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THE ARRIFLEX 35 MM MOTION PICTURE CAMERA

Report prepared by

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THE ARRIFLEX 35 MM MOTION PICTURE CAMERA

by

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Signal Corps

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FIELD INFORMATION AGENCY, TECHNICAL

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ABSTRACT: This report deals with the construction and operation of a 35 mm motion picture camera which uses a new reflex type view finder. The camera is primarily a hand held camera especially applicable for news and combat work where stable light weight equipment is required.

THE ARRIFLEX 35 MM MOTION PICTURE CAMERA

I. INTRODUCTION.

The Arriflex is a special hand held camera. It embodies two features of design which are entirely new in motion picture cameras The first feature is the reflex finder, shown in the accompanying drawing. By coating the front side of the conventional motion picture camera shutter, forming it into a mirror, the image received by the taking objective is reflected by mirror on the ground glass and through a prism into the finder objective where it is magnified 5½ diameters. (See Figure 1). This allows the operator to see in the finder exactly what is being recorded by the taking lens. In order to reflect this image into the finder, the shutter is set at a 45° angle to the optical axis. A special process of making this metallic shutter into a mirror has been developed. Certain metallic salts are deposited on the plate by a process of evaporation, and are polished after the material has hardened. This provides an unusually bright reflecting surface of the high accurate optical quality required. In other respects the shutter is of the same design as other cameras. It is the revolving plate type, having a 130° opening. It can be seen that the image formed by the taking objective is recorded on the film during the time the shutter is in this open position during 130° of its rotation. For the balance of the rotation period the image is reflected by the mirror on the opposite side into the findor.

II. GENERAL DESIGN.

In other respects the camera is of fairly conventional design. The camera and magazines are built of Hydronalium, which is a composition of aluminum and magnesium. It is extremely light in weight, but not quite as light as some of the American models made almost entirely of magnesium.

All bearings except one, are roller bearings, and the camera has been tested at minus 30 C and has been found to work satisfactorily at that temperature without any changes in the lubrication.

All gears are of the helical cut, fibre type to minimize noise. The claw is (A) a single steel beam mounted on an eccentric cam and operates at the rear of the film. The aperture plate (B) is of fibre and contains side pressure springs which hold the film rigid. A loop (C) is preset to a required length which is marked on each separate magazine, then dropped into the camera, threaded into the film chute (D), and held in place by one locking catch on the film gate. A measured loop is left at the top of this

chute, and a long loop is left below the chute. These loops of film are protected from hitting the side walls by scooped-out chromium guide plates.(E), which allow the gilm to slide over them, riding on the edges only - thus eliminating the possibility of any scratching. One screw (F) locks the magazine in place. One catch (G) fastens the film in place, and one knob (H) locks the camera door in place making the entire loading operation in three steps. The usual feed and take up sprockets (I) are not located in the camera housing, but are in each separate magazine. The camera is fitted with a grip (J) that enables the operator to grasp the camera in his right hand and load it with his left, making it possible to change magazines even while the operator is walking. This is a very important feature for a news camera.

III. TURRET ASSEMBLY.

A three lens turret has handles to provide easy rotation and small projecting levers (K) on the lens mounts make possible the changing of the lens settings of both diaphram of distance. With these the operator can, with his right hand on the grip, use his fingers to swing the turret or change openings, or follow focus while operating the camera.

IV. LENSES.

The camera comes equipped with Astro Pan-Tachar lenses or Hugo Meyer Primo Plan Lenses. A wide-angle lens of 30 MM, a 50 MM, and a 75 MM may be mounted in the turret without interference from each other in operation, and the sunshade (L) may be used with this combination. If longer telephotos are used they will cut the field of the wide angle lens and in extremely long focal length telephotos, with the 50 MM lens. Lens mounts are the standard American-type with locking ring, and may be removed by pressing two levers together.

V. SUNSHADE.

The sunshade (L) is of the rectangular type, and can be removed by loosening one thumb screw. It is black-felt sprayed inside to prevent reflection, and has a section for holding filters which are held in place by a spring lock. For lenses of longer than 80 MM focal length, special screw-on filters are necessary.

VI. FILM MAGAZINES.

Two types of film magazine (M) are available. one having a 60 meter or two hundred foot film capacity, and the other a 120 meter or 400 feet capacity. The magazines contain gears for rewinding

the film and mesh with the camera gears when the magazine is attached to the camera. One spring-back thum screw (F) locks the magazine in place. Each magazine is equipped with an automatic light trap and contains a built-in footage indicator (H) which shows the amount of unexposed film remaining at any time. A fabric belt drives the actual take-up hub and the slippage of this belt prevents too much tension on the film as it is being wound. One locking catch (O) removes the whole magazine cover.

VII. POWER DRIVING MOTOR.

A 12 volt DC motor with a variable rheostat (Q) is mounted vertically at the base of the camera and acts as a handle (P). Equipped with an ultra-rapid starting coil it develops full speed almost immediately, and in this way the motion of the motor is not transmitted to the camera causing it to jerk in the operator's hand. In fact, because a very high speed motor is used (5000 RPM), and because it is located on the axis of the camera weight and very low on the center of gravity, this motor has a gyro-stabilizing effect which tends to counteract some of the unsteadiness of the operator's body.

In photographing at speeds from 30 to 64 frames per second (slow motion), two batteries are used instead of one. They will not damage the motor providing not more than 200 feet of film are run through at any one time.

VIII. POWER SUPPLY.

Three types of battery are available. They are of the steel plate Edison-type, and differ only in size. The smallest weighs ten pounds, and willrun through 1200 to 1500 feet of film at one charge. It is carried by the operator on a shoulder strap. These batteries will not loose their charge like the lead-acid type, but require special methods of charging. Any 12 volt battery may be used.

IX. TACHOMETER.

A tachometer (R) indicates picture frequencies from zero to thirty frames per second with a red mark indicating sound speed at 24 frames. The speed is varied by the rheostat on the driving motor.

X. VIEW FINDER.

This finder, because of the reflex action already described, actually shows what is being recorded by the taking objective, and

therefore does not require any mats or masks with lenses of different focal lengths. It magnifies this image 5½ diameters. The finder eyepiece may be fitted for either right or left hand operation, and the objective is adjustable to the individuals eyes.

XI. CAMERA SUPPORTS

The Arriflex is primarily a hand-operated camera, but by use of a specialadaptor it may be mounted on any standard tripod. This special adaptor is necessary because of the interference of the motor. However, the manufacturers make a special tripod for use with this camera that has a free-head for both pan and tilt, and, because the weight of the motor is below the tilt pivot, it balances the camera very well, making a very smooth pan or tilt.

The camera also comes equipped with an adjustable shoulder strap for carrying when not in use. This strap can be tightened over the shoulder in such a manner as to furnish additional support when taking pictures.

If the operator desires he can drop to one knee and rest the camera by the motor handle on his other knee. This has proven to be a very steady support.

For extreme low angle shots, and those taken from a prone position, the motor base can be rested directly on the ground, but care must be taken in either the kneeling or prone position not to pan the camera as this will turn the theostat.

XII. DEFECTS OF OPERATION.

i) The camera has no mechanical governor to control the speed, and must be tested with film before operation to pre-determine the correct operating speed.

ii) The visibility of the finder is reduced when the lens diaphrams are used at the smallest stops, and it is sometimes difficult for the operator to determine the exact focus at these smaller openings. There is some pillow distortion in the finder, and the eye must be shifted to get a clear view of the corners of the field.

iii) The lens turret is of too small diameter to allow the use of wide angle lenses with those telephoto lenses of longer length than 80 mm.

iv) The sun-shade cannot be used with lens of long focal length.

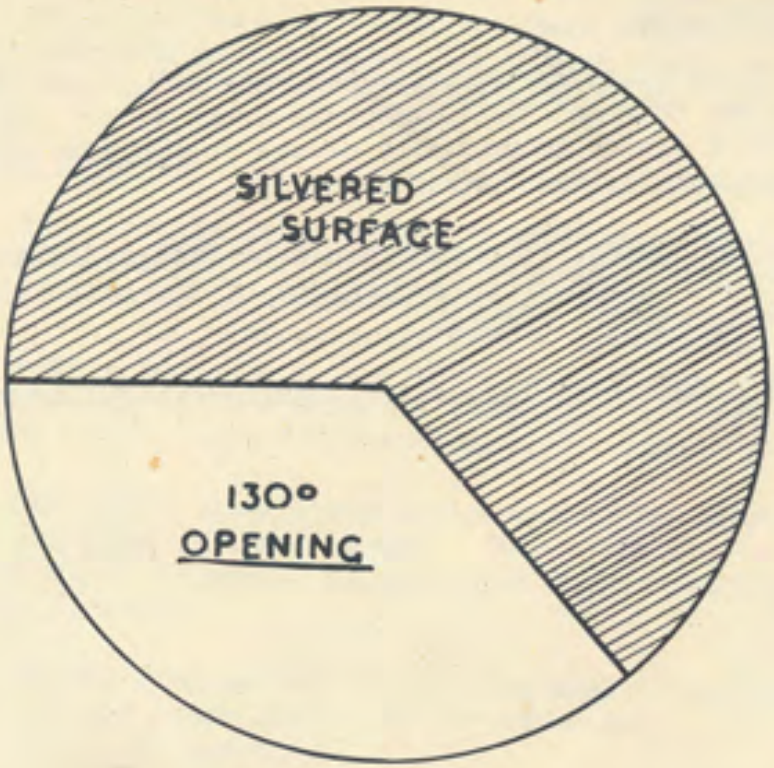
XIII. RECOMMENDATIONS

i) It is believed that further research should be conducted t try and find a way to mount the shutter in front of the lens diaphram so that the reflex findor image would always retain its original brightness regardless of the lens stop used.

ii) A mechanical governor should be designed that would keep the camera at a given speed regardless of the battery voltage or the load handled by the camera.

iii) The design of this camera could very easily be applied to 16 mm camera.

SCHEMATIC OF THE ARRIFLEX REFLEX VIEW FINDER.



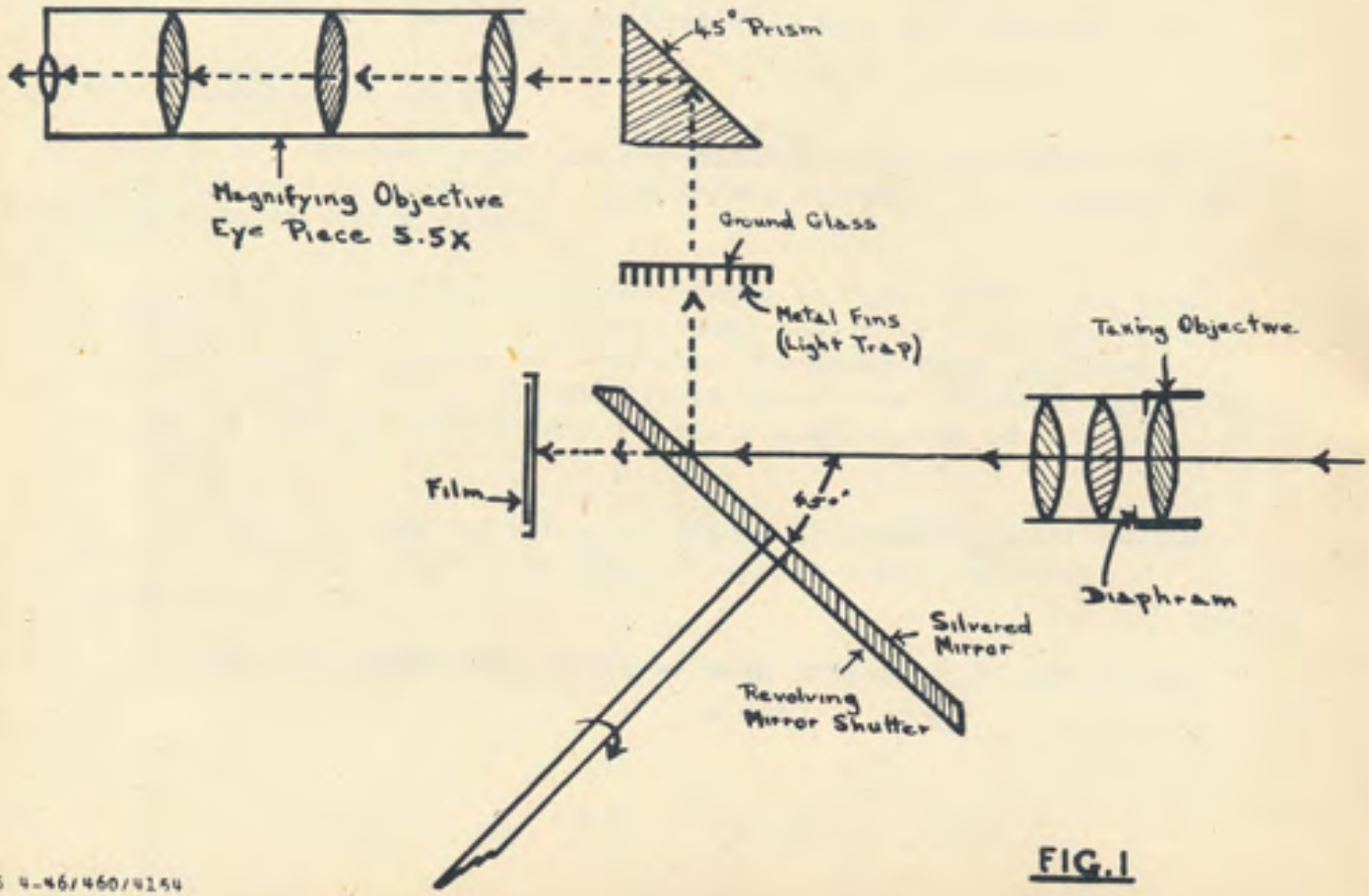
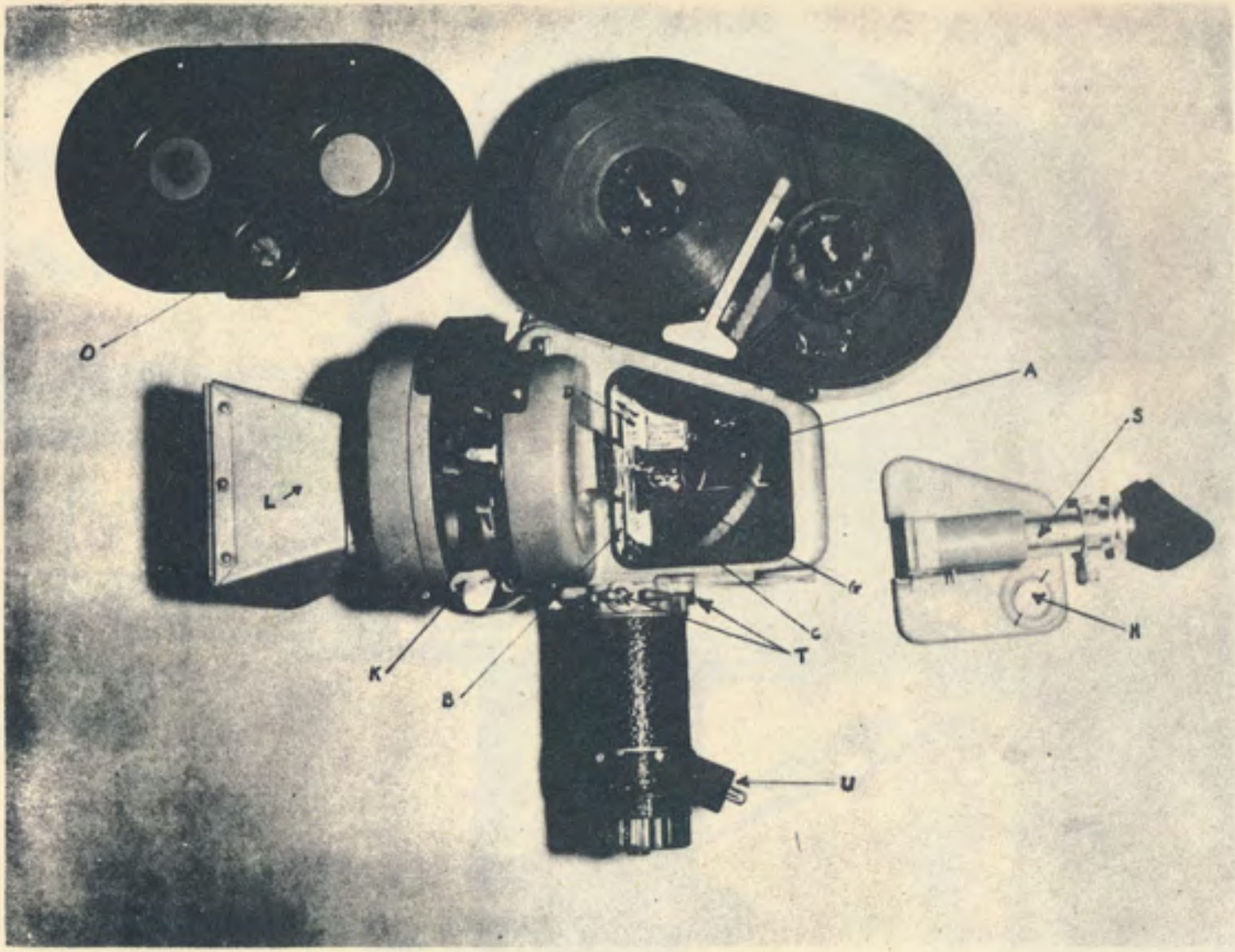


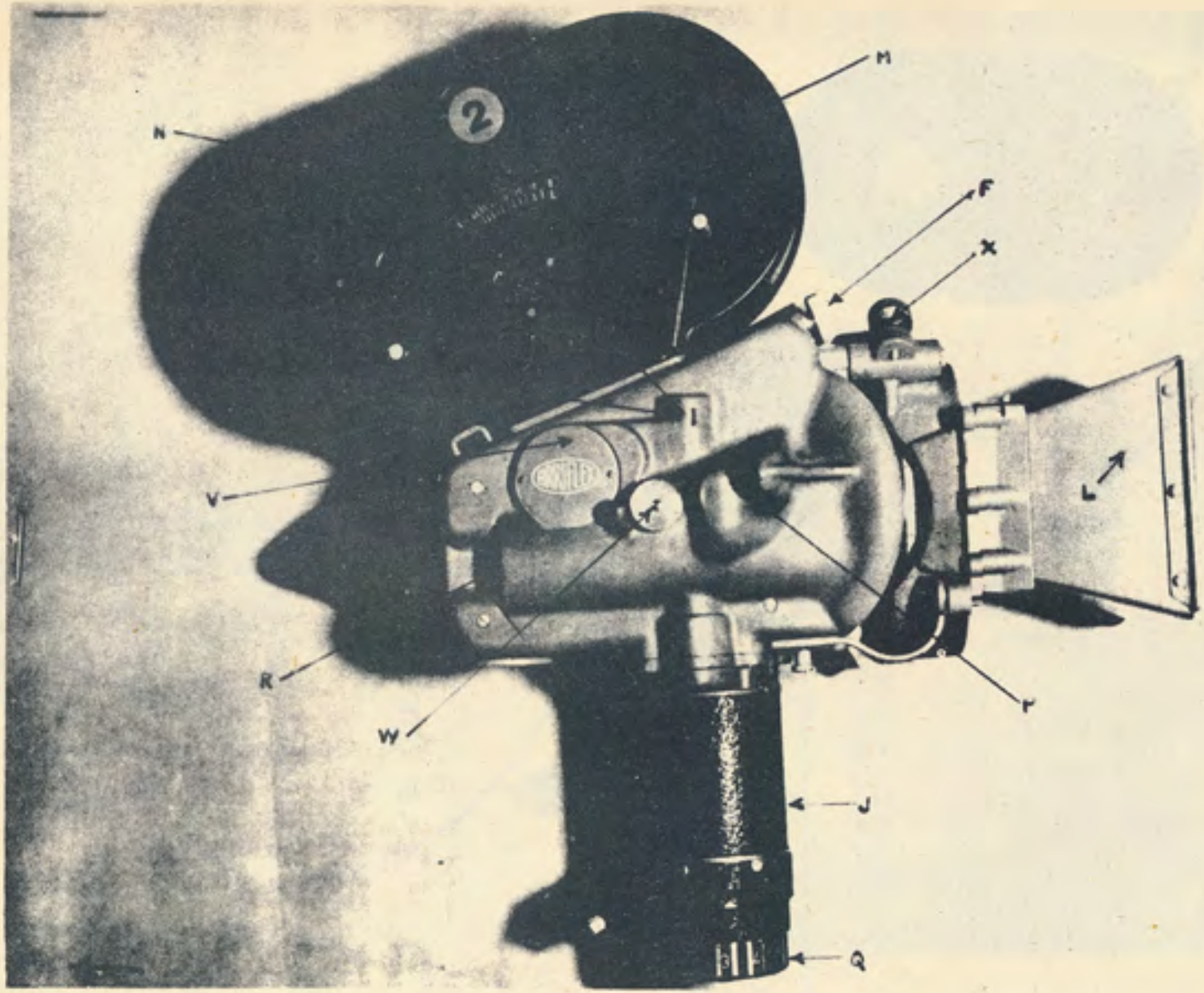
FIG. 1

AGPS 4-46/460/4144



A. Claw
B. Aperture Plate
C. Film Loop
D. Film Gate
E. Chromium Guide Plate
G. Film Gate Catch
H. Camera Door Lock
K. Lens Levers
L. Sunshade
O. Magazine Locking Catch
S. Optical Reflex Finder
T. Motor Starting Switches
U. Socket for Battery Cable

FIG. 2.



F. Magazine Locking Screw
I. Sprockets in Magazine
J. Camera Motor and Handle
M. Magazine
N. Footage Indicator
P. Hand Grip
Q. Variable Rheostat
R. Tachometer
V. Cover for Attaching Hand Crank
W. Hand Wheel for Testing
X. Thumb Screw For Removing Sunshade.

FIG.3



FIG.4.



FIG. 5.



FIG.6.



FIG. 7.