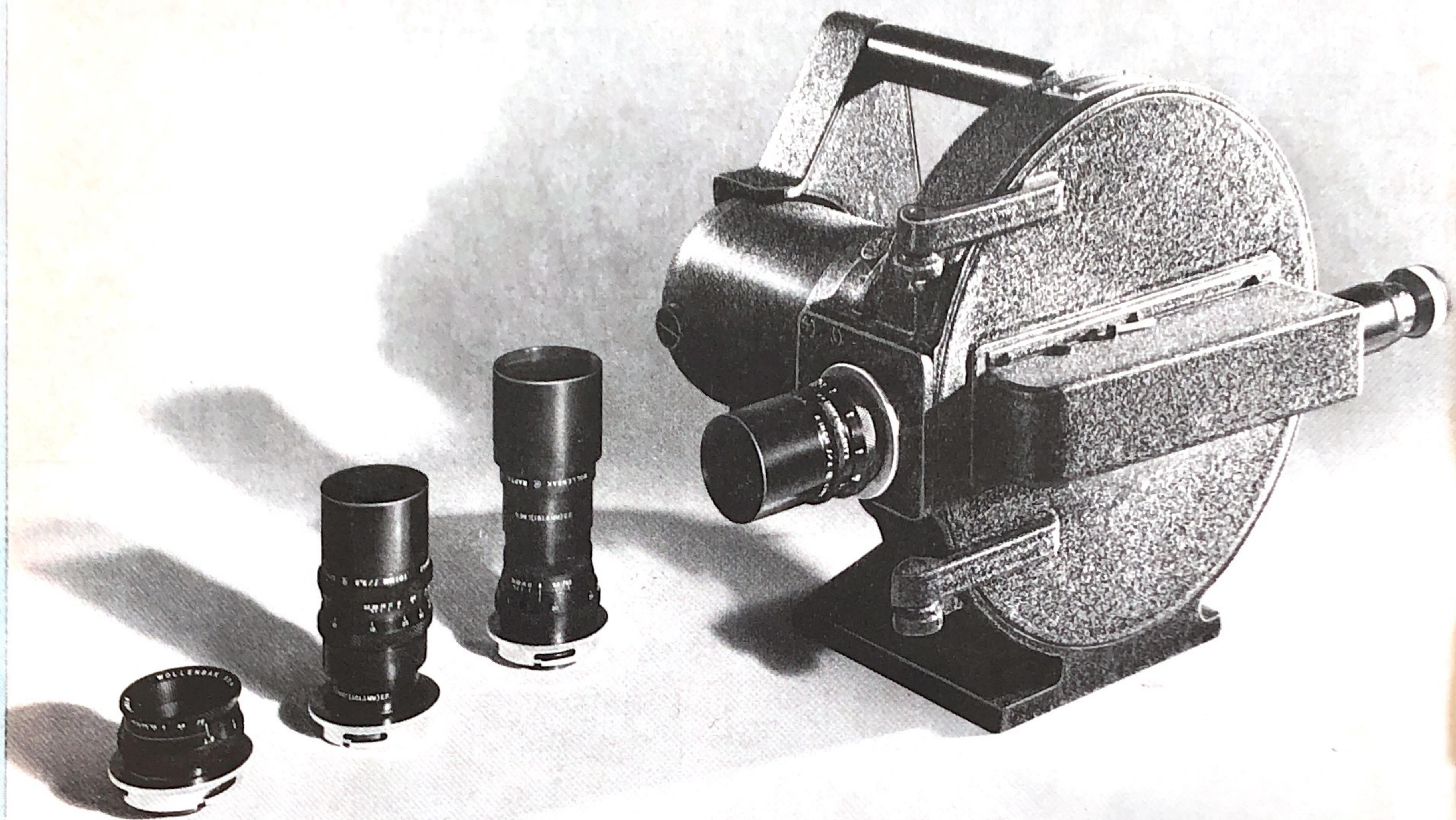


1640

2

*Wollensak*



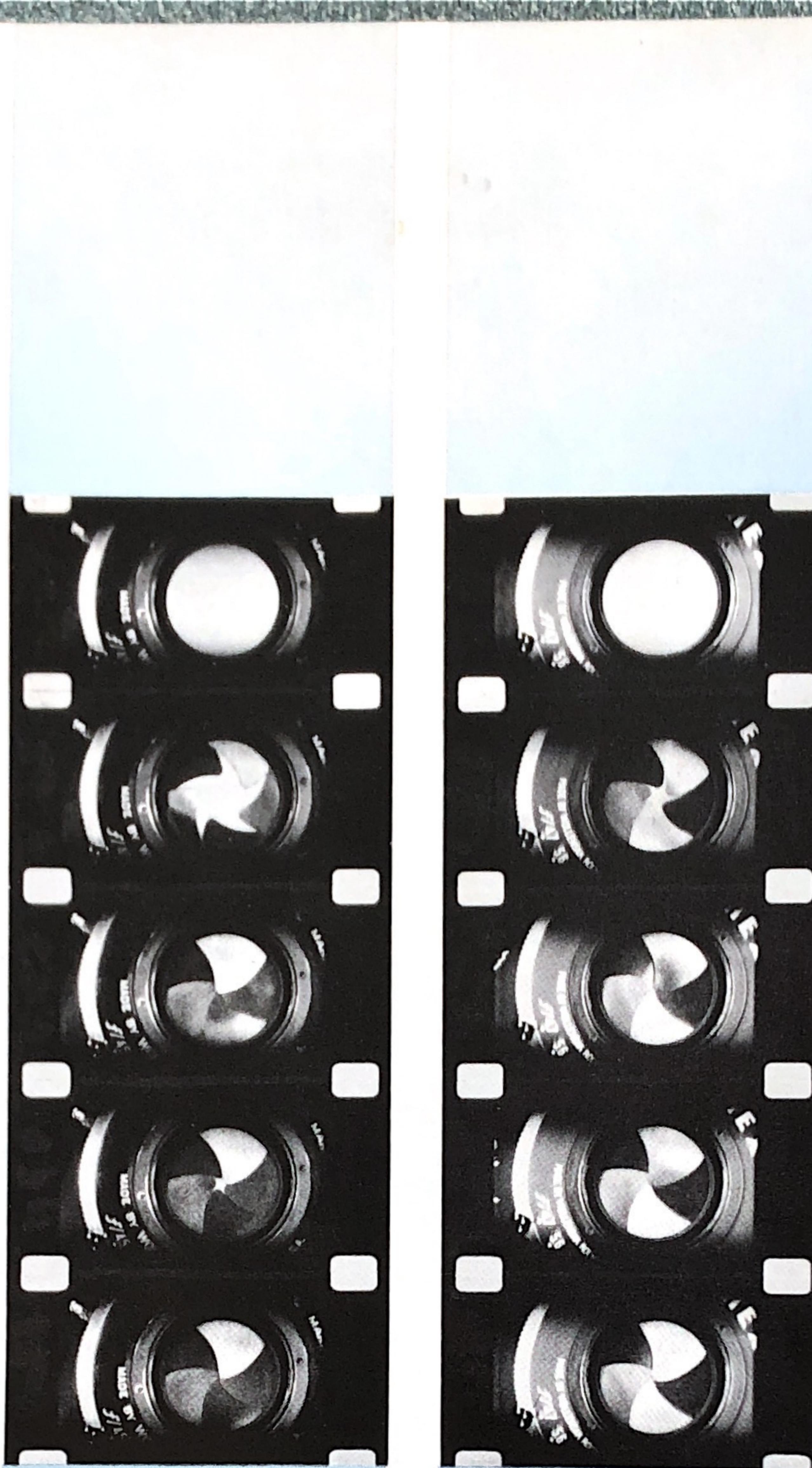
**FASTAX**

**HIGH-SPEED  
MOTION PICTURE  
CAMERAS**



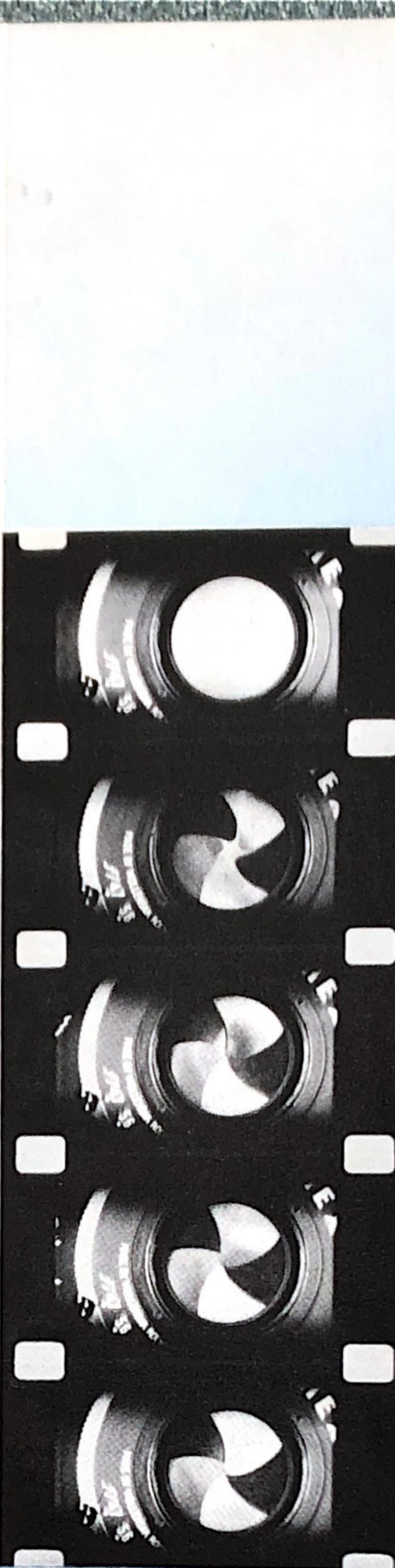
## FILM OFF SPROCKET

Photo of camera sprocket rotating at 300 rps, taken at 7,000 frames a second showing effect of shrunken film. Note film leaving the sprocket on lower left.



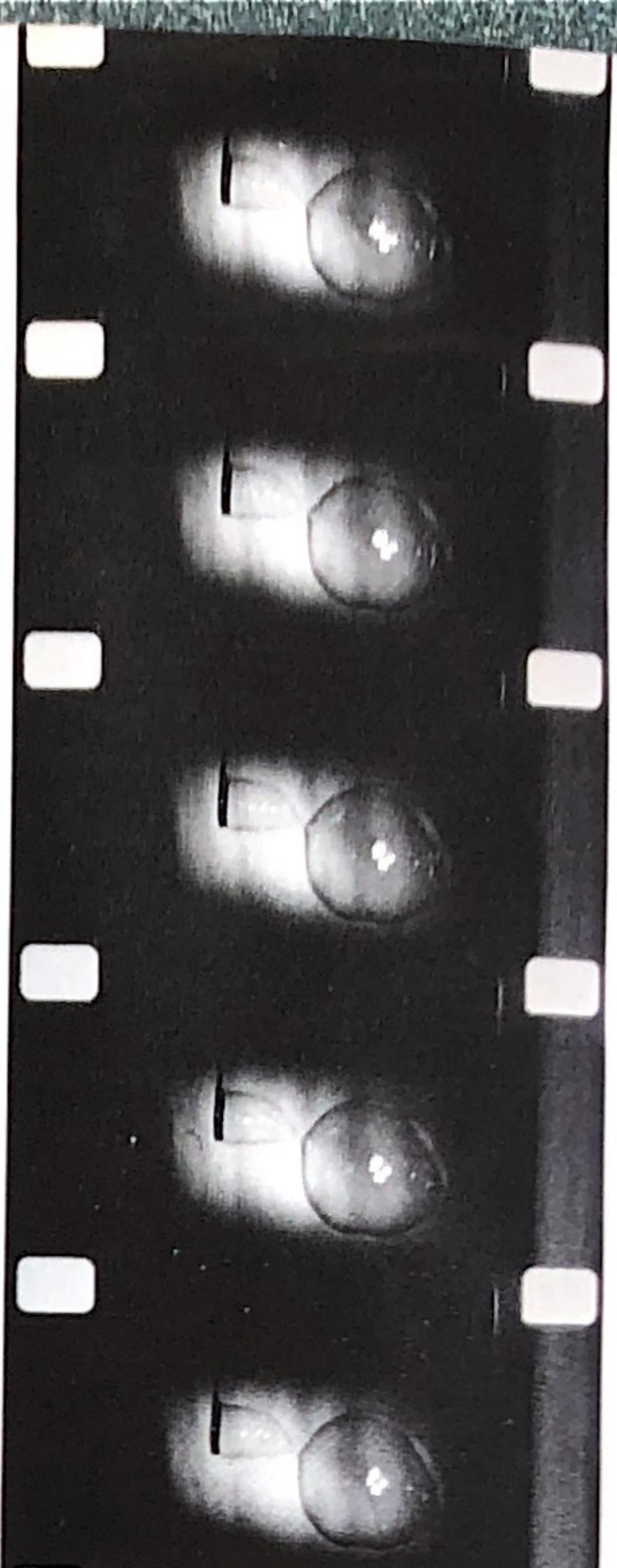
## EXPERIMENTAL CAMERA SHUTTER

Selected frames of experimental study showing re-opening after closing of shutter due to bounce. The frames No. 30, No. 42, No. 50, No. 60, No. 78 make up sequence in both studies.



## REDESIGNED CAMERA SHUTTER

Same shutter after redesign showing elimination of all bounce.



## BLOWING SOAP BUBBLES

Black and white print of a soap bubble taken from a roll of Kodachrome exposed at 5,000 frames per second.

# FASTAX

## HIGH-SPEED MOTION PICTURE CAMERAS

Motion analysis has long constituted an important factor in industrial development and research. High speed motion picture photography lends itself admirably to the accomplishment of motion analysis and is being successfully used for this purpose by a rapidly increasing number of industries and research laboratories. Changes that take place in certain steps of processing . . . changes in the character of materials, alone or in combination, which may occur through an almost instantaneous reaction can now be studied visually at a time magnification of 800 to 1, when projected at the normal speed of 16 pictures per second. Thus, in the field of industrial research the FASTAX Cameras are substantially aiding manufacturers in their efforts toward product betterment.

The FASTAX is a high-speed motion picture camera manufactured by Wollensak Optical Co. It makes available to engineers and scientists another tool for the study of high-speed phenomena that are beyond the perception of the human eye. (See opposite page.) It is a versatile device for recording high-speed motion of either a repetitive or transient nature.

The motion of objects viewed frame-by-frame can be measured with great accuracy. The pictures are a complete, direct, and permanent representation of the action, as compared to the indirect and partial representation obtained from such instruments as optical levers, shadowgraphs, oscillographs, oscilloscopes, stroboscopes, and flash and spark photographs. Action photographed at high speed by the FASTAX and projected at a slower speed is retarded by the ratio of the two speeds.

Wollensak FASTAX Cameras are capable of taking pictures at a rate of 150 to 14,000 frames per second, which, when projected at the normal speed of 16 frames per second, give a time "magnification" of 10 to 875 times. Motion studies that can be made with these high-speed cameras are virtually unlimited. They can aid research and commercial engineering in many fields. Some of these applications are listed on Page 6.

FASTAX Cameras are of the continuous moving film type with a rotating prism positioned between the lens and the sprocket. The prism rotates in synchronism with

the film creating successive and properly spaced images traveling with the film. Figure 2 is a schematic of the system. The image gathered by the lens is refracted by the prism upward to meet the incoming frame, and as the frame advances downward, the image follows, thereby permitting continued exposure throughout the period that the film passes the aperture. New improved prism, made of high index, low dispersion glass, increases resolution. Sharper pictures result.

The camera is driven by two one-quarter horsepower, 120 volt universal motors, Figure 3; one drives the take-up spindle and the other the sprocket and rotating prism. Designed to operate on full initial voltage impact up to 140 volts the FASTAX does not require preliminary accelerating equipment. Above 140 volts a "Goose" control unit is recommended to secure the higher speeds. A 100 foot film takes from 7/10 of a second to 25 seconds to pass depending upon the number of pictures per second desired. The camera is capable of accelerating to maximum speed within the first 35 feet of film, thus permitting 65% of a 100 foot roll of film to be exposed at full speed. Eight interchangeable lenses are available for the cameras, enabling them to cover practically all fields of application. The entire optical system is coated.

Each FASTAX Camera is equipped with an externally activated, neon glow lamp timer, Figure 4, mounted in such a way that its light is projected on the edge of the film for accurate timing of a moving subject. The lamp normally operates from a 115 volt a-c supply but can be operated with voltages as high as 130 volts rms. When operated from a 60 cycle source the lamp gives 120 pulses of light per second. The lamp operation is adaptable to a wide range of frequencies thus permitting the camera user to obtain the exact timing sequence he may desire. The upper frequency limit is determined by the characteristics of the glow lamp used. Timing pulses in no way interfere with the picture frame area of the film.

Operation of the FASTAX Camera is a relatively simple function requiring no special skill. The instruction booklets accompanying each camera are thoroughly written and can be understood by non-technical personnel.

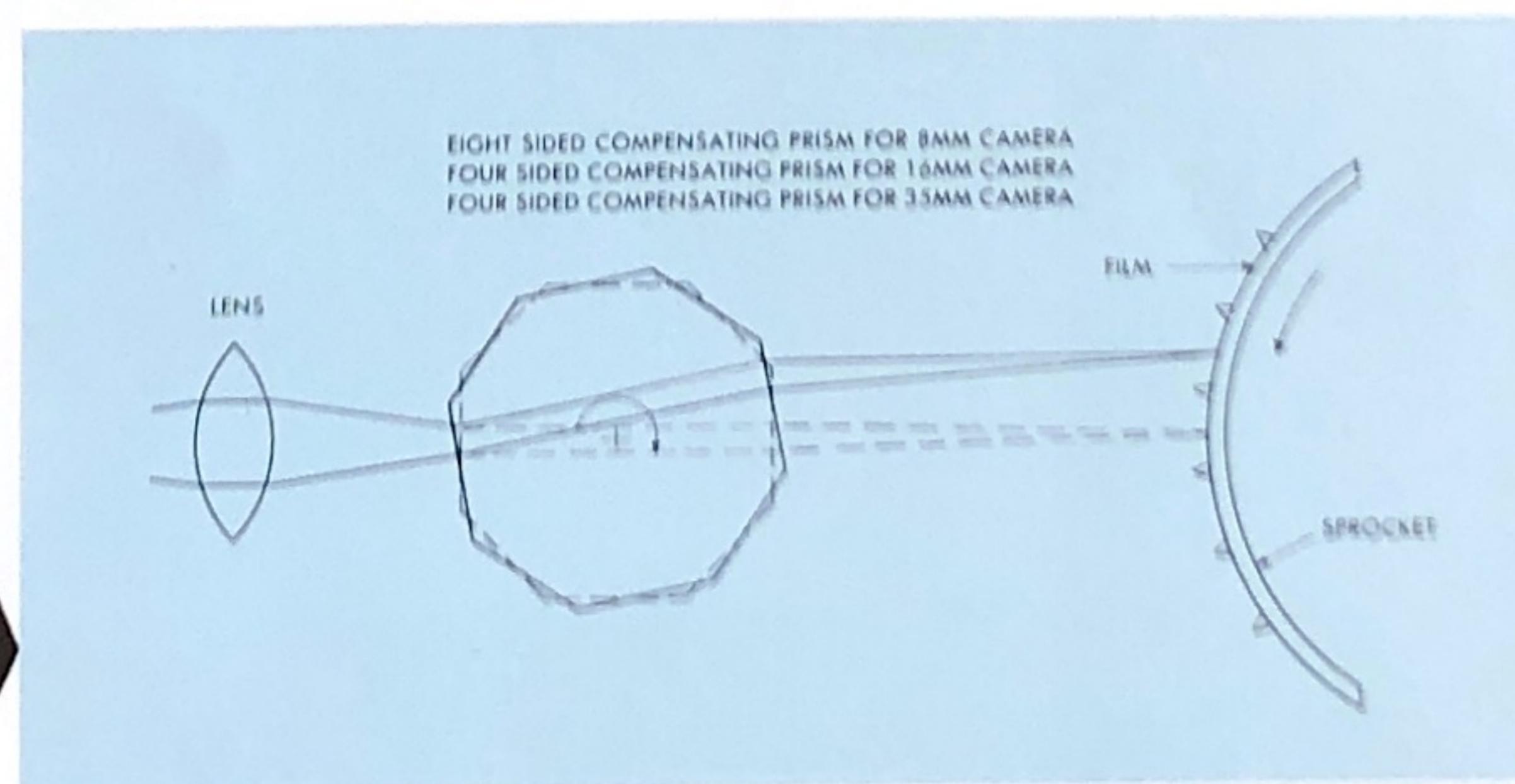
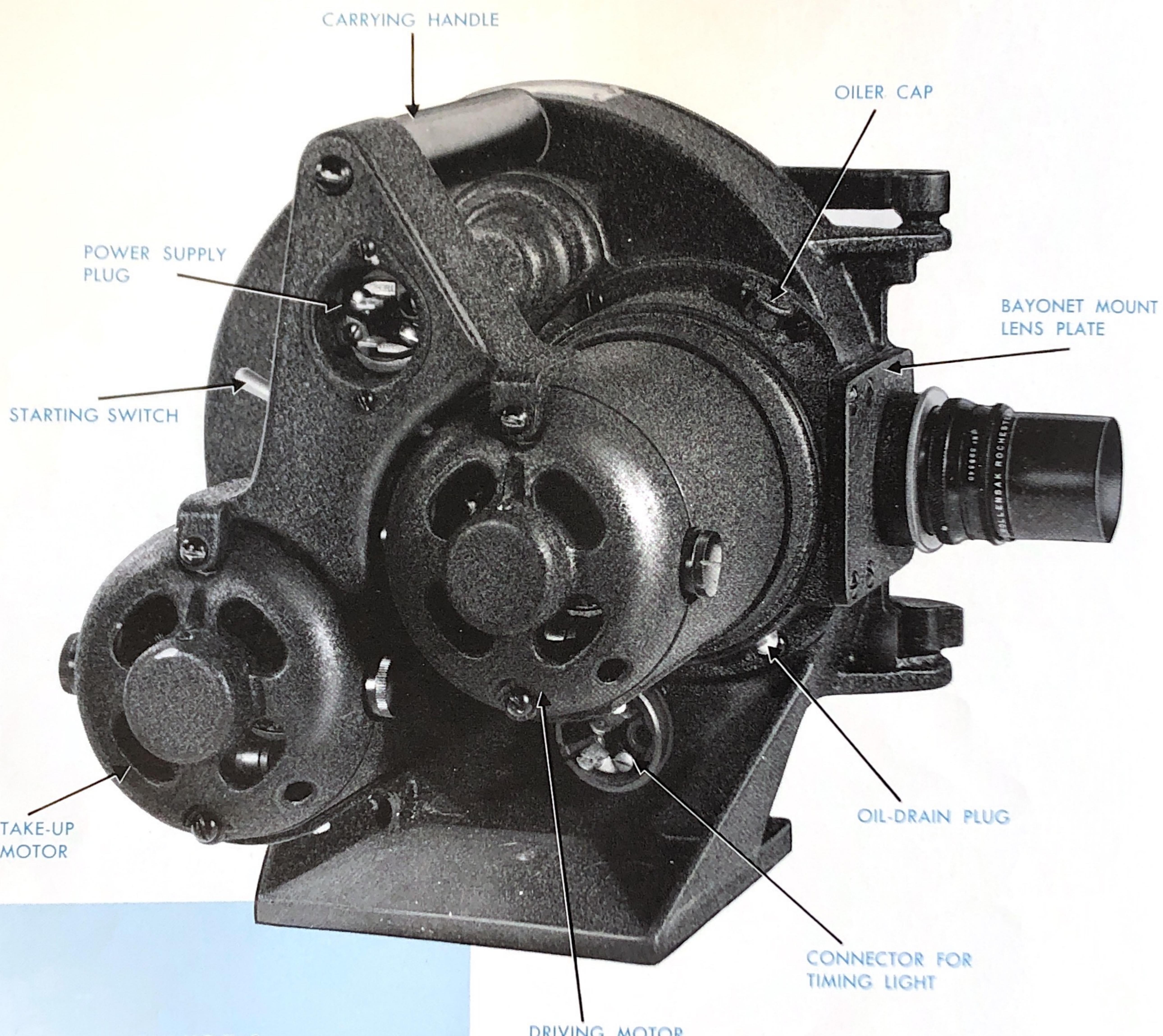


FIGURE 2

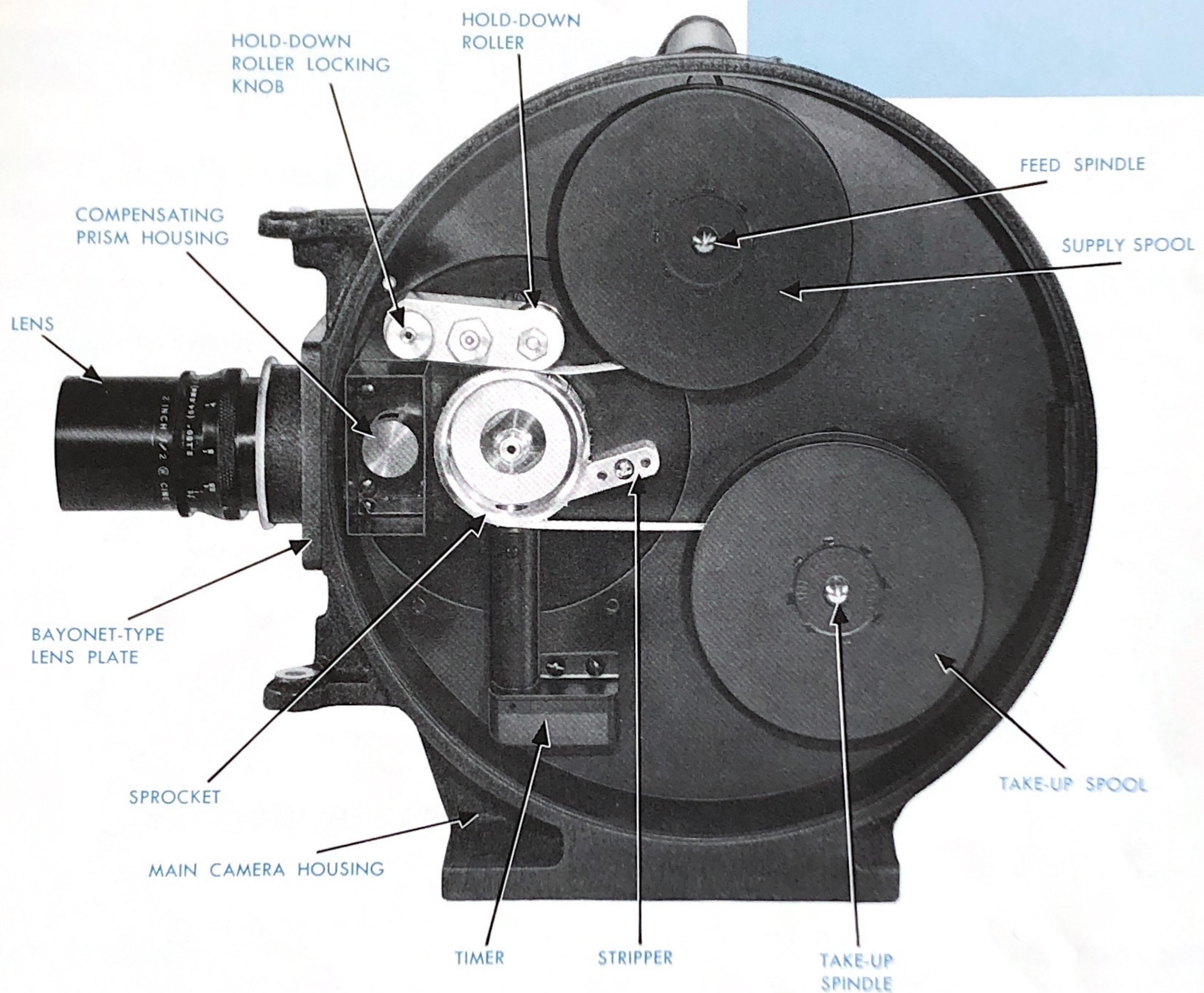


**FIGURE 3**

Exterior view of FASTAX Camera  
showing  $\frac{1}{4}$  h.p. driving  
and take-up motors  
and other features.

FIGURE 4

Interior view of FASTAX Camera,  
showing location of timer lamp,  
compensating prism, film spools  
and other pertinent features.



# APPLICATIONS

FASTAX high-speed motion picture studies have been successfully made in the following fields:

## BUSINESS MACHINERY

Calculating machinery, both mechanical and electrical  
Cams  
Cash registers  
Clutches  
Gears  
Springs  
Tabulating machines  
Typewriters  
Vibration

## ELECTRICAL INDUSTRY

Air flow  
Arcs and flash-overs  
Circuit breakers  
Coil winding machines  
Contacts  
Dancing line wires due to wind conditions  
Equipment shock and vibration  
Fans  
Fuse blowouts  
Fusing of metallic filaments  
Governors  
Mercury switches  
Meters  
Motors and generators  
Printing telegraph  
Relays and switches, both manual and automatic  
Telephone central office equipment  
Teletypewriter  
Variable speed drives  
Welding

## FACTORY STUDIES

Air compression studies  
Cutting and wrapping machinery  
Evaporation of liquids  
Flow of liquids, gases and solids  
Linotype machines  
Liquification of gases  
Mixing actions  
Printing presses  
Sewing, knitting and weaving machinery  
Studies in friction  
Watch and clock movements.

## MACHINE SHOP STUDIES

Cold and hot flow of metals, including extrusion and pouring  
Fatigue of metals  
Impact and tension tests  
Setting of tools and rates of cutting of various metals and non-metals with lathes, shapers, punch presses, drill presses, millers, etc.

## MILITARY and NAVAL STUDIES

Bomb releases  
Catapult and arresting gear studies on ships  
Effect of impact and pressure waves on various materials  
Ejection of torpedo from both deck tubes and under-water tubes  
Explosive effect of bombs, shells, rockets and grenades  
Flight of projectile studies  
Impact of incendiary bullets and shells  
Jamming actions on machine guns  
Measurement of acceleration of missiles  
Measurement of muzzle velocities  
Parachute design  
Power units of torpedoes  
Recoil  
Rocket studies  
Self-sealing gasoline tanks  
Wind tunnel studies

## PHOTOGRAPHIC INDUSTRY

Compound and reflex shutter actions  
Film perforators  
Flash synchronizing equipment

## TRANSPORTATION

Air and mechanical brake actions  
Aircraft, both ground and flight studies  
Cavitation of ships and propellers  
Carburetor and valve studies  
Chain drives  
Effect of hydrostatic pressures on ships' bottoms  
Engines  
Fans and fan belts  
Flow of gases in fire boxes

## TRANSPORTATION . . . Continued

Internal combustion firing chambers  
Jet propulsion  
Locomotive driving wheels, pistons and driving rods  
Propellers  
Proving ground tests

During "Operation Crossroads" at Bikini, in 1946, a battery of 57 FASTAX Cameras was used to record in slow motion the two atom bomb tests for study by military

Ship studies  
Spring actions  
Transmissions  
Turbine studies  
Wind tunnel studies  
Wings

ballistic experts. Many FASTAX Cameras are in daily use at Aberdeen Proving Grounds and other military testing stations.

## CHARACTERISTICS

### MODELS

Wollensak FASTAX Cameras are available in three types:

8 mm . . . . .	(W-163045)
16 mm . . . . .	(W-163269)
35 mm . . . . .	(W-171004)

### LENSSES

The 8 and 16 mm FASTAX Cameras are supplied with a 2-inch coated  $f/2.7$  lens or  $f/2.0$  lens (optional) at no increase in cost. (See Figure 5.) (The natural aperture of these two cameras is  $f/2.8$  hence a faster lens is not required. The  $f/2.7$  lens provides greater resolution also.) The 35 mm camera is supplied with a 35 mm coated  $f/2.0$  lens. (See Figure 6.) They are furnished with a bayonet type lens plate to provide a convenient mount for the inter-changing of additional lenses below:

35 mm $f/2.0$ Ciné Raptar in focusing mount
50 mm $f/2.7$ Ciné Raptar in focusing mount
50 mm $f/2.0$ Ciné Raptar in focusing mount
75 mm $f/3.5$ Anastigmat in focusing mount
101 mm $f/3.5$ Ciné Raptar in focusing mount
152 mm $f/4.5$ Ciné Raptar in focusing mount
254 mm $f/4.5$ Ciné Raptar in focusing mount
*15" $f/5.6$ Ciné Raptar Telephoto

*\*(barrel in iris only—set at infinity focus.)*

### NEW TELESCOPIC VIEW FINDER

A new bright field telescopic view finder comes as standard equipment on all 8 and 16 mm FASTAX Cameras. It enables photographer to focus more accurately and easily under much lower levels of illumination. Image size is same as will appear on film.

### FILM

Only FASTAX specially made and perforated film is suitable for use in these cameras. For best results film should only be ordered in quantities for immediate use. Keep refrigerated until ready for exposure. Prolonged heat

and dryness makes film brittle or shrinks it. Consequent change in sprocket perforation distance renders film unuseable. Film sources can be obtained from Wollensak.

### FILM LENGTHS

CAMERA	LENGTH OF ROLLS
8 and 16 mm . . . . .	50* or 100 foot rolls
35 mm . . . . .	100 foot rolls

*\*50 foot rolls not recommended.*

### TAKING SPEEDS

CAMERA	TAKING SPEED PICTURES PER SECOND
8 mm . . . . .	300 to 14,000
16 mm . . . . .	150 to 7,000
35 mm . . . . .	500 to 5,000

### EXPOSURE TIME AT MEDIUM SPEEDS

CAMERA	APPROXIMATE EXPOSURE TIME PER FRAME AT TOP SPEED
8 mm . . . . .	1/75,000 of a second
16 mm . . . . .	1/30,000 of a second
35 mm . . . . .	1/14,000 of a second

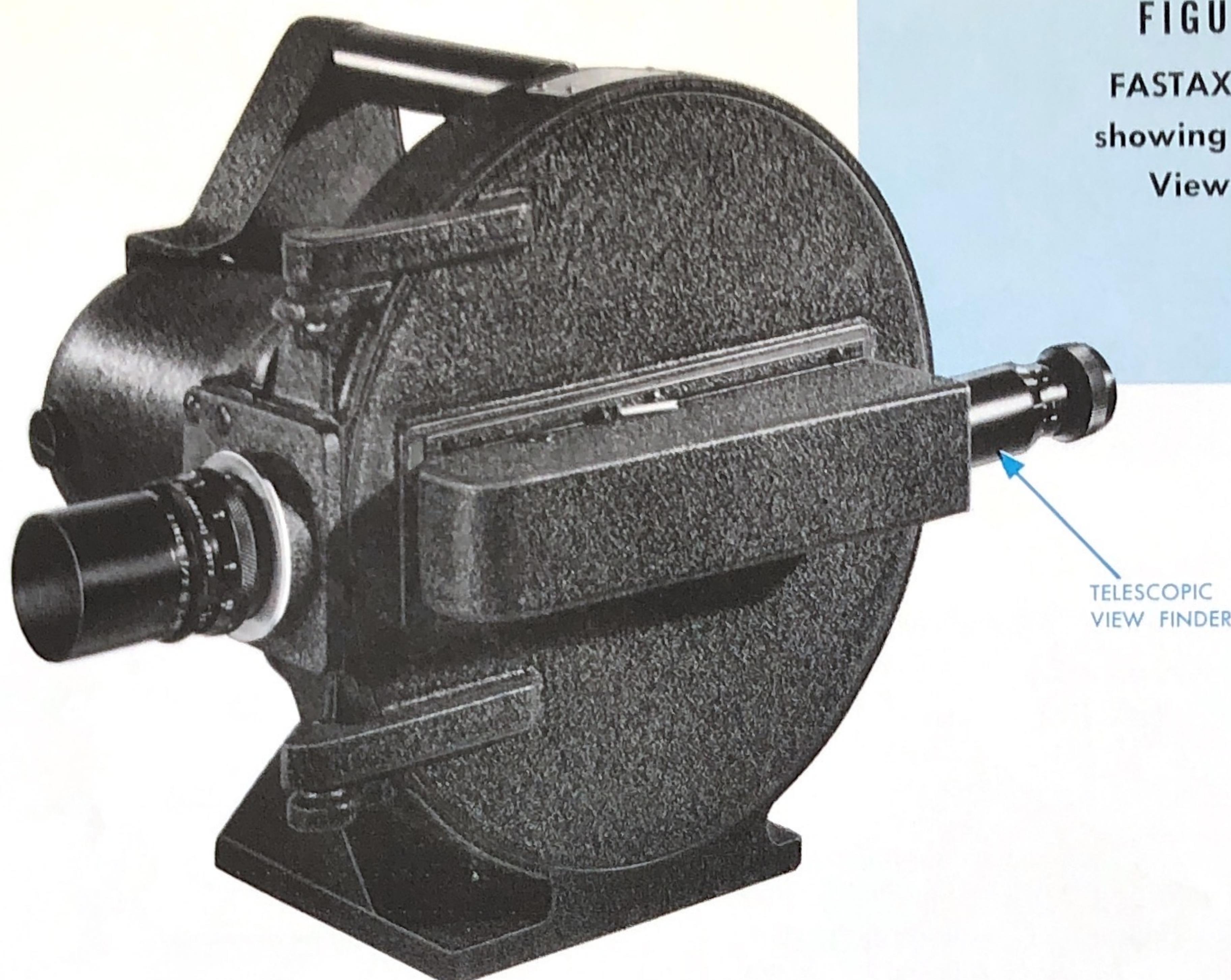
### SPEED CONTROL

Speed is regulated by controlling the voltage applied to the motors. A series resistance can be used for speed control for d-c application, and an autotransformer can be used for a-c application. Figure 7 shows the relation of applied voltage to the number of pictures per second.

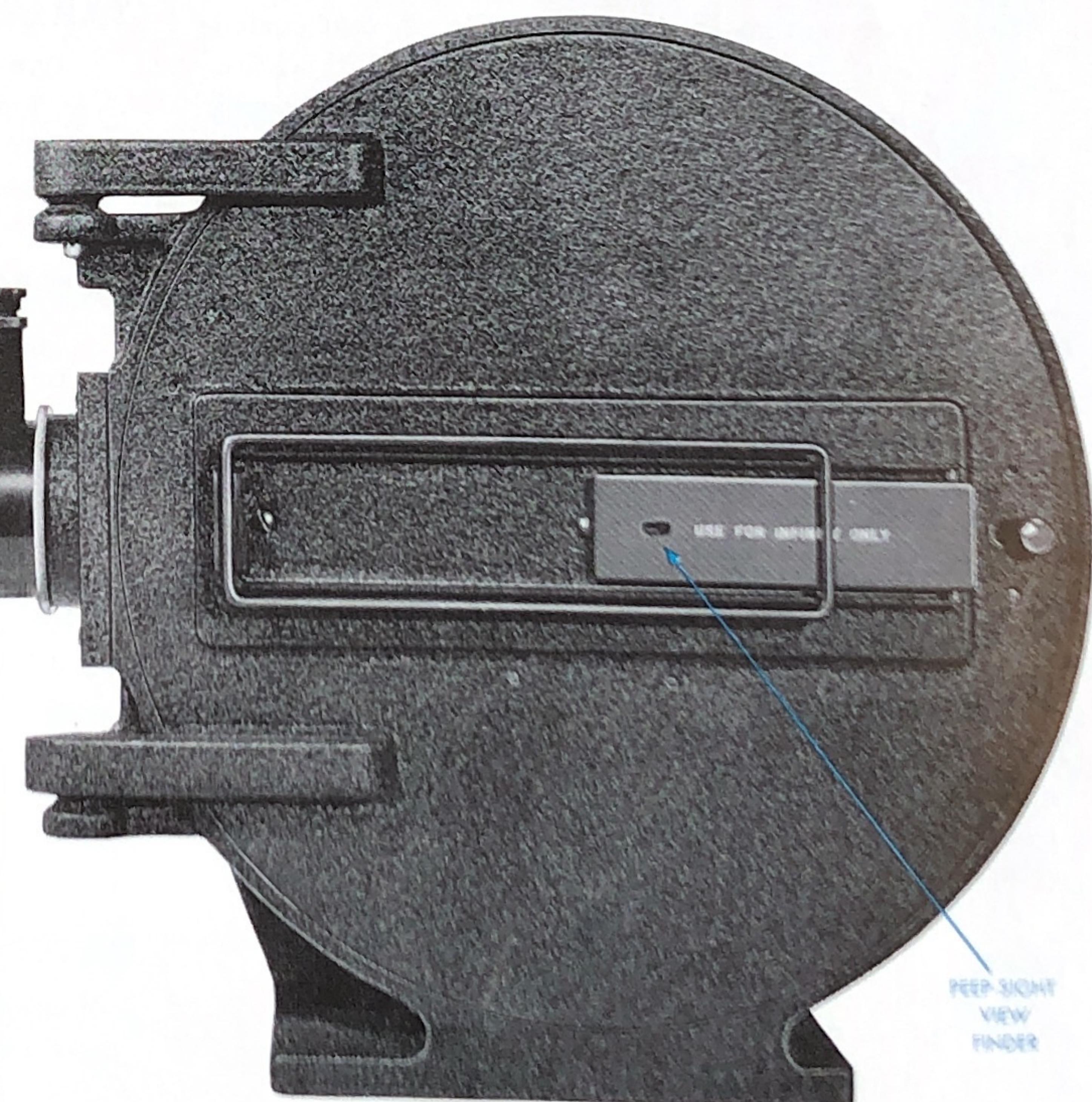
### DRIVING AND TAKE-UP MOTORS

Both motors are universal type, and can be operated under normal conditions on direct current, or alternating current, 60 cycles per second or lower. Voltage requirements for various taking speeds are shown in Figure 7.

**FIGURE 5**  
**FASTAX Camera**  
**showing Telescopic**  
**View Finder**



**FIGURE 6**  
**Exterior of FASTAX Camera**  
**showing Reflex View Finder and**  
**Peep-Sight View Finder,**  
**found only on 35mm cameras.**



## NEW PRISMS

New compensating prisms, made of higher index glass, provide greater resolving power.

CAMERA	NUMBER OF SIDES
8 mm.	8
16 mm.	4
35 mm.	4

## ANGLE OF VIEW FOR LENSES FURNISHED WITH CAMERA

CAMERA	ANGLE OF VIEW, DEGREES
8 mm.	5½
16 mm.	11¼
35 mm.	40

## FINISH

Gray Crystaline Lacquer

## WEIGHT

Approximately 25 pounds

## DIMENSIONS

Approximately 11½" x 11½" x 11½"

## MOUNTING

¾ inch-16 tapped hole for standard professional 35 mm motion picture camera tripod, or other suitable sturdy supports

## ILLUMINATION

Lighting units are required for indoor use, Figure 8; and supplementary lighting is usually required for outdoor use. In general, the amount of light required will be in direct proportion to the taking speed.

## EQUIPMENT

With each FASTAX Camera the following is included:

- 1—Carrying Case
- 1—Atomizer (for lubricating)
- 1—Bottle of Special Oil
- 2—Instruction Bulletins
- 1—Speed Calibration Curve
- 1—Spool of High Speed Pictures taken with the camera supplied
- 1—20' Power Cord

## ACCESSORIES

The following accessories are available from Wollensak and are essential for best results in high-speed photography:

Control unit for both camera and event, the "Goose"  
Exposure Meter  
Tripod  
750-R Spot lights & RSP 2 lamps

Clamps  
Oscillator  
Hi-Lo Series—Parallel Switch for lights  
Timing lights (NE 66)

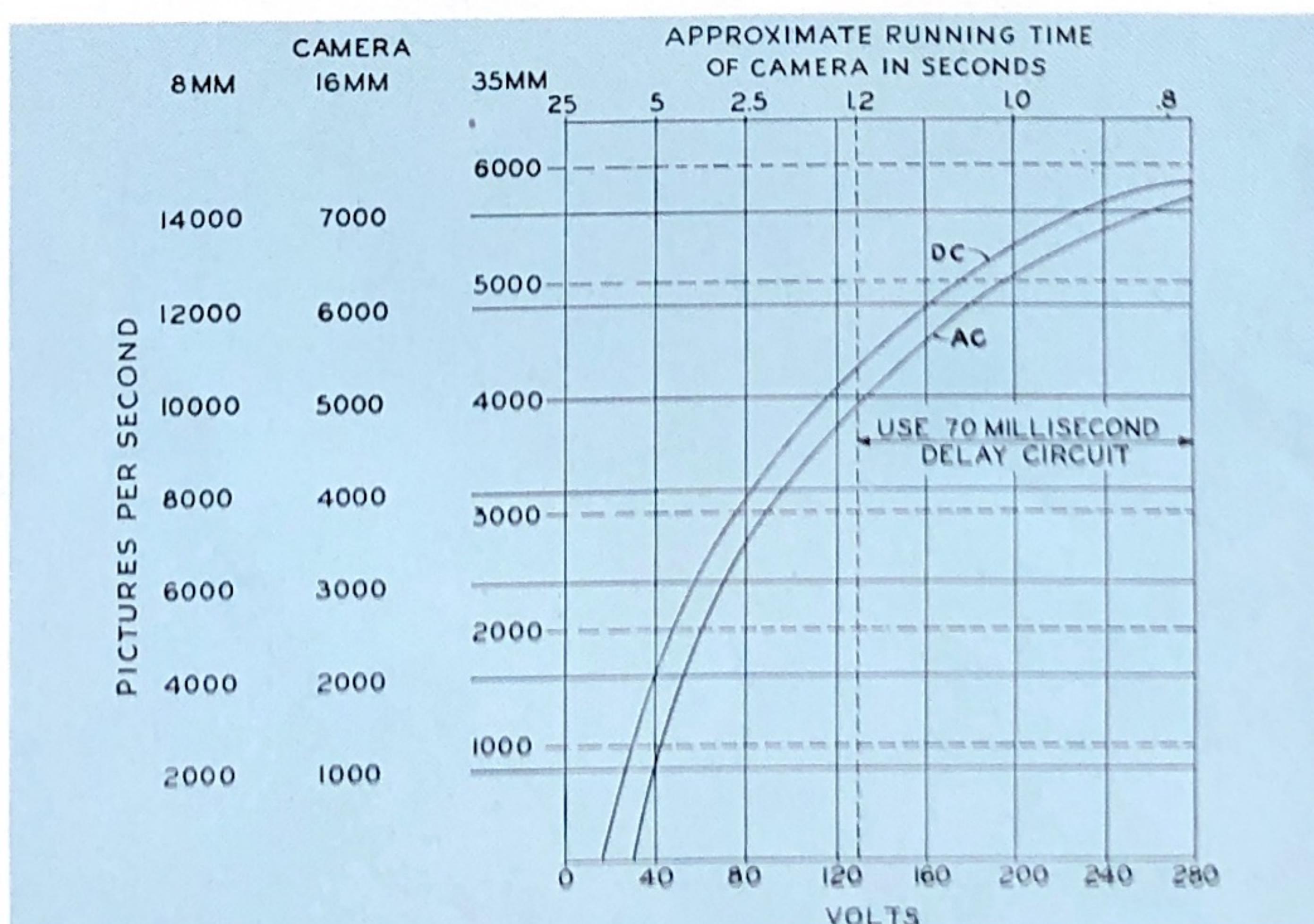
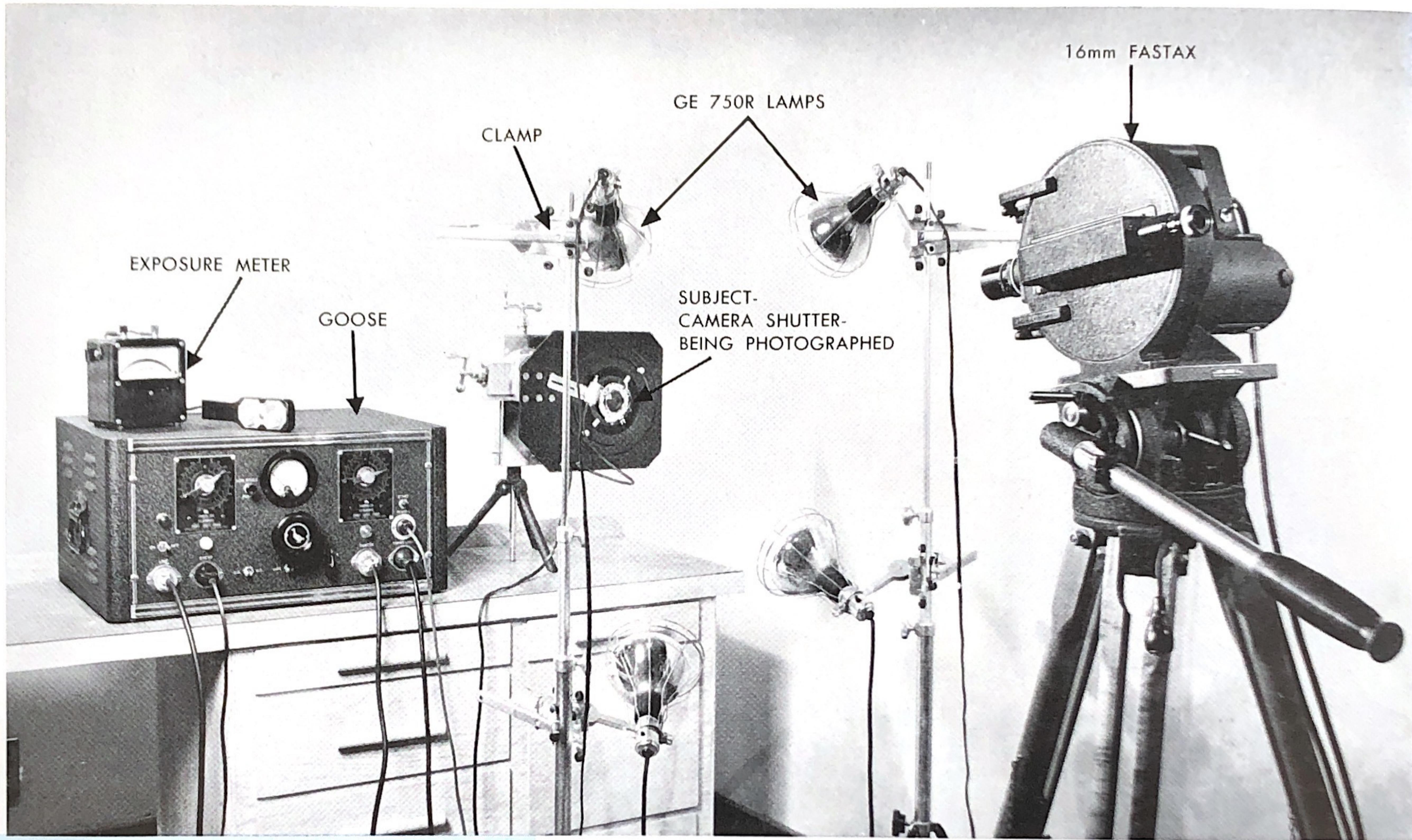


FIGURE 7



**FIGURE 8**  
**Typical Indoor Lighting**  
**Arrangement**

## AUTOMATIC TIME CONTROL (the Goose)

The Model J-410 Timer (The Goose) is manufactured exclusively for Wollensak by the Industrial Timer Corporation. It automatically controls the FASTAX Camera in synchronism with the event to be photographed and allows for remote control operation.

It regulates the film speed through a built-in variable transformer which controls the voltage from 0 to 270 volts. When the "Goose Timer" is set for 1/15 of a second it takes care of inserting a resistance in series with the variable transformer so the high-speed camera does not tear film as it is starting. In short, the "Goose" increases the picture taking speed and prolongs life of the camera. It's extremely accurate, simple in operation and saves time, money and film.

## EXPOSURE METER

FASTAX Illumination Meter is manufactured for Wollensak by Weston Electric Instrument Corp. Because of the extreme speed of the FASTAX a conventional exposure meter cannot be used and the human eye is incapable of estimating the high light values employed. Improperly exposed film is not only film loss but may mean hours of preparation time lost. The recommended model has

Wollensak reserves the right, without notice, to make such changes in equipment, design, or components as progress in engineering or manufacturing methods may warrant.

Mr. John H. Waddell is ready and willing to give individual attention to your problems in planning and execution of your high-speed photography.

ranges of 0-3000, 0-30,000 and 0-300,000 foot candles. These ranges cover all light conditions from normal sunlight to extremely high level artificial light levels such as that obtained from multiple banks of high intensity spot lights.

## OSCILLATOR

For ultra high-speed FASTAX Camera Operation 1,000 timing marks per second may be recorded on the film by connecting a special oscillator in the camera timing light circuit. This unit, Model 2098 A, operates on 120-volt, 60- or 400-cycle power, so it can be used in the laboratory, the field or airplanes.

## CLAMPS

Alligator clamps for lamps are especially made to clamp tightly on any surface. They will not wiggle when in position, and will not scratch or mar any finish.

## HI-LO SWITCH

The Hi-lo series parallel switch is most helpful when focusing as it enables lights to be burned in series. When ready for particular exposure, lights are used in parallel.

*Wollensak*  
OPTICAL CO. • ROCHESTER 21, NEW YORK  
INDUSTRIAL & TECHNICAL PHOTOGRAPHIC DIVISION

