GRAFLEX HISTORIC QUARTERLY

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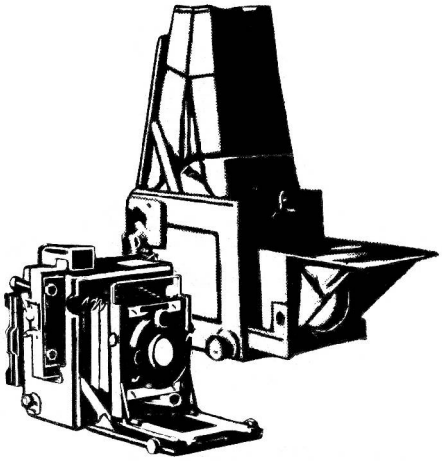


VOLUME 12 ISSUE 3 **THIRD QUARTER 2007**

FEATURES

Evolution of the Graflex Focal Plane Shutter

By James Flack

The concept of the Graflex focal plane shutter traces its origins to the late 19th century, yet the focal plane shutter is an important feature of many sophisticated cameras today. Along with the introduction of dry plates in the 1870s and then roll film in the 1880s, the "speed" of photographic emulsions steadily improved. Faster emulsions enabled photographers to use smaller apertures to improve image sharpness and depth of field and/or faster shutter speeds to capture a clear image of a subject in motion. Exposures no longer required seconds or minutes, and a picture taken at a shutter speed of a half-second or less came to be called an "instantaneous" photograph.

As emulsion speeds continued to improve, accurate and reliable fast shutter mechanisms became a necessity. At first, shutters were designed as add-on accessories to retrofit existing studio and field cameras, and quite a variety of novel shutter designs were developed, patented and marketed. One in particular is worth noting because it was developed very early, was widely adopted, and it may be argued that it was an ancestor of the Graflex shutter: the Thornton-Pickard Roller-blind Shutter. This apparatus was comprised of two pieces of opaque cloth (each somewhat larger than the front lens element) connected by two cloth ribbons at the outer edges. The cloth shutter was wound around one roller against spring tension that, if released, would cause the shutter to wind itself around the opposite roller. This entire apparatus was packaged within a little wooden box designed to fit over the front of a camera lens or just behind it. See Figure 1.

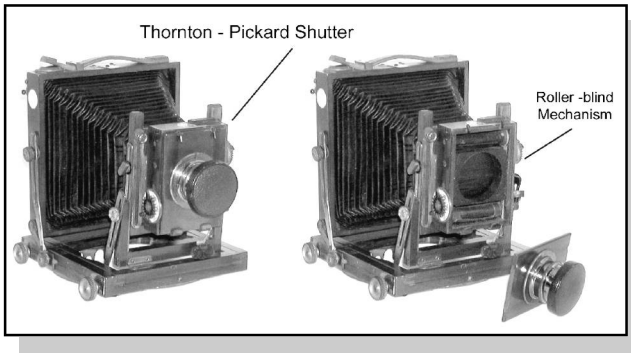


Figure 1. Thornton-Pickard Roller-blind Shutter

When the shutter was "cocked" by pulling downward on a string, the shutter cloth was wound around one roller against spring tension until the opaque cloth at one end blocked light entering the front lens element. When released, spring tension quickly pulled the shutter cloth from one roller to the other. When the open segment between the two opaque cloth panels passed over the lens, light was briefly allowed to enter. The shutter cloth continued to be wound from one roller to the other until the second opaque panel stopped over the opening to block light entering the lens again.

The space between the two opaque cloth panels was fixed by the length of ribbon along the edges and large enough to completely open the lens aperture. Thus, the shutter could be "cocked" half way so that the space between the two opaque panels was in front of the lens, allowing the photographer to use his camera's ground glass for composition and focusing. In this design, the only way to adjust shutter speed was to change the spring tension which affected the rate that the cloth shutter was wound from one roller to the other.

As I mentioned, there were quite a large number of different shutter designs developed as plate and film speed improved. There were various flapping doors, sliding guillotines, moving leafs, etc., and they were mounted in front of the lens, behind the lens and even between the lens elements. Eventually, many shutter designs were incorporated into new cameras, rather than just sold as add-on accessories. It would be a diversion

from this article to get too deeply into comparing the technical advantages and disadvantages of the various design approaches.

However, those who did analytically compare shutter designs concluded that having the shutter placed very close to the film plane was the most "optically efficient" design. In 1888 a German scientist, Ottomar Anschütz, developed and patented a variable slit shutter that moved across the focal plane of the camera directly in front of the film or plate. Its design could be said to derive from the concept of the Thornton-Pickard Roller-blind Shutter but with several very significant improvements. Most important, the opaque cloth shutter material was as large as the film size and moved on rollers very close to the film plane. There was an adjustment for spring tension, just as in the T-P design, but there was also an adjustment to control the width of the gap between the first opaque cloth panel and the second. By varying both the spring tension and the size of the opening, this design enabled a wide range of shutter speeds to be selected. As film speeds continued to improve and, with the advent of photographic pictures printed in newspapers, stop-action instantaneous photographs became an important tool as the profession of press photographer emerged. The shutter designed by Ottomar Anschütz was incorporated into a hand-held folding strut type camera sold by the Goerz company of Berlin from about 1890 and became known as the Goerz Anschütz or Ango (**An**schütz -**Go**erz) press camera. See Figure 2.

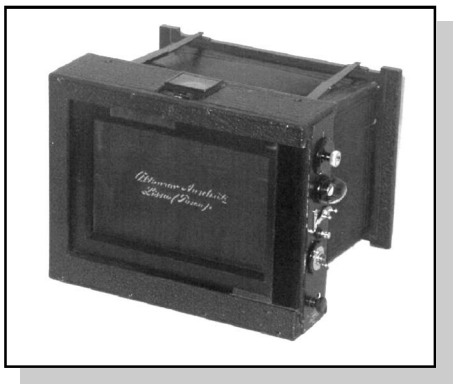


Figure 2. Ottomar Anschütz Focal Plane Shutter - 1888

The Goerz Anschütz camera was very sophisticated and very popular with professional and press photographers throughout Europe well into the 1930s. To achieve high shutter speeds across a large film plane, the distance between the first and second opaque cloth was often only a fraction of the total size of the film or plate. It was possible to carefully focus the camera using its ground glass, but only by setting the distance between the shutter cloths to the maximum and then resetting them before making the exposure. Practically speaking, this method of focusing was rarely used. Typically, the focus was set by estimating distance to the subject, and the subject was framed through a viewfinder mounted atop the camera. So, in spite of the technical and marketing success of the Goerz Anschütz camera, there were still significant limitations in its design for broader classes of photography.

In 1887 William F. Folmer and Walter E. Schwing partnered to establish a manufacturing company in New York City related to the bicycle trade, which they incorporated in 1890 as the "Folmer & Schwing Mfg. Co." The bicycle was a vehicle of liberation for the youth of the emerging urban middle classes, and bicycle manufacturing was a growth business. At about the same time, mass production and mass marketing of photographic equipment were in full swing. Photography was often marketed to young people as a wholesome pastime linked to the popularity of bicycling, and a new category of light-weight self-casing cameras was specifically marketed as a "Cycle" style camera in popular print advertising.

A personal letter from W. F. Folmer reveals that their company added "a photographic side line during the summer of 1891," perhaps because of this general association of bicycles and cameras. The Folmer & Schwing Mfg. Co. product catalog in 1896 depicts a "4x5 Cycle Graphic Camera" on the back page, which sold for $25 with a Victor shutter and Rapid Rectilinear lens. According to Rudolf Kingslake's book, The Photographic Manufacturing Companies of Rochester, New York, their first cameras were probably produced by Scovill and Adams, but soon the Folmer & Schwing Mfg. Co. began producing cameras of their own design.

William Folmer was as much an inventor as he was a businessman. In 1901 he obtained his first U.S. patent (no. 686,045) for a curtain shutter, followed by another shutter patent (no. 763,173) in 1902. According to Eaton Lothrop's book, A Century of Cameras, the first version of the Graflex camera was in production in 1902. These early Graflex cameras had a complicated two-piece focal plane shutter with a variable aperture, much like the Anschütz shutter developed a decade earlier. William Folmer's Graflex camera design also incorporated a single lens reflex feature that overcame one limitation of the Goerz-Anschütz design, since the Graflex camera could be focused on a reflex ground glass that did not require the shutter to be readjusted before and after focusing. However, the early Graflex variable-aperture shutter was a complicated mechanism and just as troublesome as was the original Anschütz design.

In 1905 William Folmer was granted a U.S. patent (no. 843,140) for a novel and important variation of the cloth focal plane shutter concept. Rather than two opaque shutter cloths that could be set to vary the size of the opening between them, the new Folmer shutter design comprised a relatively long opaque shutter cloth, incorporating a sequence of progressively smaller openings at intervals along its full length. The mechanism to control two independently adjustable shutter cloths was eliminated.

Typically, a Graflex shutter cloth would have four or five openings. Any of the different openings in the cloth shutter could be selected using one control knob, and the speed that the opening passed across the film plane could be further controlled by adjusting a spring tension knob. This gave the Graflex camera a very broad range of shutter speed choices. The first opening would be larger than the film and could be set in an open position ("O") to allow through-the-lens composition and focus on a ground glass like a view camera or set in another position ("T") to be used for timed exposures. Each of the other shutter selections was indicated on the control knob by the actual width in inches of the slot opening being used (1½, ¾, 3/8, 1/8). There were also up to six levels of spring tension that could be selected on a second control knob. The smallest opening and highest spring tension could provide a very fast shutter speed. Although the maximum shutter speeds were not really quite as fast as the 1/1000 second indicated on the shutter controls, the Graflex camera had unparalleled capabilities for stop-action photography.

Figure 3 shows different shutter cloths from a variety of Graflex SLR camera models from 4x5 to 2¼ x 3¼ film formats.

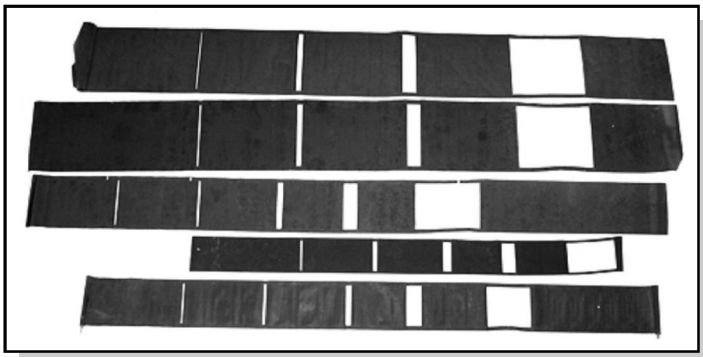


Figure 3.

To select a particular shutter speed, the photographer would refer to a matrix mounted on the camera showing the shutter speeds resulting from various combinations of shutter width and spring tension. The settings for selection of the shutter cloth opening and shutter spring tension are indicated by numbers or letters on their respective control knobs. Spring tension is indicated by a number (1, 2, etc.) or a letter on some models (A, B, etc.), and shutter opening is indicated by the width in inches (1½, ¾, etc.). The long shutter cloth would be wound until the appropriate shutter opening for the chosen shutter speed was poised in position ahead of the film plane. Then the spring tension would be adjusted according to its corresponding value on the shutter speed matrix to give the proper rate for the shutter cloth to traverse the film plane.

The Graflex focal plane shutter was incorporated into many camera styles manufactured by Folmer & Schwing Mfg. Co. and later by the Folmer & Schwing Division of Eastman Kodak. The Graflex focal plane shutter was a key feature that made the Speed Graphic the dominant camera used by professional press photographers for several decades. The Graflex shutter was even manufactured as a focal plane shutter accessory that could be used with large format studio and field view cameras. Figure 4 shows three early examples of different applications for the Graflex focal plane shutter designed by William Folmer: 1. an early Graflex SLR camera, 2. a Graflex focal plane shutter accessory for a 5x7 view camera, and 3. a 4x5 RB Cycle Graphic fitted with a Graflex focal plane shutter.

Cameras incorporating the focal plane shutter designed by William Folmer had many significant advantages over the Goerz Anschütz and other similar cameras with a focal plane shutter. First and most important, especially now that these cameras are about 100 years old, is that this shutter design is very reliable and durable. The Graflex shutter designed by William Folmer has many fewer moving parts and stress points. In fact, if a Graflex camera has been properly protected during periods of disuse and storage, one should still expect it to function properly today.

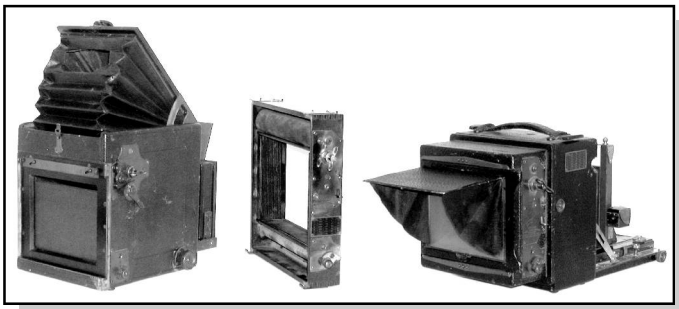


Figure 4. Three Early Examples of Graflex Focal-Plane Shutter Applications

In many cases, it is possible to readjust a Graflex shutter that has developed weak spring tension over years of improper storage under tension. It is also quite possible to restore a shutter that has developed pinholes or cracks in the shutter cloth itself. In a future article, I'll present a few straightforward tips for correcting some typical Graflex shutter problems so these wonderful cameras can continue to be used today and well into the future.

Note: Special thanks to Ken Metcalf for his diligent review and fact-checking and for providing valuable reference information. The examples of photographic equipment used to illustrate this article are from the collection of James Flack.

The Graflex xl

Part 2

by Ken Metcalf

with William E. Inman, Sr.
(Former Graflex Sales Representative)

Production and Pricing

An area of uncertainty is the number of xl cameras produced. According to Graflex collector, Roger Adams, 10,000 rangefinder, 1,000 wide angle and 200 non-rangefinder cameras were produced. From cameras entered on Richard Paine's serial number list, the wide angle camera may have approached 1,500 and the rangefinder model 12,000.

Pricing is another interesting part of the xl story. By the time the xl was introduced, fair trade was gone, and the industry standard discount to the dealer was 33-1/3%, or 40% for three or more units. A professional discount of 10 to 15% was usually given to professionals. In 1967, 1968 and 1969, the xl 714 outfit with an 80mm Heligon listed for $598.00. In a 1970 "Spring Promotion," Graflex listed an xl 770 outfit (with an 80mm Heligon lens, a quick focus lever, Multi-Grip and RH/10 Roll Holder) for $628.60 list and $249.00 net to dealers. In 1971 the xl 714 outfit was gone, and an 80mm Noritar (xl 791, along with an outfit with an 80mm Planar lens) was available for $578.55. Tim Holden listed 18 outfits over the life of the camera.

Military

Although not designed with the direct involvement of the military, it appears that many were sold to them. In a General Services Administration catalog from 1968, an outfit was available to the Air Force (KE-46A) for $658.94 and to the Army (KS-98A and KS-98B - which was essentially the same as the A, but included an RH/50 70mm Roll Film Holder) for $523.47 or $625.47. The catalog states that an additional $50 was required for a black non-reflective combat coating.

Repairs

An honest review of the xl camera must include repair and maintenance problems. There are three areas of concern: The rangefinder, loose lens barrels, and pictures out of focus. Most rangefinder problems can be repaired by adjustment, and a broken glass window (according to one source) can be replaced with a microscope slide, cut to fit the frame. A loose barrel is caused by the lugs on the barrel being broken or the sleeve assembly being out of tolerance. Properly done, experience and special tools are needed. Although most owners do not have a problem, if you buy the camera, I personally would make sure that the plastic lugs on the lens barrel sleeve assembly are not worn. Also, test the focusing ease of each lens to be sure that there is not a lot of "play" when you focus.

Out of focus pictures are usually caused by a loose focusing ring or incorrect shimming of the lens. A third possibility, though not addressed here, is a jerk on the end of the cable release. With the former problem, when mounting lenses to lens barrels, the factory used thin shims to adjust small tolerance differences in focal lengths of individual lenses. If the lens had been removed and replaced without awareness of the setup, shims could be lost.

Motor-driven Back

Interestingly, within the last several years, Dr. Alex Presilla located a prototype xl motor-driven roll film back. The back was designed for 120 or 220 roll film, had an off-and-on switch on the top, two built-in hand grips, two cable releases and a film counter. When the counter reached zero, the end of the film counter had an arrow where the xl back stopped and locked. You then had to advance the wheel manually in order to start the cycle again. The back of the holder had a "reminder tab," so you could insert the end of a film box to let you know the type of film you were using. The release button was designed to take a cable release that was connected to the release on the xl in place of the regular cable release. When you pressed the release button, it mechanically pushed the cable release, triggering the lens shutter and electronically advancing the film (unless the dark slide was inserted or the film counter was set on the end arrow point). There was an additional cable and single motion advance lever for mechanical use, in case of battery failure. The xl back had a film release button with a spring, so you could very easily take the film out of the chamber. The back slide prevented the release button from being fired. Film flatness was very well handled with springs on the back that press firmly against the film.

As the original battery is no longer available, the back was modified to take four AA batteries. The Essex Camera Co. (New Jersey) repair person who modified the back, and added a second switch to prevent battery discharge, thought the prototype xl camera was well constructed and the motor was of good quality, although heavy. Dr. Presilla has also adapted a motorized Mamiya RB 120/220 back to his xl.*

Using the Camera

On the internet, I found the following interesting comment from Ed Scott about the xl: The material on the Graflex xl "brought back some memories. I was a combat photographer in Vietnam, and the standard issue 120 camera was a Graflex xl. We had a choice between a 4x5 Speed Graphic and the only slightly smaller Graflex xl. The Army photo labs were unable to print 35mm which is the only logical choice for a combat camera. I did have a Leica M3 but was only supposed to use it for jobs which called for 35mm slides. I have in front of me a B&W photo of a skinny fellow I hardly recognize with a Graflex xl slung over his shoulder."

Another interesting story about the xl comes from Ron Bennett: "I remember forty years ago when Graflex announced the xl system. I was working in a camera store and studying photojournalism. I had a severe 35mm Nikon bias (I was studying

with Earl Theisen at the time, and he had just switched me from Leica to Nikon.), and I could not understand why anyone would want one of those big clunky-looking rangefinder cameras, when they could have a Hasselblad , a Rollei, or if they were on a budget, a Bronica S. Now, forty years later, I have closed a very successful advertising agency and commercial photo studio, and I am living the yuppie dream (I run a small beekeeping supply business in rural Oregon.).

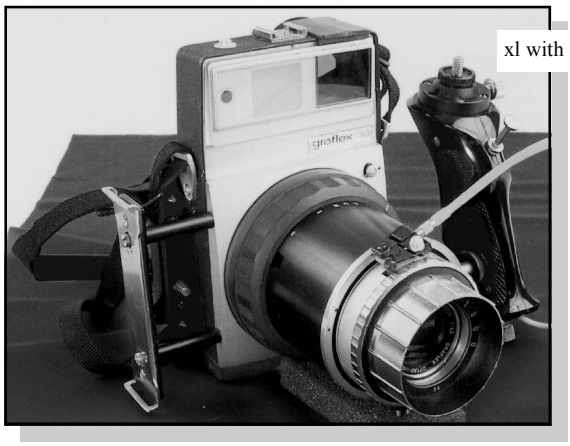
Our agency and photo studio were noted for large format special effects shots. We had the luxury (and budget) to own any camera system we needed and in triplicate. Needless to say, camera suppliers went to great lengths to convince us to buy their systems, so, over the years, we have had the chance to use them all in a commercial high-production environment. In medium-format, we settled on Mamiya RB67s and Hasselblads. We used the RB67s 95% of the time.

But now that we are "retired" and shoot only for pleasure, we can own any camera system solely for its merits. We sold off all of the Hasselblads and Mamiyas and went to Bronica ECs, one of the truly great systems ever developed. Out of my buying and selling to build an extensive Bronica EC system (I buy large systems and parts out the extras.), I ended up trading a Bronica EC with a 135mm lens for a Graflex xlrf with a Grandagon, an 80 Planar and a 150mm Ysarex with the idea of selling them off. Since "discovering" the xl systems, we have added a 270mm, a 180mm, and an xlsw body."

Special Cameras

Graflex advertised their systems set up in various configurations. Two are especially interesting. The first is an aerial camera outfit (xl 777) which had two handle grips, an aerial viewfinder, a sky filter and a 180mm Rotelar f/4.5 lens in a Compur shutter. It retailed for $461.36.

The second is a rangefinder body fitted with a 135mm f/4.5 Rodenstock Optar lens in a Graflex Model 2a 1000 shutter. It was modified for the xl system from the 4x5 Super Speed Graphic. The modification consisted of eliminating the lensboard, which was part of the shutter, and fitting the flash contact to the shutter housing. By doing this, the shutter could be mounted to an xl barrel assembly for the xl systems like a normal lens and shutter. It became "Model 3" of the 1000 shutter, although it was not so designated. The list price for this adaptation was $537.00. Bill Inman has one of these special order cameras.



xl with 1000 shutter

Also, according to Bill, "As the xl Bright Line Finder does not work for the 135mm Optar with the 1000 shutter, I adapted a Graphic Long Optical viewfinder with an xl foot on the bottom of the finder, so it fits into the xl shoe on the top of the xl rangefinder or standard body with the proper mask. I can use this with my xl 150mm lens as well, although it is only for composition. I still use the xl rangefinder for focusing, and with the standard body, I estimate the distance or use the ground glass to focus."

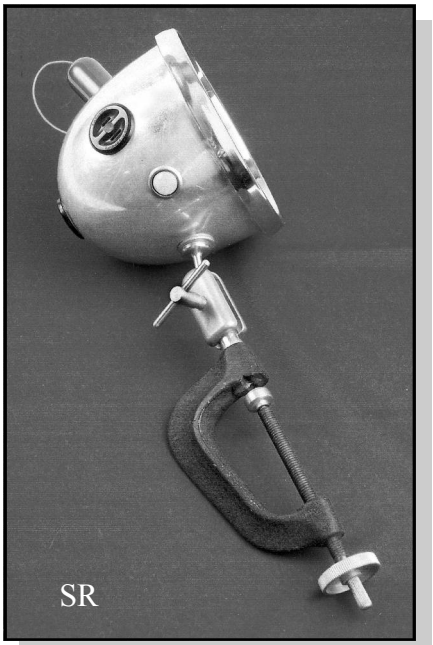
Bill also has an 80mm f /2.8 Rodenstock lens in a Graflex 1000 shutter. He was told by Graflex engineer Harry Davis that only two of these lenses were made. See insert. Interestingly, Bill also says this same shutter modification could be special ordered for the Century Graphic for $462.00. His is fitted to a 2¼ x 3¼ Crown Graphic.

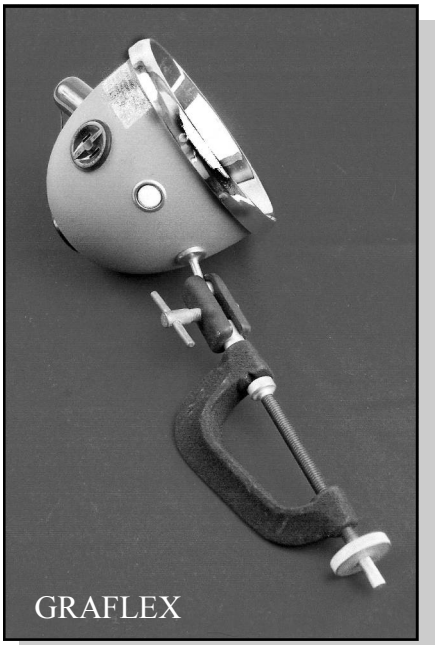
The End of Sales

All three camera bodies were listed in their last photographic catalog of 1973. Some accessories that could be used on the xl were still available from Singer Education Systems in 1975. In 1976 the xl camera tools and dies were sold to Cambo of Holland, who came out with an improved version of the rangefinder model. According to Bill Inman, about 200 were made before they stopped production. According to Cambo, the camera was produced in 1978 and 1979, but was discontinued when Cambo fell on hard times and ownership of the company changed. A few have been seen in the U.S.

I believe this general comment describes the xl very well: "The continuing use of Graflex cameras produced many years ago is a sincere tribute to the American pride and initiative that created fine photographic equipment." The All-American Camera a review of Graflex by Richard P. Paine.

* The motor-driven and dental prototypes, along with modified xl cameras, are shown in the Camera section of graflex.org.





GRAFACTS.....

The SR Teleflash
from
Strobo Research and Graflex

Strobo Research (SR) was founded in 1945 by Robert Dumke, Edward Farber, Egon Grim, and Frank Scherschel, all employees of the Milwaukee Journal, although initial research by Edward Farber dated to 1940.

When the SR Teleflash (meaning flash at a distance) was first marketed is unknown, but we can guess it was sometime between 1945 and 1953. Edward Farber applied for a patent in 1947 (no. 2,546,737), and it was granted in 1951. In 1954 the SR price was $59.50. Later under the Graflex name (Cat. No. 2024), it was $66.00 (later $79.00). Graflex Inc. acquired Strobo Research in 1955, along with the rights to their Teleflash and electronic flash units. I will not cover the electronic flash units at this time.

So what is a Teleflash? It is a self-powered, photo-electrically triggered, battery-capacitor (B-C) flash lamp synchronizer, sometimes referred to as a "slave unit."

The Teleflash is a compact unit supplied with a C-clamp on a swivel for easy mounting on stands, doors, etc. It weighs only 2½ pounds and is powered by four Eveready Minimax No. 413 30-volt batteries. The batteries are calculated to last for a year or more. The Teleflash has a 5" reflector, which is an exact copy of the old Graflex 5" reflector, including the socket, but with an added ½" rim, allowing the reflector to be attached to a housing by three screws. The Teleflash accepts bayonet-type flashbulbs, such as no. 5, no. 25, SMs and SFs. The Strobo Research housing was unpainted aluminum, while the Graflex production model was painted with a gray (later brown) crackle finish over the aluminum housing.

The unit is fired by a light sensitive phototube in the top of the Teleflash housing, which can be rotated in any direction to pick up a flash from the camera. When not in use, the phototube is protected by a red metal cover on a 4" nylon cord.

To activate the Teleflash, a flashbulb must be inserted into the unit to turn it on, as the Teleflash has no switches. After the flashbulb goes off, it turns off the unit. A white "safety button" must be pressed while inserting the flashbulb to prevent the flashbulb from going off in the user's hand.

"In addition, its phototube circuit is sensitive only to a *marked change* in light intensity; it will work, therefore, regardless of room illumination. It should be noted that bright sunshine or the presence of florescent lamps about three or four feet away will temporarily 'fatigue' the photocell, reducing its sensitivity to a point where it may not trigger the circuit of the Teleflash. If the Teleflash must be used under these adverse conditions, the only solution is to shield the phototube as much as possible from direct rays." To protect the Teleflash from being tripped by someone else's flash during an assignment, such as a sports event, a Milwaukee Journal photographer drilled a ¼" hole in the red metal cover, then rotated the phototube's concave receptor behind the cover opening, aiming it through the ¼" opening at the Journal photographer's camera flash unit. A bit tricky, but it worked.

The Teleflash has an outlet on the right side that can be used with regular extension reflectors, so that a number of flash lamps can be fired from the same unit. A Graflite

Side Lighting Unit (Cat. No. 2778) would be one example. If the camera has a solenoid operated shutter, it can be tripped remotely by plugging the connecting cord in the same side outlet. When a flash lamp is fired toward the Teleflash, the solenoid will operate by means of the phototube circuit. (It is not necessary to use a flashbulb in the Teleflash when remotely tripping the solenoid on the camera, unless the lighting setup requires it.)

On the rear of the Teleflash is another outlet which permits the unit to be used as a B-C flash unit by plugging a flash cord into the built-in shutter contacts on a Graphic camera, in the event of the failure of regular equipment. Sidelights can also be used by plugging them into the outlet.

The Teleflash will respond to the primer of a flash lamp when it is as close as 15 feet. The Teleflash will activate within five milliseconds of the time the master lamp is fired from the camera, because the applied capacitor charge is over 100 volts to the flash lamp. This means the flash lamp will peak several milliseconds earlier. This is a minimum lag between the master and the slave lamp.

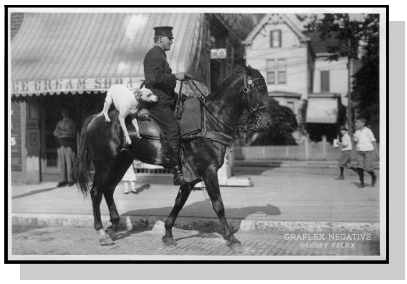
As a starting point, with a no. 5 or no. 25 flash lamp, from 10 to 15 ft, 1/200th of a second can be used, when the full light from the master lamp falls on the phototube of the Teleflash. From 15 to 25 feet, 1/100th of a second may be used under similar conditions. Beyond 25 ft, 1/25th of a second is recommended. In other words, the weaker the light falling on the phototube, the greater the lag between the master and the slave unit, thus the need to use a slower shutter speed. Testing is recommended. SM or SF lamps may be used to trip the Teleflash but will not affect the exposure of the picture. Only the Teleflash will affect the exposure.

A case was available that held six Teleflash Outfits and six All Purpose Light Stands. The original SR price was $29.95, and the Graflex price (Cat. No. 2047) was $33.25. The Milwaukee Journal photographers always kept one of these cases with them when they were on big assignments. For smaller assignments, they usually had two Teleflash units or one Teleflash and a Graflite Side Lighting Unit.

1963 was the last year the Teleflash was listed in a Graflex catalog.

Ed: The information for this article was condensed from a 1954 Strobo Research price list, catalog and instruction manual, along with some limited experience with the Teleflash by the author. The author has four Teleflash units in his collection. Photographs are by the author and from his collection.

Bill states that "The exposure for two flashbulbs is the same as if you were using incandescent key and fill lighting. The key light generally prevails unless you are going for a special effect. If you used an SM or SF bulb from the camera to fire a no. 5 or no. 25 in the Teleflash, the exposure from the Teleflash would determine the exposure. Experimentation is recommended."



Subscriber Jerry Spiegel recently saw the movie "No Reservations" and is sure he saw the location of this picture - lower Manhattan. The picture was part of the insert for the Fourth Quarter 2006.

UPDATE

We have good news to report. Based on our subscribers' responses, here is what we are planning:

1. We will continue to publish the Quarterly in its present form through the end of 2007.

2. Starting with the March 2008 issue, we will send the Quarterly by email at no charge, with the length determined by material available. This will increase our circulation without affecting the quality of our publication.

3. Color will be added.

4. We will be affiliated with graflex.org, which will allow greater participation and readership.

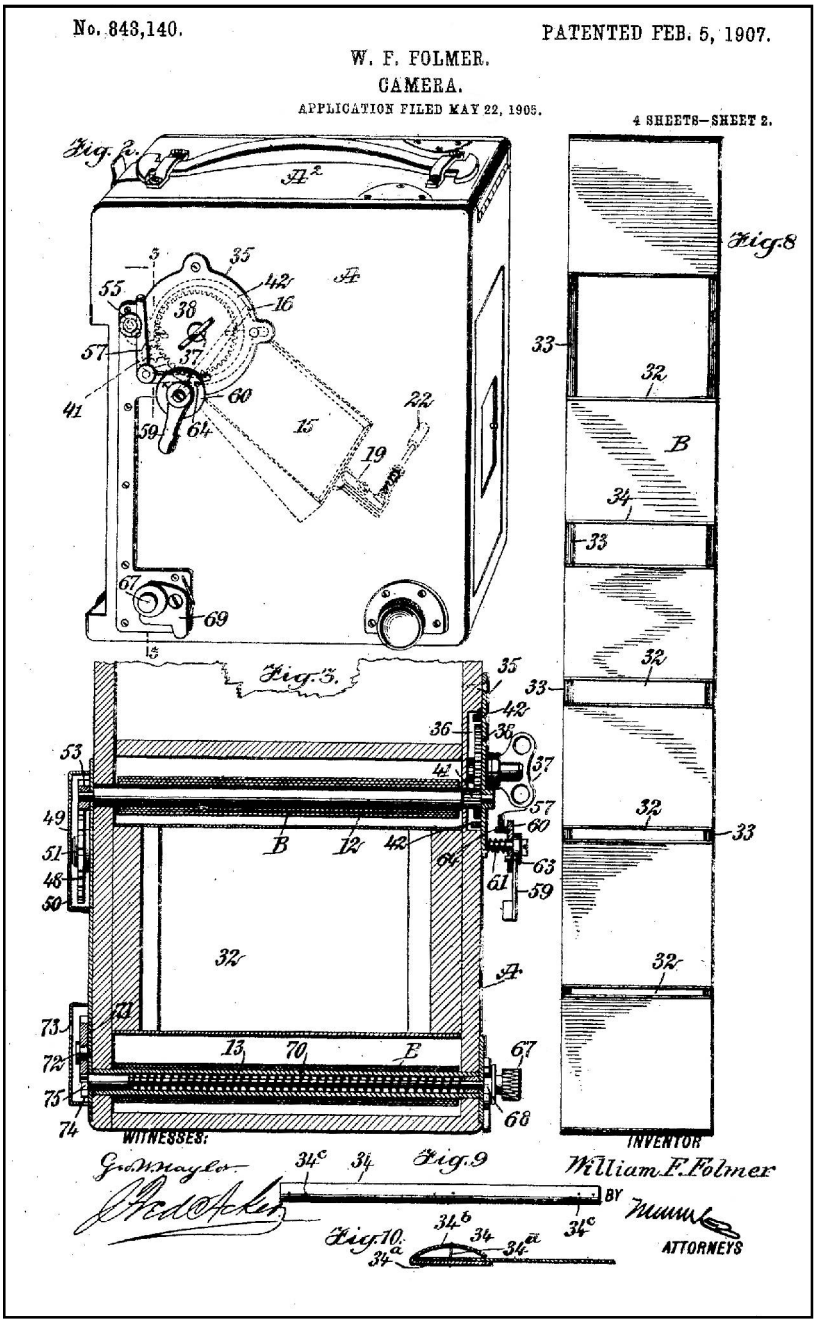
5. If you would like to receive the Quarterly next year, please let Ken know, and give him your email address.

6. For those without internet access or if your internet provider blocks PDF files, the Quarterly will be available on a fee basis.

As always, subscriber participation is needed.

Graflex Historic Quarterly

The Quarterly is dedicated to enriching the study of the Graflex company, its history, and products. It is published by and for hobbyists, and is not a for-profit publication. Other photographic groups may reprint material provided credit is given GHQ and the author. We would appreciate a copy of the reprint.


No. 843,140. PATENTED FEB. 5, 1907.

W. F. FOLMER.

CAMERA.

APPLICATION FILED MAY 22, 1905.

4 SHEETS—SHEET 2.

Fig. 2.

Fig. 8

Fig. 3.

Fig. 9

Fig. 10.

WITNESSES:

INVENTOR

William F. Folmer

BY

ATTORNEYS

Patent for Auto Graflex camera and one-piece focal plane shutter.

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xl

Attaching lens to xl camera body

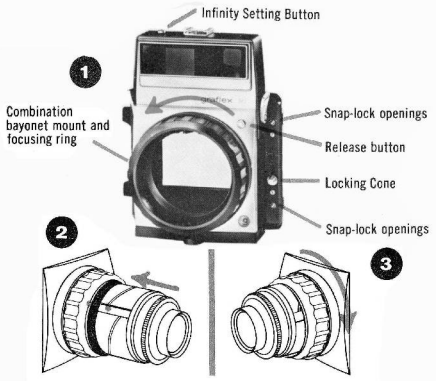
NOTE: To follow these directions correctly, be sure you face the camera (as illustrated in fig. 1, 2, 3).

1. Lenses attach to the bayonet mount and focusing ring. Simply rotate the focusing ring counterclockwise until it stops. Depress the release button, hold, and continue to rotate the ring until the interior guides and the interior lugs align.

2. To insert the lens barrel, line up the red dot on the focusing ring with the red dot on the lens barrel. Seat the lens barrel into the mount as far as it will go.

3. Once the barrel is placed in the mount, turn the focusing ring clockwise to secure it. Continue to rotate the focusing ring clockwise until it stops at the infinity position.

4. To remove the lens barrel, rotate the focusing ring counterclockwise until it stops. Depress the release button. And again, rotate the focusing ring counterclockwise until it stops. Remove the lens barrel.



Synchronizing lens with rangefinder on the xl

With the lens set at infinity, press down on the infinity setting button (see fig. 1). This gives you proper synchronization between the rangefinder and the mounted lens. And it eliminates the variations incurred within normal camera manufacturing tolerances.

SPACER-EXPOSURE CORRECTION

$$\text{INDICATED EXPOSURE} \times \frac{(\text{LENS TO FILM})^2}{(\text{FOCAL LENGTH})^2} = \text{CORRECTED EXPOSURE}$$

EXAMPLE

$$\frac{1}{50} \times \frac{(\text{F.L. OF LENS } 4'' + \text{SPACER } 3\tfrac{3}{4}'')^2}{(\text{FOCAL LENGTH } 4'')^2} = X$$

$$\frac{1}{50} \times \frac{(4''+4'')^2}{(4'')^2} = \frac{64}{16}$$

$$\frac{1}{50} \times \frac{\cancel{64}^{4}}{\cancel{16}_{1}} = \frac{4}{50} = \frac{1}{12.5} \text{ OR } \frac{1}{10}$$

CORRECTED EXPOSURE IS :
1/12 OR 1/10 OF A SECOND

MASTER SELECTION CHART

FOR USE WITH:	CAT. NO.		ADAPTER RING	SKY 1A FILTER	LENS SHADE	RETAINER
47 mm Super Angulon f/8	7453	7458	7450	7465		
80 mm Heligon f/2.8	7453	7458				
95 mm Ysarex f/3.5	7453	7458				
100 mm Tessar f/3.5	7453	7458				
80 mm Planar f/2.8	7454	7459				
95 mm Heligon f/2.8	7454	7459				
150 mm Ysarex f/4.5	7454	7459				
100 mm Planar f/2.8	7455	7460				
270 mm Rotelar f/6.6	7455	7460				
58 mm Grandagon f/5.6	7456	7461				
180 mm Sonnar f/4.8	7456	7461				

Bill Inman's xlrf with 80mm f/2.8 lens in prototype 1000 shutter.

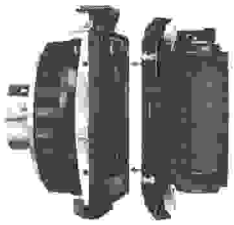
Attaching backs and accessories to xl camera bodies

The back of the xl camera body has easy-mounting, snap-lock openings (Figure 1). All xl backs and accessories, including the xl Graflok® back, xl Polaroid* pack film holder, xl RH/50 roll film holder have four corresponding metal posts which fit into these snap-lock openings.

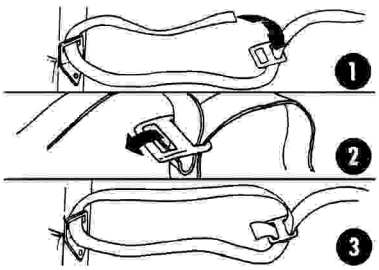
To attach backs or accessories to the xl camera back, align the four metal posts with the four snap-lock openings in the camera body. Press accessory into place on camera back. Secure and lock by sliding the locking cones on both sides of camera downward.

To remove the mounted accessory, reverse the process. Slide the locking cones upward — hold — and remove the accessory.

To fasten shoulder strap to camera, thread the strap through the outside of the buckle and pass free end through the handle lug or mounting bracket (Fig. 1). Bring the strap end back through the same slot in the buckle, over the middle brace and up through the other side

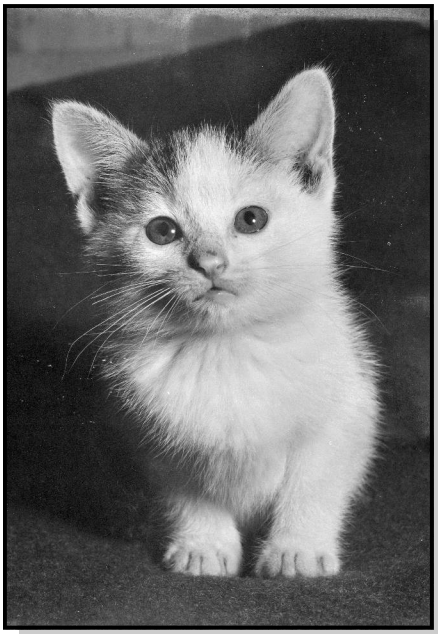


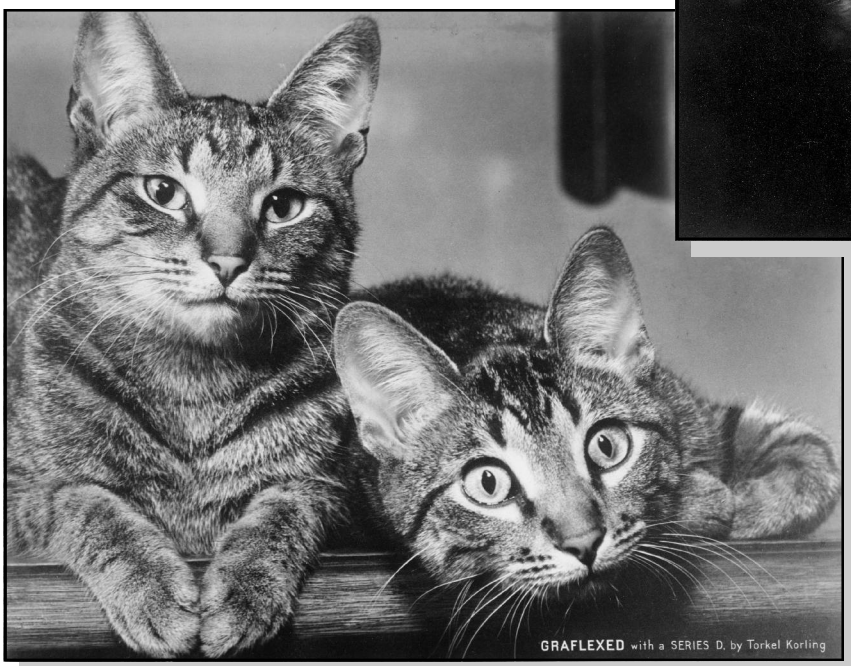
(Fig. 2 and Fig. 3). This provides you with a non-slip knot and an adustable loop for extra camera-carrying convenience.



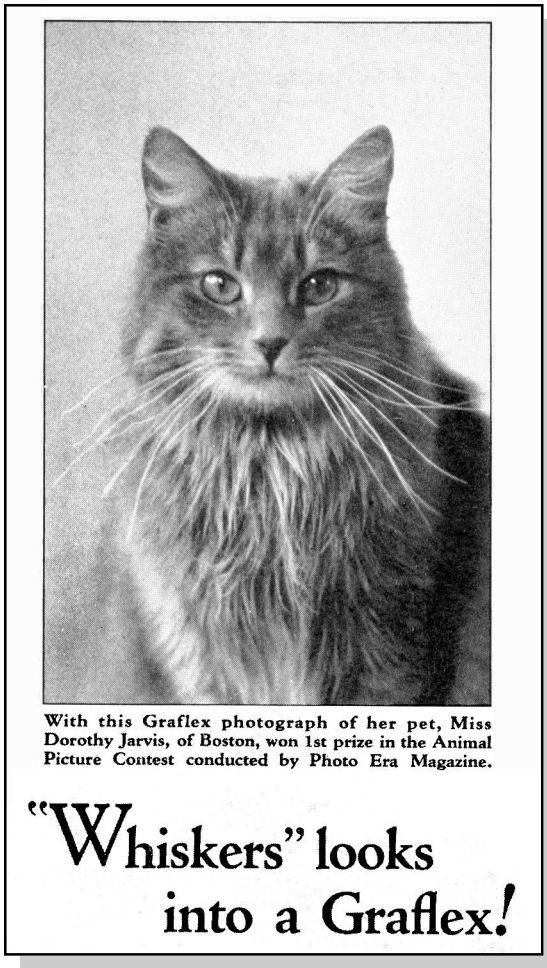
Graf-cats!

Left: Shot with 4x5 Speed Graphic in 1948, by Bill Baker.
Below: Freckles, made with a 3-1/4 x 4-1/4 Super D, by Jim Maxon and Barbara Smith.





c. 1934. Courtesy Bart Nadeau



1931

c. 1910