.5. Because the interchangeable lenses protruded from the camera case, the lens cover door was no longer practical, and was discontinued.

The film was on a spool, and the camera could be successfully loaded in a typical illuminated indoor setting (that is, it was best not done outdoors in sunlight).

The camera included an internal viewfinder, which could be switched between “waist level” and “eye level” modes. (The earliest version had the eye level mode only.) As with many waist level viewfinders, the image seen in that mode was reversed left-to-right.

The aperture and, in later models, the focus distance were set from the rear of the camera with substantial levers. Also on the rear is a “footage remaining” indicator somewhat in the style of a pressure gauge. It did not operate by “feeling” the remaining film. Rather, the

user set it when the film was loaded to the amount of film on the supply spool (normally either 50 ft or 100 ft). It was then decremented by the camera mechanism as it ran (the amount of film consumed being precisely relatable to the turning of the feed sprocket).

The “intended” frame rate of this “system” was 16 fr/s, but this was in no way regulated by the camera. Rather it was determined by the rate at which the photographer turned the crank—the recommended two revolutions per second yielded 16 fr/s.

At that frame rate, the total shot time for a 100 ft spool of film was a little over 4 minutes.

This camera was originally marketed in an “outfit” comprising the camera, a rather robust tripod designed for the purpose, a projector (the projectors were a critical part of this story but nevertheless I will ignore them in this article), a screen, and a film splicer so one could do editing and aggregation and recover from accidents with the film. The price for this outfit, with a 25 mm f/3.5 lens (in 1923) was \$335.00, which one historian has noted was about that of a Ford Model T coupe with electric starter at the time. So we see that this “revolution” did not actually bring home movies to “Everyman”.

Starting in 1924, the camera was sold separately, at \$125.00 when equipped with a 25 mm f/3.5 lens and at \$200.00 when equipped with a 25 mm f/1.9 lens.

The cost, size, weight, and need for continuous cranking were off-putting for many potential amateur cinematographers. But nevertheless this camera gave a powerful start to the new art form of “home movies”.

Kodak later introduced a motor drive attachment for the camera, using an electric motor powered by a rechargeable “battery” (wet cell, of course). It was cumbersome and really impractical, and was withdrawn from the market after a short while.

The Ciné-Kodak Model A was made through 1930.

3. MOVING ON

3.1 The Ciné Kodak Model B camera

Kodak’s next move was the introduction, in July, 1925, of the Ciné-Kodak Model B camera, which also used 16 mm film, spool loaded. This camera was smaller, lighter, and more convenient to use than the original Ciné-Kodak (which from then on became known as the Ciné-Kodak Model A). Figure 2 shows a typical early version of the Model B (this from our personal collection).



Figure 2. Kodak Ciné-Kodak Model B

The biggest convenience factor of the Model B was that it had a motor drive, using a spring motor. The motor was wound with a crank, and one winding was sufficient for a little less than one minute of shot time. As with its predecessor, it could be loaded with either a 50 foot or 100 foot spool of film. An ingenious film handling system allowed the housing to be more compact than that of the (then called) Model A while still accommodating the 100 foot supply spool and the matching takeup spool.

The camera was initially provided with a fixed focus 20 mm f/6.5 lens. In April, 1926, a version became available with a fixed focus 20 mm f/3.5 lens. In June, 1927, a version was introduced equipped with a focusable 25 mm f/1.9 lens.

In 1928, the camera became equipped for interchangeable lenses (the mount was unique to that camera). Two lenses were available, optically corresponding to the two lenses available for the interchangeable lens version of the Model A: a 25 mm f/1.9 and a 78 mm f/4.5 (presumably both focusable).

In June, 1927, the Ciné-Kodak Model B, with a fixed focus 25 mm f/1.9 lens, sold for \$150.00, considered equivalent to over \$4,400 in November, 2017..

The Model B was made until June, 1931

3.2 The Ciné-Kodak Model BB

The Ciné-Kodak Model B, while much more practical than the initial Ciné-Kodak (“Model A”) was still rather large, heavy, and expensive, all off-putting to many potential home movie makers.

To attack this problem, Kodak in April, 1929 introduced the Ciné-Kodak Model BB, which was significantly smaller and lighter than the Model B, and a bit less expensive.

A major factor in the smaller size of the Model BB was that it only accommodated 50 foot reels of film. But beyond that, although the film handling system followed closely the design used in the Model B, the layout was “tightened up”, further contributing to the smaller size of the Model BB.

Figure 3 shows a typical Ciné-Kodak Model BB (from our collection).



Figure 3. Ciné-Kodak Model BB

The Model BB was arranged from the outset for interchangeable lenses, using a mount that was only used on this model and the later Model K. It was normally supplied equipped with either a focusing 25 mm f/1.9 lens or a focusing 25 mm f/3.5 lens. We see the f/1.9 lens on the unit in the photo. A focusing 78 mm f/4.5 telephoto lens was also available.

An odd feature of the Model K was that, by pressing a button on the side of the camera, it could be made to run at 8 fr/s rather than the normal 16 fr/s. The object of this was to double the exposure time (to about 1/16 s) and thus allow pictures to be taken under lower light conditions than would otherwise be practical.

Of course the result was that the motion of the subjects would be at double speed when the film was projected. The manual urges that when circumstances required the use of this mode that subjects should be cautioned (and I quote verbatim) “to move *very, v-e-r-y slowly and deliberately.*”

But of course if one was filming a drama, or a comedy. and at one point wanted the characters to move at abnormal speed, this feature could be used for that as well.

But a 50 foot roll of film only allowed about 2 minutes of shooting, and many potential users found this too limiting. As a consequence, the model BB was only made through May, 1932.

In April, 1929, when it was introduced, the Ciné-Kodak Model BB, equipped with a 25 mm f/1.9 lens, sold for \$140 (considered equivalent to over \$2,000 in November, 2017).

3.3 The Ciné-Kodak Model K

In July, 1930, Kodak introduced the Ciné-Kodak Model K, which accommodated up to 100 foot rolls (just as did the model B). But because this camera followed the design principles of the Model BB, it was significantly smaller (and lighter) than the Model B. In Figure 4 we see a typical Ciné-Kodak model K (this one from our collection)

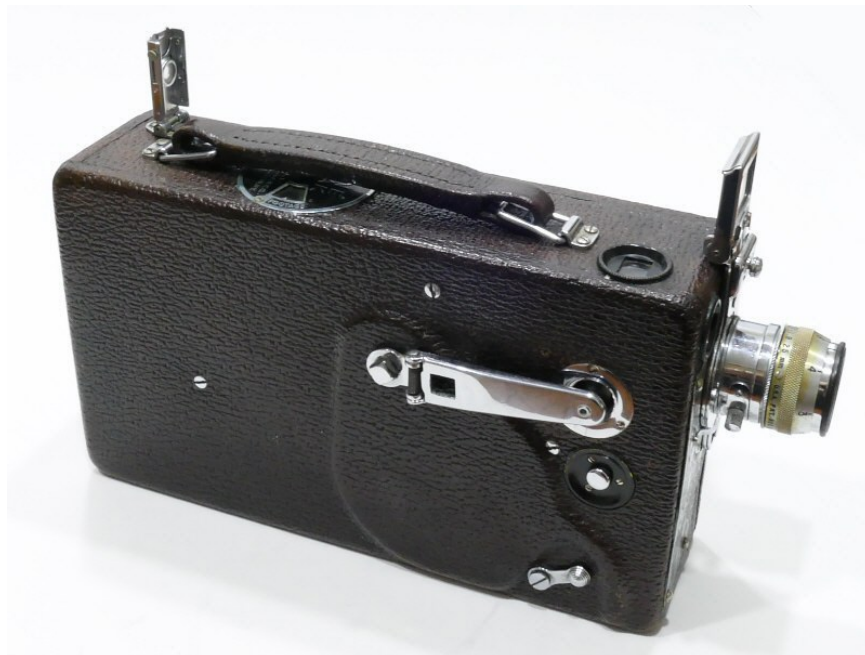


Figure 4. Kodak Ciné-Kodak Model K

The Model K, like the Model BB, was arranged for interchangeable lenses, using a mount that was only used on this model and the Model BB. It was normally supplied equipped with either a focusing 25 mm

f/1.9 lens or a focusing 25 mm f/3.5 lens. We see the f/1.9 lens on the unit in the photo. A focusing 78 mm f/4.5 lens was also available.

Like the Model BB, the Model K had a button that would change the frame rate to 8 fr/s.

The Model K was very popular with amateur movie makers, and was manufactured until May, 1946.

In July, 1930, when it was introduced, the Ciné-Kodak Model K, equipped with a 25 mm f/1.9 lens, sold for \$150 (considered equivalent to over \$2,200 in November, 2017).

In figure 5 we see the players in this evolution, which started with the Model B (with a 100 foot capacity), then the Model BB, with 50 foot capacity, and then the Model K, again with 100 foot capacity, but still smaller than the Model B (all cameras from our collection).



Figure 5. Ciné-Kodak Models (from the front) BB, K, and B

4. THE NEXT STAGE OF THE REVOLUTION–8 mm FILM

4.1 Ciné-Kodak Eight–Model 20 and 25

The next stage of the revolution came in July, 1932, when Eastman Kodak introduced 8 mm motion picture film and a lovely small spring wound camera to use it, the Ciné-Kodak Eight. This structure resulted in lower cost, weight, and size for a camera of given capabilities and significantly lower cost for film and processing. Figure 6 shows a typical Ciné-Kodak Eight (from our collection).

There was more to the development of usable 8 mm motion picture film than might be thought. Most critically, because of the smaller image size (and thus the greater enlargement in projection), a film with finer grain than the 16 mm film was needed to maintain image quality. It was also necessary to develop cost-effective ways to more precisely register the film both in the camera and in the projector, again because the greater magnification in projection would make much more noticeable to the viewer any unsteadiness of the image.



Figure 6. Ciné-Kodak Eight Model 25

Largely to be able to take advantage of film production and film processing machinery developed for 16 mm motion picture film, the new system used the “double 8 mm” system. Here the film as supplied had an actual width of 16 mm, but the sprocket holes on each side were at half the pitch they would have had on film to be used in 16 mm cameras.

The film was run once through the camera, during which the frames, with about half the linear dimensions of the frames in 16 mm cinematography) would be laid down on one side of the film centerline. When this “pass” was done, the film (now on the takeup reel) was removed and replaced in its original “supply spool” position, other side up. It was then run through the camera again, the frames being laid down opposite those from the first pass.

At the processing laboratory, the film was developed intact. Then the film was slit lengthwise, giving two lengths of actual 8 mm wide film.

These were spliced end to end and returned to the user on a reel, ready for projection.

The most common film “package” in this mode had 25 feet of film (plus some extra on each end to be used for threading and to protect the roll from the intrusion of light during handling). Thus the result for the user was a 50 foot movie, with a running time of a little over four minutes.

The Ciné-Kodak Eight was initially produced in two variants, the Ciné-Kodak Eight Model 20 (equipped with a fixed focus 13 mm f/3.5 lens) and (as of July, 1933) the essentially identical Ciné-Kodak Eight Model 25 (equipped with a fixed focus 13 mm f/2.7 lens) (seen in the figure above). The Model 25 was made through November, 1946.

A credible report is that the main drive spring in these cameras is in a sealed canister lubricated with whale oil.

In July, 1933, when it was introduced, the Ciné-Kodak Eight Model 25, equipped with a 25 mm f/1.9 lens, sold for \$45 (considered equivalent to nearly \$850 in November, 2017).

4.2 Ciné-Kodak Eight–Model 60

In October, 1932, the Ciné-Kodak Eight Model 60 was introduced. It offered interchangeable lenses, using a mount that was unique to this camera (although its basic principle was used on two other mounts). It was furnished as standard with a 13 mm f/1.9 lens, focusable from 2 feet to infinity. An available alternative was a focusing 38 mm f/4.5 telephoto lens. Otherwise the camera was almost indistinguishable from the Model 20 and 25. It was made through March, 1947.

In October, 1932, when it was introduced, the Ciné-Kodak Eight Model 60, equipped with a 25 mm f/2.7 lens, sold for \$79.50 (considered equivalent to almost \$1,500 in November, 2017).

5. MAGAZINE LOADING

Loading these cameras involved “threading” the film through the transport mechanism, a slightly tedious process that was not attractive to the user. The process was more difficult in the 8 mm cameras than the 16 mm cameras because the film path was more “congested” in the 8 mm camera. Overall, the prospect of having to thread the film repeatedly kept many people away from adopting this new art form.

5.1 The Magazine Ciné-Kodak

To mitigate this problem, Eastman Kodak, in January, 1936, introduced the Magazine Ciné-Kodak, a camera that utilized 16 mm

film that was preloaded in a light-tight magazine. Loading the camera was now as simple as just placing a fresh magazine in the camera and closing the loading door.

Figure 7 shows a typical camera of this model (from our collection).

The magazine held 50 feet of 16 mm film, for a total shot time of a little over two minutes.

The camera was arranged for interchangeable lenses (using, of course, a mount that was unique to this model and some later siblings and cousins, which came to be known as the "Type M" mount), and was furnished as standard with a 25 mm f/1.9 lens. There were several alternative lenses available.

A folding open viewfinder was provided, integrated with the carrying handle. It would be erected for use by raising the handle. There were various arrangements for making the field of view of the viewfinder match that given the camera proper by the lens in place.



Figure 7. Kodak Magazine Ciné-Kodak

This model was made until September, 1945. It was then superseded by the almost indistinguishable Ciné-Kodak Magazine 16. That model was made through December, 1950.

In January, 1936, when it was introduced, the Magazine Ciné-Kodak, equipped with a 25 mm f/1.9 lens, sold for \$79.50 (considered equivalent to almost \$2,500 in November, 2017).



Figure 8. Kodak Magazine Ciné-Kodak Eight Model 90

5.2 The Magazine Ciné-Kodak Eight Model 90

Moving this new boon to a wider pool of prospective users, Eastman Kodak, in June, 1940, introduced the Magazine Ciné-Kodak Eight Model 90, seen in figure 8 (from our collection).

Again, this used an easily loaded preloaded magazine. Following the lead of the earlier spool loaded 8 mm cameras, this used the double 8 mm scheme.

The magazine contained 25 feet of double 8 mm film. It was inserted in the camera and the loading door closed. After all 25 feet of usable film had been exposed in its "first pass", the camera was opened, the magazine removed and then replaced the other way to, and the door closed. The camera was then ready to give the film its second pass.

As with a 25 foot roll of double 8 mm film, the total shot time for an 8 mm magazine was a little over four minutes.

The camera was arranged for interchangeable lenses, with the Type M mount. This mount was somewhat less clumsy than the interchangeable lens mount used on the Ciné-Kodak Eight Model 60, Still its latch feature was rather obtrusive. (In the patent for this

mount, the inventor says that one objective was for the latch to be of “small and pleasing contour”.)

Provided as standard on the camera was a 19 mm f/1.9 lens, focusable from 2 ft to infinity.

This camera was produced until July, 1946, when it was replaced by the almost indistinguishable Ciné-Kodak Magazine Eight, which was made until March, 1948.

In January, 1936, when it was introduced, Magazine Ciné-Kodak Eight Model 90, equipped with a 25 mm f/1.9 lens, sold for \$79.50 (considered equivalent to almost \$2,500 in November, 2017).

6. BACK TO 16 mm

6.1 The Ciné-Kodak Special

The announced scope of this article relates to “home movies”, but I will go a bit outside that box in this section. Although the film and camera systems I have described so far were originally intended to bring cinematography to Everyman’s backyard, it was recognized that there was great potential to adopt the 16 mm medium for industrial, commercial, scientific, and educational cinematography.

To cater to that newly recognized market in fine style, Eastman Kodak in April, 1933 introduced the Ciné-Kodak Special camera. Figure 9 shows a typical configuration of this model.



Figure 9. Kodak Ciné-Kodak Special

It was a wondrous machine with many advanced features and capabilities. It used a nicely machined aluminum housing (actually in two sections, as we will see shortly).

In the Special, the film (16 mm) was carried in a replaceable film magazine (actually called by Kodak, except in the first few years, a “film chamber”), which was actually half the camera. It included the film supply and takeup spool areas, the film transport system, and the exposure gate. There were two types, one that accommodated a 100 foot film spool and another (giving the camera the iconic “movie camera” profile) that accommodated a 200 foot film spool.

The camera has a two-position lens turret. The lenses are interchangeable, using a mount that was unique to this model (although its locking principle was used on a couple of other mounts).

The Ciné-Kodak Special was usually supplied equipped with a 25 mm f/1.9 lens. A common second lens was the 15 mm f/2.8 lens.

A problem with the turret system was that the lens axes were parallel. That meant that if both lenses had large front elements, or were equipped with serious hoods, they would be physically incompatible, or if one lens had a wide field of view, and the other was physically long, the second one would intrude into the field of view of the first one. (We might wonder why nobody saw that coming.)



Figure 10. Kodak Ciné-Kodak II 16 mm camera

In April, 1933, when it was introduced, the Ciné-Kodak Special, equipped with a 25 mm f/1.9 lens and a 100 foot film chamber, sold for \$375 (considered equivalent to over \$7300 in November, 2017).

6.2 The Ciné-Kodak Special II

This problem was overcome in the Ciné-Kodak Special II, which superseded the Ciné-Kodak Special in August, 1948. We see a typical one in figure 10.

It differed from the earlier model primarily in that the turret was now “roof shaped”, with the axes of the two lenses diverging, keeping them out of each other’s way (physically and optically). (The front face of the camera, against which the turret sat, was angled so that the active lens axis was “straight ahead”.) The principle can be seen in figure 11, adapted from a sketch in the patent.

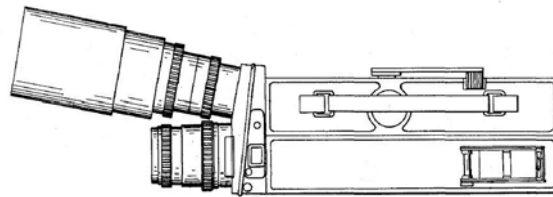


Figure 11. Ciné-Kodak Special II—Turret geometry

The camera has a two-position lens turret. The lenses are interchangeable, using a different mount from that used on the Ciné-Kodak Special, this one known as the Type S mount.

This mount was designed by Kodak to be a “universal” mount for all their ciné lenses. And it indeed took that role, adapters being made for almost all interchangeable-lens Ciné-Kodak cameras so that they could utilize any of the substantial stable of ciné lenses made with the Type S mount. But oddly, the Ciné-Kodak Special was the only Kodak camera to directly use this mount.

The Ciné-Kodak Special II was made until March, 1961.

In August, 1948, when it was introduced, the Ciné-Kodak Special II, equipped with a 25 mm f/1.4 lens and a 100 foot film chamber, sold for \$893 (considered equivalent to almost \$9000 in November, 2017).

6.3 The Ciné-Kodak K-100

In March, 1955, Kodak introduced the Ciné-Kodak K-100 camera, which is perhaps the last camera (in terms of the date of introduction) to bear the Ciné-Kodak marque.¹

¹ Another contender for that “honor” is the Ciné-Kodak Medallion-8 magazine load 8 mm movie camera, also introduced in 1955.

This is an elegant and capable “advanced amateur” 16 mm roll loading camera. In its flexibility and capability it is only second to the Ciné-Kodak Special series.

The initial version had provision for a single lens (interchangeable). In March, 1956, the second version was introduced, this having a three-lens turret (and formally called the Ciné-Kodak K-100 Turret camera, or sometimes the Ciné-Kodak K-100T).

In figure 12 we see a typical turret version (this from our collection). (It is only equipped with two lenses.)



Figure 12. Kodak Ciné-Kodak K-100 Turret camera

The camera uses the Type C lens mount, a mount that had been originally developed by Bell & Howell, and which had been used over many years for ciné cameras made by several manufacturers. But the K-100 is the only Ciné-Kodak camera to use that mount.

The three position turret's face is “dished”, convex outward, to minimize the risk that one lens would interfere, physically or optically, with another. The principle is exactly the same as for the turret of the Ciné-Kodak Special II, as illustrated in figure 11.

The camera has an internal viewfinder, with adjustable vision correction. The front lens of the viewfinder is external, with a separate one in the turret for each of the taking lenses. These viewfinder lenses each give the viewfinder a field of view matching the field of view of the camera with that taking lens in use.

In March, 1956, when it was introduced, the Ciné-Kodak K-100, turret version, equipped with a 25 mm f/1.9 lens, sold for \$315 (considered equivalent to almost \$3000 in November, 2017).

This was the last (in terms of the year of introduction) Kodak 16 mm camera to bear the “Cine-Kodak” name and, except for the Kodak Reflex Special camera, the last Kodak 16 mm movie camera.

6.4 The Kodak Reflex Special

Here I diverge even farther from the “home movies” theme of the article, but the Kodak Reflex Special (introduced in October, 1961) was in fact the very end of the trail for Kodak in the 16 mm camera field, and I think it deserves mention here.

In 1937, the German company Arri introduced a 35 mm studio camera (the Arriflex) with true reflex viewing. That means that the operator could continuously see, through an eyepiece viewfinder, the scene exactly as the lens was depositing it on the film (just as we do in an SLR still camera, except of course that there we can only do it before the shot is taken). The advantages of this in terms of precise framing and focusing were great, and soon this camera took an important place in 35 mm studio cinematography.



Figure 13. Kodak Reflex Special

In 1952, Arri introduced a 16 mm camera with this same feature. It soon became very important in demanding 16 mm cinematography. As such, it offered serious competition to Kodak’s Ciné-Kodak Special, their flagship 16 mm camera. In reaction to this challenge, Kodak

developed its own continuous reflex-viewing camera, the Kodak Reflex Special. In figure 13 we see a typical configuration of this camera.

The camera is electric motor driven. There were several different motor drive assemblies, readily interchangeable (made both by Kodak and by other companies). They varied to suit the context of operation.

A spool of film up to 100 feet could be mounted in the camera itself. The supply and takeup spool are mounted "face to face", the same clever scheme used in the Ciné-Kodak Model B of the mid 1920s and its direct descendants. When a greater capacity is needed, a 400-foot or 1200-foot film chamber ("magazine") can be mounted atop the camera proper (the picture shows the 400 foot chamber in place).

The standard model had a three-position turret. A large lever locks and releases the turret. (Well, with it unlocked, you have to pull it out to turn it, then push it back in, then move the lever to the locked position!) The lenses are mounted with a mount (Type R) unique to this model (so what's new?). The lenses push straight in, oriented with a pin that goes into a slot in the mount. Then a pair of levers (per lens position) lock the lens firmly into place. All very handy? Not so much.

A head for direct recording of sound in-camera (magnetic) could be fitted at the factory. It went in the space in the camera proper where the 100-foot film supply arrangement would otherwise go. 100 foot rolls could then be readily mounted in the "400 foot" film chamber.

The reflex viewing function works (as in the Arriflex) by having the front face of the opaque sectors of the rotary shutter mirrored so they are in fact mirrors. The shutter is placed at a 45° angle to the optical axis.

During the part of the frame cycle when the film is being moved between frames, the shutter (in the usual way) blocks any light from the lens from going to the film. But since the shutter blades are mirrored, during that phase the image-forming rays from the lens are directed to the side, where they form the image on a ground glass screen. The operator then views that through an eyepiece optical system with a mirror to turn the corner.

We see this in figure 14 (adapted from a figure taken from the Kodak promotional brochure for the Kodak Reflex Special).

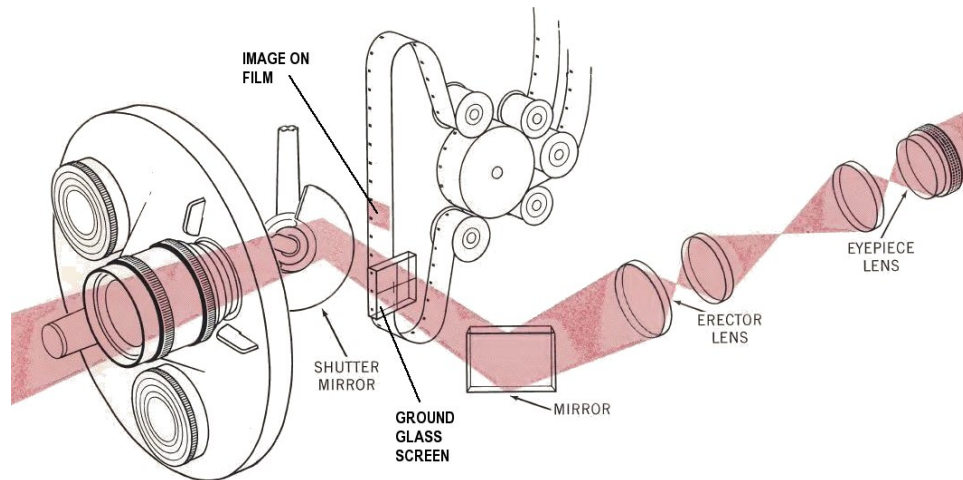


Figure 14. Kodak Reflex Special—reflex viewing system

So that the “active” portion of the shutter could be fit into the small space between the lens and the film, and because the shutter was mounted with its axis at a 45° angle to the lens axis, the shutter had to be located so its “other” portion would extend beyond the front of the camera body proper (on which the turret sat). It was accommodated there by a small “doghouse”. That in turn was accommodated by a tent-like housing in the center of the turret.

On 1931, when it was introduced, the Kodak Reflex Special, equipped with the “synchronous” motor drive, a 25 mm f/1.4 Ciné Ekton lens, and a 400 foot film magazine, sold for \$1,895 (considered equivalent to almost \$32,000 in November of 2017).

It seems that this machine never caught hold in the competition against such cameras as the Arriflex and the 16-mm version of the Mitchell (that, however, not being a reflex camera). It is reported that only a few hundred were ever made. The model was discontinued in 1968. And thus essentially came to an end Kodak’s place in the field of 16 mm cine cameras.

7. EXPOSURE RECKONING

7.1 Aperture “suggestions”

Of course, at the time “home movies” became practical, there were not exposure meters that were practical for use by amateur photographers. Instead, exposure reckoning (in most cases, choice of an aperture to use for a shot) was done by way of empirical guidelines, generally working from descriptions of the lighting conditions (“full sunlight”).

Of course the underlying “exposure equation” also takes into account the sensitivity of the film and the exposure time (“shutter speed”). But most operation was with a nominal frame rate of 16 fr/s, which

inevitably lead to a fairly consistent exposure time, perhaps 1/30-1/35 second. And at first there was only one kind of film used in this arena. So the presentation of the “guidance” came down to a simple list of descriptions of lighting conditions with a recommended aperture for each.

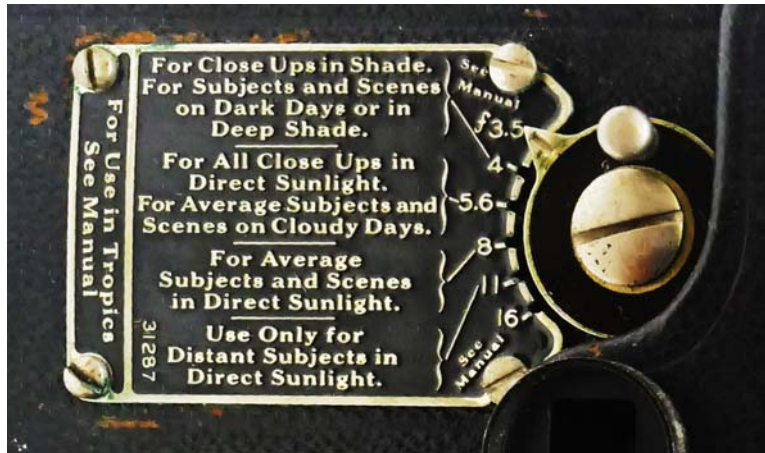


Figure 15. Aperture indicating plate (Ciné-Kodak Model B)

In addition to this being covered in often excruciating detail in the manual, starting with the Ciné-Kodak Model B, the Ciné-Kodak cameras had indication plates for the aperture settings that actually included, for each aperture, a description of the lighting situation for which that aperture would probably be suitable. In figure 15, we see one of these (from our 1927 Ciné-Kodak Model B).

7.2 Flies in the ointment

But this ointment would soon take on a couple of flies. For one thing, new kinds of film emerged, with different sensitivities, at first the “Ciné-Kodak Super Sensitive Panchromatic” film, whose sensitivity was evidently about twice that of the original Ciné-Kodak Panchromatic film.

Then Kodachrome color film was introduced, and there were two kinds, one for use under daylight illumination and one for use with photoflood lamps, but of course we could use a filter with the “daylight” flavor to use it under photoflood illumination, and we could use a (different) filter with the “photoflood” flavor to use it under daylight. And all of these combinations had different sensitivities.

Then, the more sophisticated cameras began to offer frame rates other than 16 fr/s, mostly greater rates intended for use in “slow motion” work. These gave different exposure times, which again affected the “suggested” aperture for any scene and lighting situation.

Thus the “scene descriptions on the aperture indicating plate” scheme soon became unworkable.

7.3 The Ciné-Kodak Universal Guide

So, in early 1940, Kodak introduced the Ciné-Kodak Universal Guide, an “exposure calculator” with a rotating dial that could be fitted with a slide-in card for the specific type of film being used. The descriptions of various scenes now appeared on that card. This then allowed the “advice” regarding exposure to be predicated on the actual type of film being used. And, for cameras offering different frame rates (and thus different exposure times), there were separate index arrows on the dial for each of them. We see a typical Universal Guide in figure 16.

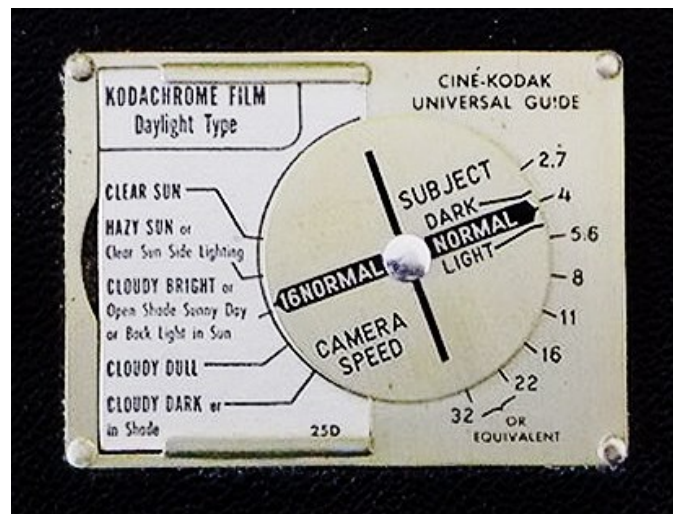


Figure 16. Ciné-Kodak Universal guide

New production of all then-current Ciné-Kodak models were equipped with this “calculator”, in a form that fit with the camera’s capabilities. And their aperture designation plates no longer carried the now often useless “lighting descriptions” for the various apertures, these now being on the film-specific card in the Universal Guide.

Owners of Ciné-Kodak cameras made before that time could, for a very nominal cost (\$1.00 in 1940) have their camera retrofit by the addition of a Ciné-Kodak Universal guide, it generally being riveted to the left side “door” of the camera (just as for an original factory installation).

When this was done, the aperture plate was (usually) removed and replaced with one not having descriptions of scene for the various apertures. In some cases, the space freed up was then used for identification of the camera model. In the case of the Ciné-Kodak Model B, that replacement plate, in the freed-up space, just carried the iconic “EKC” Eastman Kodak Company logo.

On the Guide itself, for a while it carried the name “Ciné-Kodak Universal Guide”, later “Cine-Kodak Universal Guide” (rare), later just “Universal Guide”, and finally just “Guide”.

7.4 A “step back” into a simpler time

An interesting “step back” occurred with the Kodak Medallion-8 movie camera, a compact 8 mm magazine camera intended for the casual user (introduced in March, 1957). Like all Kodak movie cameras of the era, it had a Universal Guide.

But it also had a very nice aperture setting facility with lighting situation descriptions for each aperture setting (read from a pointer on a small circular dial that rotated with the aperture setting wheel). What made this practical? For one thing, this camera did not offer different frame rates. But most importantly, by the time this camera was introduced, almost all “casual” movie photographers were using a single type of film: Kodachrome (the ASA 10 version).

Still, against the possibility that the user would be using some other type of film (perhaps one for the black and white films that were then available in the 8 mm magazine format), there were two alternate “pointers” on the dial that catered to film sensitivities 2 and 4 times that of ASA10 Kodachrome.²

We see this arrangement in figure 17.



Figure 17. Kodak Medallion 8 movie camera aperture control

So, as they say in Texas, “what goes around comes around.” And the users of the Kodak Medallion 8 had the benefit of a “simple” exposure

² Handy because not long after (1961) a new kind of Kodachrome film, Kodachrome II, with a sensitivity of ASA 25, became available for use in this kind of camera.

planning tool as much earlier enjoyed (for a while) by users of such iconic cameras as the Ciné-Kodak Model B.

8. THE BROWNIE MOVIE CAMERAS

In February, 1900, Kodak introduced the Brownie camera, an inexpensive still camera with a cardboard case (leatherette covered), using 117 type roll film. The name is said to be drawn from the “brownie”, a mischievous but kindhearted fairy-like domestic sprite from folklore, popularized in a series of cartoon strips and books by Palmer Cox. But an interesting coincidence is that the Kodak Brownie camera was designed by Frank A. Brownell! (We suspect his childhood nickname was not “Red”.)

Over the years, Kodak used the “Brownie” marque for an enormous range of inexpensive still cameras.

In February, 1951, Kodak introduced the Brownie Movie Camera, an inexpensive movie camera using 8 mm roll film.

There ensued over the years a plethora of “Brownie” movie camera models and variants. In figure 18 we see a typical one, The Brownie 8 mm Movie camera II (“Improved version”), introduced in March, 1960 (from our personal collection).



Figure 18. Brownie 8 mm Movie Camera II (“Improved”)

We note that it has essentially the same aperture setting system, with exposure “suggestions” based on textual scene lighting descriptions, that we saw on the Kodak Medallion 8 (see figure 17).

This by the way has what I consider to be the “nicest” run control of all the Kodak movie cameras in our collection.

We will not follow the Brownie movie camera line further here as it really falls outside the announced time window of this article.

9. FILM PROCESSING

Originally, the price for a Kodak roll of film included the cost of processing by Kodak in any one of its several processing laboratories. The user could put the can of film back in its original carton and hand it in at a Kodak dealer to be sent off for processing. Alternatively, the film (back in its original carton) could be mailed to the Kodak laboratory of choice. Early Ciné-Kodak camera manuals recommend tying a string around the carton to hold it closed.

In the case of, for example, 8 mm roll film, the original carton was not really too suited to this, owing to the limited space for the destination and return addresses. To overcome this problem, Kodak made available (through dealers) various kinds of mailing envelopes (or in some case, a fabric bags with an attached tag for the addresses) to be used to send the film to the Kodak Processing Laboratory.

Later (in 1954), a court decision prohibited Kodak from embedding the price of processing by Kodak in the film sale price. The issue was that this practice had allowed Kodak to unfairly compete against other processing laboratories, since the Kodak film buyer was already forced to pay for Kodak processing.³ The change took effect in early summer of 1956.

A further aspect of the decision was that Kodak would be obligated to (at a price that was fair to Kodak) license other processors to use the patented Kodak processing systems, to sell them the chemicals and equipment required for the processing of the more sophisticated Kodak films (such as Kodachrome), and to offer (at fair fees) consultation with those processors as to how to establish their film processing lines for Kodak films.

Users of Kodak film could take it to a photo dealer, who would send it off to the user's choice of processing laboratories. Of course, the user might choose Kodak for that. Kodak's advertising aggressively suggested that.

To make the process easier for users who did want Kodak to process their film, and who has been used to mailing their film to the Kodak laboratory for processing, Kodak shortly introduced a new system. The user could purchase, from a photo dealer, a "prepaid processing label", which would be put on the film carton when it was sent to Kodak. Film arriving at a Kodak laboratory with such a label would be processed and returned to the user. Presumably competing processing laboratories could offer the corresponding mode for their services.

³ That prohibition was lifted in 1995, the court having been convinced that there was no longer any need for it..

In any of these cases, the user shortly received (by mail, if the film was mailed in by the user) processed film on a nice reel.

But of course as before, the original film carton was not always well suited to this use.

A bit later, the normal mode for users wishing to have Kodak process their film was to purchase a Kodak “prepaid processing mailer”, a sturdy envelope of a suitable size (or, in some cases, at certain times, a fabric bag with attached tag) to carry a can or spool of exposed film of a certain type. The exposed film in its can was placed in this mailer and mailed to Kodak. Other processing laboratories also offered prepaid processing mailers.

In one version of the Kodak “bag” form, the tag had an “underprint” pattern to deter counterfeiting of the mailer (which after all, had a monetary value).

Figure 19 shows a fairly modern (1978, I think) typical Kodak prepaid processing mailer (this one actually for a 36 exposure roll of Kodachrome or Kodak Ektachrome 35 mm still camera film).

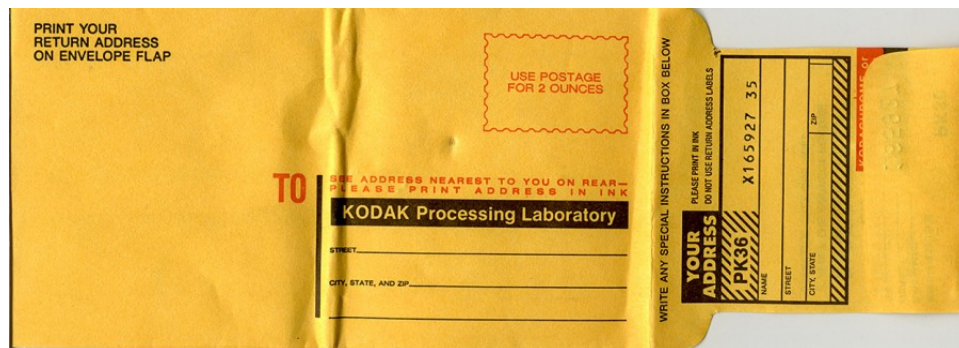


Figure 19. Kodak prepaid processing envelope—front

Photo by Ken Steinhoff

This was a functional improvement compared to the older practice involving the original film carton since, especially for 8 mm roll film, that was so small that it was difficult to put on it the address of the chosen Kodak laboratory (there were several, in different parts of the country) and also the name and address of the user to whom the developed film was to be returned. The envelopes were able to have a much better layout and system for this.



Figure 20. Kodak prepaid processing envelope—back

Photo by Ken Steinhoff

In figure 20 we see the back of the envelope with the addresses of the various Kodak processing laboratories (it was advantageous, from a mail transit time basis, to send it to the nearest one).

I remember several of those addresses well!

There were many variations in the actual physical arrangements of these mailers, both to accommodate different kinds and shapes of film, and just over the passage of time.

A further wrinkle involved pre-loaded magazines. Under the old policy, these were considered to be (and were marked as) the property of Kodak. When one was sent in for processing of the film therein, Kodak recovered it and typically rehabilitated it and used it again for a “new” magazine for sale.

After the policy change, the magazines were still the property of Kodak, but now the price of the film included a deposit on the magazine (in 1956: \$0.50 for an 8 mm magazine, \$0.85 for a 16 mm magazine). If one paid (perhaps via a prepaid mailer) to have Kodak process the film, the price included credit for “refund” of that deposit.

If one sent the film to a non-Kodak laboratory for processing, that laboratory recovered the magazine and was able to return it to Eastman Kodak and receive the “deposit”, and again this was presumably figured into that laboratory’s price for processing.

10. THE “CINÉ-KODAK” NAME

So far most of the cameras we have discussed in any detail here bore the “Ciné-Kodak” (or, later, “Cine-Kodak”) name.

The word "ciné", not surprisingly, is taken from the French, a shortened form of *cinématographe*, a term popularized by the Lumière brothers, the pioneers of cinematography. That term was drawn from the Greek words for "motion" and "write".

For quite a while, Kodak was rigorous about using the French spelling of "ciné", but in 1947 decided to de-Gallicize the word by subsequently spelling it "cine".

In 1958, Kodak stopped using "Cine-Kodak" as the initial part of camera model names and instead (mostly) began using "Kodak Cine". Only a few models, all 8 mm, bore names of that form⁴. From 1959 on, all Kodak Movie cameras⁵ had model names just beginning with "Kodak."

I'm sure there is a fascinating story behind the corporate decisions behind these changes. It may be that the word "ciné" had become associated with "professional" movie making, and Kodak's movie camera products were primarily intended for the "amateur" photographer, who might be "put off" by the word "ciné" (or even "cine")*.

Various odd thing happened as these changes struck. One is not really a result of a "change", but in 1948 and 1949, two cameras that had "Ciné-Kodak" in their names, but not at the beginning, had their names changed to have "Ciné-Kodak" (or "Cine-Kodak") at the beginning⁶.

In the "Medallion" family of 8 mm magazine load cameras, the first pair of models (September, 1956) had the name "Cine-Kodak Medallion-8", but the second pair of models (March, 1957) had the name "Kodak Medallion-8".

And after this, when Kodak needed to speak of this model family collectively, as perhaps to discuss the differences among its four member models, it was as the "Medallion" cameras.

⁴ The Kodak Cine Scopemaster (12/1958-12/1962), the Kodak Cine Automatic (04/1959-06/1960), and the Kodak Cine Automatic Turret (04/1959-02/1963)

⁵ Other than those whose model name began with "Hawkeye" or "Brownie" (genres not represented in this article).

⁶ The Magazine Ciné-Kodak (01/1936) became the Ciné-Kodak Magazine 16 in 09/1945. The Magazine Ciné-Kodak Eight Model 90 (06/1940) became the Cine-Kodak Magazine Eight in 12/1955 (the word "cine" having been de-Gallicized in the meantime).

11. AND THEN . .

Of course, while all this was going on, competitive camera manufacturers got it the “home movie” game, many of them with great success. And Eastman Kodak continued to develop new models to satisfy various market needs. But we must leave this story now, with the home movie *milieu*, and Kodak’s participation in it, robust.

12. REISSUE

The article is reissued principally to:

- Provide an enlarged description of the Kodak Reflex Special camera.
- Provide information on the original cost of more of the cameras discussed.

13. ACKNOWLEDGMENTS

Many thanks are due to Alan Katelle, whose monumental book *Home Movies—A history of the American Industry, 1897-1979* contains a wealth of information on the cameras I discuss above, including accurate information on their dates of manufacture.

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