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COMPLETE SPECIFICATION

Improvements in or relating to Photographic Cameras

We, JOHAN STEENBERGEN, a Dutch subject, OTTO DIEBEL, a German citizen, HUGO FRAUENSTEIN, a German citizen, EMIL ENGLISCH, a German citizen, HERMANN SCHUBERT, a German citizen, and CONRAD KOCH, a German citizen, trading as IHAGEE KAMERAWERK STEENBERGEN & COMPANY, of 24, Schandauer Strasse, Dresden, A.19, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

15 This invention relates to improvements in or relating to photographic cameras of the roll film type, more particularly to miniature cameras.

20 It has already been proposed, in a photographic roll film camera, to provide a clutch coupling between the film-winding spool and the winding key, which coupling comprises one member having ratchet teeth fixed to the film-winding spool and a second member, also with ratchet teeth for co-operation with the ratchet teeth on the fixed member, longitudinally movably mounted within the winding key. By moving the movable member manually in the said winding key the clutch may be engaged and disengaged whereby the spool may be coupled to the winding key, when it is desired to wind on a film, or uncoupled therefrom to enable the spool to rotate freely in the reverse direction on rewinding the exposed film.

40 The principal object of this invention is to provide a camera of the above type which is simple in construction and assembly and convenient and accurate in use and which, at the same time, necessitates the carrying out of as few movements as possible on the part of the operator. Owing to the compact arrangement of the various parts of the camera, a comparatively small instrument is provided which may be manipulated easily and accurately for high speed work, instantaneous exposures, for longer time exposures and in the production of clear-cut photographs from which, if desired, enlargements may be subsequently made.

[Price 4/6]

According to this invention, we provide a photographic camera of the roll film type including a cassette spool, film-winding spool and a driving device for rotating the film-winding spool, wherein the driving device has a one-way connection with the winding spool through the medium of a one-way clutch, such that the said spool is positively coupled to the said driving device during movement thereof in one direction and is automatically uncoupled therefrom during movement of said device in the other direction to allow of free rotation of the said spool in the reverse direction, independently of the said driving device, for the purpose of enabling the film to be rewound into the cassette.

Means located externally of the camera casing and associated with the cassette spool are preferably provided for effecting the rewinding operation. These means may comprise a pin loosely mounted in a bearing collar seated in the casing wall of the camera and having a head portion located externally of the camera casing and the said pin extending into the casing so as to engage at its inner end with the cassette spool. The head portion of the pin preferably carries a pivoted yoke-like handle member.

The driving device for effecting the film-winding movement advantageously includes an operating lever rigid with a sleeve rotatably mounted on the main film-winding shaft, the said sleeve being adapted to be coupled to the said shaft on rotation of the sleeve in one direction by means of the aforesaid one-way clutch which may comprise a cam arm formed on the sleeve, a toothed clutch disc fixed on the winding shaft and a spring-pressed pawl pivotally carried on a member loosely journalled on the shaft and normally held out of engagement with the clutch disc. On the rotation of the sleeve the said cam arm causes the pawl to become engaged with the clutch disc thereby coupling the shaft to the sleeve.

The film spool is preferably prevented from rotating in the reverse direction when the mechanism is set for winding

- by means of a one-way spring-pressed pawl adapted to engage a pinion constantly meshing with a further pinion mounted on the winding shaft so as to allow of rotation of the said shaft in winding direction only and releasable from the said engagement to allow of reverse rotation of the shaft when required.
- 10 A cutting or severing device is advantageously arranged in the camera casing adjacent the cassette and operable from the outside of the said casing for cutting the rewound film. The cutting device is preferably slidably carried in a hollow shaft or casing rigidly mounted in the dark chamber of the camera.
- 15 A rotary driving head carrying an exposure indicator is preferably mounted on, and adapted to be operatively connected to, the film-winding shaft. The exposure indicator may comprise a disc frictionally engaging within the driving head and having thereon an annular series of marks or numbers for successively indicating the number of exposures made. A pair of diametrically opposed pins are preferably provided on the indicator for setting the latter to zero position.
- 20 Rotary gears and pinions may be provided for stabilizing the reverse motion of the film and causing rotation of the indicator with respect to the driving head during reverse rotation of the winding shaft.
- 25 In order that the invention may be fully understood, we shall now describe one embodiment thereof by way of example by reference to the accompanying drawings, in which:—
- 30 Figure 1 is a front elevation of a camera embodying our invention with the lens removed from the lens mount, disclosing the interior iris - diaphragm, and showing by dotted lines the arrangement of the roll film.
- 35 Figure 2 is an elevation at the rear of the camera, with the detachable back-plate removed to disclose the interior of the dark-chamber for the reversible film, the film-cutter, the cassette and film-winding spool.
- 40 Figure 3 is a horizontal sectional view at the rear portion of the camera, disclosing the dark-chamber, the cassette and film-winding spool, and indicating by dotted lines the film.
- 45 Figure 4 is a top plan view of the camera, with the lens mount omitted, showing the winding-lever, time setting dial, and film-reversing key.
- 50 Figure 5 is an enlarged detail view, partly in section showing the lower end of the film-winding spool with its release device, and the latter in released position.
- 55 Figure 6 is a perspective view in diagrammatic arrangement showing the two curtains, the winding pinions, and the two automatic spring-wound curtain-rollers; the curtains form the shutter, and the latter is illustrated, for convenience, in open position.
- 60 Figure 7 is an enlarged detail sectional view of the film-cutter located adjacent the cassette in the dark chamber which cutter also forms the stop for the cassette.
- 65 Figure 8 is an enlarged, detail, vertical sectional view of the film-winding and shutter-setting head, together with the film-winding spool.
- 70 Figure 9 is a detail sectional view at line 9—9 of Figure 8 disclosing the driving clutch, and Figure 10 is a similar view at line 10—10 showing the complementary clutch head for the clutch-gear of Figure 9.
- 75 Figure 11 is a top plan view of the shutter control mechanism, with the driving head, and the timing spindle in section.
- 80 Figure 12 is an enlarged vertical sectional view showing the time-setting knob and gears, and also indicating the shafts of the winding rollers for the two curtains of the shutter.
- 85 Figure 13 is a detail, inverted, plan view of the hollow time-setting knob of Figure 12.
- 90 Figure 14 is a detail elevation of parts of the winding-head shown in Figure 8 and showing especially the arrangement of the gears for reversing the movement of the film, with its latent images, in the dark chamber at the rear of the camera.
- 95 Figure 15 is a detail view, in section, at line 15 of Figure 14.
- 100 Figure 16 is a plan view, with the camera inverted, showing shutter-releasing parts, these parts being located beneath the interior frame-plate while the parts of Figure 11 are located above the same interior frame-plate, at one side of the central light chamber of the camera, and normally enclosed by the exterior casing of the camera, and
- 105 Figure 17 is a detail elevation showing the inner face of the detached back-plate of the camera, with its film-guides.
- 110 In order that the general assembly and arrangement of parts may readily be understood we have shown the camera with an outside casing C that is provided with a removable quick-detachable back-wall C¹, the interior face of which is shown in Figure 17 with a flat presser-plate 1, supported by two spring blades 2, 2 each having one end screwed to the back-wall and the other end fixed to the
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presser plate. A guide roller 3 is also journalled in brackets attached to the inner face of the removable back-wall, and the presser plate forms a resiliently supported guide for the film F to glide over, while the roller forms a rotary guide for the roll-film F.

The opposite ends of the removable back-wall are equipped with suitable fastening devices that may readily be released for removal of the back-wall in order that a standard type of cassette P (Figures 1, 2 and 3) may be loaded into or unloaded from the dark-chamber at the rear of the camera. The back-wall C¹ forms one wall of this dark-chamber and an interior partition 4 (Figure 3) forms the remaining walls of this dark-chamber, the partition extending from end to end of the camera and enclosing the cassette P as well as the winding spool W for the film, and located at the opposite end of the camera.

As best seen in Figure 3 the film passes from right to left, or reversely left to right, between the resiliently supported presser plate 1 and the partition 4, and the guide roller 3 of the back-wall is located adjacent a sprocket shaft 5 having a pair of sprockets 6, 6 for engagement with the perforations at the upper and lower edges of the roll-film, as indicated by dotted lines in Figure 2.

The cassette P, with its interior spool D, and the film-winding spool W, are both removable from the dark-chamber of the camera, and they are retained in their respective positions by means of releasable fastening devices mounted in the bottom wall of the casing.

One of these devices forms an auxiliary re-winding head by means of which the exposed film, with its latent images, may be rewound on the spool D of the film pack P, without exposure to the light.

The interior spool D of the standard cassette P is provided at its lower end with a socket 7 and a transversely extending pin 8 (Figure 5) and this spool D is not only rotatable in one direction to permit advancing feed of the film, but the spool is also rotatable in the opposite direction to cause reverse travel of the film with its latent images, and rewinding of the film within the cassette P. For this purpose we employ a rewinding head, exterior of the casing C and accessible for turning by hand, which rewinding head is mounted loosely in a bearing collar 9 seated in the bottom wall of the casing C, and retained also by co-action of its flange 10 with the back-wall C¹ when the latter is in closed position.

The rewinding head includes a rota-

table pin 11, centrally mounted in the collar for longitudinal movement as well as rotary movement, and provided at its lower end, exterior of the casing, with a flat circular head 12, upon which is pivoted at 13 a U-shaped cam-yoke 14. Upon the upper end of the pin, within the casing, is mounted a notched socket-head 15 for engagement with the socket 7 and pin 8 of the spool D of the cassette P.

Below the socket-head 15 a bearing head 16 is mounted on the pin, and between this bearing head and the bottom 9¹ of the collar 9 a spring 16¹ is interposed and coiled about the pin.

Thus, as in figure 5, it will be apparent that the U-shaped yoke may be swung from its horizontal position in figure 2, to the depending position shown, and used as a handle for turning the enclosed spool D to rewind the film within the cassette.

The pin 11 thus forms a bearing for the rotary movement of the film-spool D within the cassette as the spool and the notched socket-head 15 turn on the pin as a journal. After the roll-film has been rewound within the cassette, (but leaving the outer end of the film attached to the winding spool W by its attaching plate W¹) the film is severed close to the cassette, by the use of a knife or cutter 17 located within the dark-chamber adjacent to the cassette. This cutter is rigidly mounted on the draw-bar 18 which is slidably mounted in an upright tubular casing 19 that is slotted at 20 to accommodate the knife and to guide the movement of the knife. The tubular knife casing is rigidly mounted in the dark-chamber with its longitudinal axis parallel with the longitudinal axis of the cassette, and at its lower end the knife-casing is fashioned with an attaching flange 21 fixed to the camera casing. Exterior of the camera casing C the knife casing 19 is fashioned with an exteriorly threaded bushing 22 adapted to receive the interior threads of a screw-cap 23 loosely mounted on the lower end of the draw-bar 18 by means of a screw 24. When out of use, the draw-bar 18 and its cutter 17 are pushed within the tubular knife casing, and then the screw-cap 23 is turned home to hold the cutter in its casing and in inoperative position. When the cap 23 is unscrewed it is then employed as a handle to pull on the draw-bar and cause the cutter to move transversely across and sever the film.

As disclosed in Figure 8, the lower bearing for the winding spool W is quite similar to the bearing for the rotary spool of the cassette, but the bearing

head of the winding spool W is not ordinarily rotatable. This bearing head includes a pin 26 with its upper end projecting into the socket 27 of the spool, and the pin, which is provided with a head 28 within the casing, is also provided with another fixed head 29 exterior of the casing C and secured to the pin by screw 30. A base plate or bearing plate 31 is loosely mounted on the pin exterior of the casing C and this plate closes an opening in the bottom of the casing through which opening the pin extends. Between the head 28 and the bearing plate 31 a spring 32 is interposed and coiled about the pin, and a U-shaped cam-yoke 33 is pivoted at 34 on the cam head, so that, when the yoke is swung down on its pivot, against the tension of spring 32, the bearing end of the pin 28 is withdrawn from the socket 27 to free the lower end of the winding spool.

The upper end of the winding spool is fashioned with a transversely extending pin 35 with which two notches 36, in a coupling sleeve 37, co-act, and this sleeve, which is flanged at 38 to engage the spool, is secured by a screw 39 on the lower end of the main winding shaft 40 of the camera.

In Figure 3 it will be seen that the presser-plate 1 is located directly behind a central light-opening in the partition 4, which opening is complementary to a similar opening in the back wall of the central box A, located within the casing C, and this box forms the light chamber of the camera.

The film F in its movements passes between the presser plate and the partition 4, and the latter resiliently holds a portion of the film against the open-portion of the partition, to present a well-defined area of the film for exposure to the light rays coming from the light chamber A.

The sprocket wheel 6, which may be mechanically rotated, and the guide roller 3 co-act to guide the film in its movement, to prevent buckling of the film, to relieve the film of strains due to winding and rewinding, and further, the sprockets, due to their location near the winding spool W, assist in preventing accidental disengagement of the free end of the film after it has been tucked in under the retaining shield or friction plate W¹ of the winding spool W.

As best seen in Figure 3, the first or opening curtain 41 and the second or closing curtain 42, which together constitute the shutter, pass through a vertical space or plane located between the back face of the back wall of the light-chamber A and the front face of the

partition 4 which forms part of the dark-chamber of the camera. The first or opening curtain is mounted at one end on a spring actuated curtain-roller 43, and the second or closing curtain 42 at one end is mounted on a second spring-actuated curtain-roller 44, which rollers are journalled in two of the spaced frame plates 45 that are employed as an interior structure of the casing C.

It will be understood that by "spring-actuated" roller is meant a roller which is rotatable under the action of a spring, which spring is stressed when the first shutter curtain is in the closed or set position. On the release of the shutter the detensioning of the spring will cause the rotation of the roller and the consequent winding up of the shutter curtain. In a similar manner, the spring of the second or closing shutter curtain-roller 44 is stressed when the shutter is in the open position and the detensioning of this spring will draw the shutter curtain across the lens.

Each of the curtains is provided with a spaced pair of tapes 46 (Fig. 6) which form extensions of the curtains, and these extensions, by their presence on the curtains, provide the necessary openings in the curtains to form the exposure slot of the shutter, so that the light rays may pass from the light chamber A through the light-openings described to make an exposure of a portion of the film, as the shutter flashes past these openings.

The spring-actuated rollers are located at one side of, and exterior of, the light chamber, between the said chamber and the cassette compartment, and in making an exposure the curtains flash successively to the right, when released, in a direction opposite to the advance or winding feed of the film F.

In setting the shutter, the first or opening curtain is mechanically wound upon a winding roller 48, and the second or closing curtain is wound upon another winding roller 47, located at one side of, and exterior of, the light chamber. These rollers, which are journalled in bearings of spaced frame plates 45, are provided with winding pinions 50 and 49 respectively. For convenience in operating the winding rollers, the roller 48 is spaced in front of the roller 47, and the latter roller is provided with guide-rollers 51 for the tapes of the first curtain, as the closing curtain changes its direction of movement at this point.

The roll-film is fed or advanced and the shutter is set, through the instrumentality of the setting or winding lever 69 (Figs. 4 and 8) located exterior of the casing and above the camera body, at

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head of the winding spool W is not ordinarily rotatable. This bearing head includes a pin 26 with its upper end projecting into the socket 27 of the spool, and the pin, which is provided with a head 28 within the casing, is also provided with another fixed head 29 exterior of the casing C and secured to the pin by screw 30. A base plate or bearing plate 31 is loosely mounted on the pin exterior of the casing C and this plate closes an opening in the bottom of the casing through which opening the pin extends. Between the head 28 and the bearing plate 31 a spring 32 is interposed and coiled about the pin, and a U-shaped cam-yoke 33 is pivoted at 34 on the cam head, so that, when the yoke is swung down on its pivot, against the tension of spring 32, the bearing end of the pin 28 is withdrawn from the socket 27 to free the lower end of the winding spool.

The upper end of the winding spool is fashioned with a transversely extending pin 35 with which two notches 36, in a coupling sleeve 37, co-act, and this sleeve, which is flanged at 38 to engage the spool, is secured by a screw 39 on the lower end of the main winding shaft 40 of the camera.

In Figure 3 it will be seen that the presser-plate 1 is located directly behind a central light-opening in the partition 4, which opening is complementary to a similar opening in the back wall of the central box A, located within the casing C, and this box forms the light chamber of the camera.

The film F in its movements passes between the presser plate and the partition 4, and the latter resiliently holds a portion of the film against the open-portion of the partition, to present a well-defined area of the film for exposure to the light rays coming from the light chamber A.

The sprocket wheel 6, which may be mechanically rotated, and the guide roller 3 co-act to guide the film in its movement, to prevent buckling of the film, to relieve the film of strains due to winding and rewinding, and further, the sprockets, due to their location near the winding spool W, assist in preventing accidental disengagement of the free end of the film after it has been tucked in under the retaining shield or friction plate W¹ of the winding spool W.

As best seen in Figure 3, the first or opening curtain 41 and the second or closing curtain 42, which together constitute the shutter, pass through a vertical space or plane located between the back face of the back wall of the light-chamber A and the front face of the

partition 4 which forms part of the dark-chamber of the camera. The first or opening curtain is mounted at one end on a spring actuated curtain-roller 43, and the second or closing curtain 42 at one end is mounted on a second spring-actuated curtain-roller 44, which rollers are journalled in two of the spaced frame plates 45 that are employed as an interior structure of the casing C.

It will be understood that by "spring-actuated" roller is meant a roller which is rotatable under the action of a spring, which spring is stressed when the first shutter curtain is in the closed or set position. On the release of the shutter the detensioning of the spring will cause the rotation of the roller and the consequent winding up of the shutter curtain. In a similar manner, the spring of the second or closing shutter curtain-roller 44 is stressed when the shutter is in the open position and the detensioning of this spring will draw the shutter curtain across the lens.

Each of the curtains is provided with a spaced pair of tapes 46 (Fig. 6) which form extensions of the curtains, and these extensions, by their presence on the curtains, provide the necessary openings in the curtains to form the exposure slot of the shutter, so that the light rays may pass from the light chamber A through the light-openings described to make an exposure of a portion of the film, as the shutter flashes past these openings.

The spring-actuated rollers are located at one side of, and exterior of, the light chamber, between the said chamber and the cassette compartment, and in making an exposure the curtains flash successively to the right, when released, in a direction opposite to the advance or winding feed of the film F.

In setting the shutter, the first or opening curtain is mechanically wound upon a winding roller 48, and the second or closing curtain is wound upon another winding roller 47, located at one side of, and exterior of, the light chamber. These rollers, which are journalled in bearings of spaced frame plates 45, are provided with winding pinions 50 and 49 respectively. For convenience in operating the winding rollers, the roller 48 is spaced in front of the roller 47, and the latter roller is provided with guide-rollers 51 for the tapes of the first curtain, as the closing curtain changes its direction of movement at this point.

The roll-film is fed or advanced and the shutter is set, through the instrumentality of the setting or winding lever 69 (Figs. 4 and 8) located exterior of the casing and above the camera body, at

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one side of the light chamber A. One swing of the lever in a horizontal plane through an arc of slightly less than 360 degrees is sufficient to set the mechanism, and the lever (when released) is automatically returned to its initial position against a stop 69¹ (Fig. 4).

As seen in figure 8, this lever has an integral attaching head 70 which is rigidly mounted on the upper end of a sleeve 74 and an exposure indicating disc 70¹ is mounted within the head and is in frictional engagement with the hub 98 of a gear 97 loosely mounted on the sleeve 74 and hereinafter referred to. The disc 70¹ is provided with a circumferential series of marks or numbers for successively indicating the number of exposures that have been made. In this instance the disc has a capacity for indicating thirty-six exposures of the film, and the disc has a couple of diametrically arranged pins 72 by means of which the disc may be set at zero. The disc is held by friction so that it will turn with the lever, but it is also rotatable relative to the lever in order that it may be turned, as by finger pressure against a pin 72, to bring the zero mark to a position opposite to a stationary mark 73 (Fig. 4) provided on the top face of the casing C adjacent the disc. The sleeve 74 is prevented from longitudinal movement on the shaft 40 by means of a screw 71.

The film-winding movement is transmitted from the lever through the sleeve, a clutch, the shaft, and coupling 37, directly to the winding spool W, to advance the film.

The sleeve 74 has rigidly attached thereto one end of a coiled spring 75, and the other end of this spring is attached to a post 76 standing erect above and rigid with one of the frame plates 45, and this spring, which is wound under tension on the working stroke of the lever, automatically returns the lever to initial position when the thumb or finger is removed from the lever.

To transmit driving power from the sleeve 74 to the shaft 40, and to prevent return or reverse movement of the winding spool W with the inactive stroke of the lever, we provide a clutch device between the sleeve and the shaft, which includes a cam arm 77 (Fig. 14) rigid with the lower end of the sleeve 74 and a toothed clutch disc 78 rigid with, or keyed to, the shaft 40 just below the cam arm 77. A clutch gear 79 (Figs. 8, 9 and 11) is loosely journalled on the shaft beneath the clutch disc, and this gear has pivoted thereon a spring-pressed pawl 80 which is normally held out of engagement with the clutch disc by its spring.

A pin 81 is rigidly mounted on the pawl and located in the path of rotary movement of the cam arm 77.

On the working stroke of the lever, the sleeve and its cam arm 77 turn on the shaft until the arm engages the pin 81, and this engagement of parts forces the pawl 80 into engagement with one of the teeth of the clutch disc 78 thereby coupling together the sleeve and the shaft. When the lever swings on its return or inactive stroke, the cam arm 77 is withdrawn from the pin 81 thus permitting the pawl 80 to be automatically released from the clutch disc 78, and of course the shaft does not turn with the sleeve in its return movement.

The star or sprocket wheels 6—6 (Fig. 2) which engage the perforation along the upper and lower edges of the roll-film, are rotated or revolved coincident with the turning of the lever, and the main shaft 40, to assist in winding the films, and when the film is re-wound in the opposite direction, the star wheels or sprockets 6—6 also assist in this movement of the film.

For this purpose a gear 82 (Figs. 11 and 14) is keyed on the shaft 40 below the frame plate 45, and above the coupling 37, and this gear transmits power through an idler pinion 83, which is loosely journalled on a shaft depending from the frame plate, to a driven pinion 84 having a stub shaft 85 (Fig. 14) that projects into and is rigid with the tubular shaft 5 of the sprocket. At its lower end the sprocket shaft has a journal end free to rotate or revolve in the journal bearing 5¹ (Fig. 2) fixed to the bottom of the casing C. The sprockets 6, 6, are at all times engaged with the perforations of the films, and they revolve in either forward or reverse direction, depending on the movement of the film.

A reverse rotation of the shaft 40 is permitted for rewinding of the film, with its latent images, from the winding spool W to the spool D of the cassette P. This reversal of the shaft and winding spool is accomplished while the clutch device is disengaged, without disturbing the position of the indicator 70¹ relative to the shaft 40. The lever 69, sleeve 74, and spring 75 remain motionless when the film is being re-wound into the cassette, and the re-winding is accomplished by turning the handle-yoke 14 (Figs. 2 and 5).

At the top of the camera, near the lever 69, a tubular control key 86, Figs. 4 and 14 having a handle 87, is mounted to oscillate on a post 88 fixed to the frame plate 45. On the top face of the camera-

against rotation by means of a spring pressed pawl 110 that engages the pinion 99 (Figure 11).

To release the shutter-curtains, the 5 operating lever is provided with an arm 122 that contacts, as the lever is swung, with a pin 123 rigid with the free end of the spring pressed pawl 110 and depending through a slot in the frame plate 10 into the path of the arm. For control of the timing gears of the shutter-curtains the lever arm 122 is provided with an upstanding pin 124 that projects upwardly through a slot in the frame plate 15 45, and actuates an escapement device comprising pivoted spring pressed pawls located above the frame plate and referred to hereinafter.

The pin 124 is operatively associated 20 with a pair of pawl members 126 and 127 pivoted about a common axis. The pawl 126 is formed with an elevated cam arm 125 and the pawl 127 with an elevated cam lever 128 for a purpose hereinafter 25 referred to. The pawl 126 is normally held out of engagement but is adapted to be moved into engagement with the pin 104 under the action of a spring, when released by movement of the pin 124. 30 The pawl 127 is normally spring-pressed into engagement with gear 102. As will be seen from Fig. 11, the cam arm 125 normally lies in the rotary path of movement of the timing pin 109 rotatable with 35 the gear 100 of the opening or first shutter curtain. The cam lever 128 also lies over the gear 100 and in the path of the pin 109.

With this arrangement, the mechanism 40 may be operated in three distinct ways, for the purpose of enabling (1) a short or "snapshot" exposure, (2) a bulb exposure and (3) a time exposure to be made as desired.

If a snapshot is to be taken, the pin 45 109 is adjusted first into the correct hole to give say 1/25 of a second exposure time. The button B or the operating lever is then pressed once whereupon the 50 pin 124 is moved to disengage the pawl 127 from the gear 102. The latter is, however, at this time prevented from rotating by the pin 103 on the gear 100 which bears against the pin 104, the 55 spiral gear 100 being still held against rotation by the pawl 110. The arm 122 then swings the pawl 110 on its pivot, thereby disengaging the said pawl from the gear 99 and allowing rotation of the 60 gear 100 with the pin 109, and, at the same time, allowing the pawl 126 to move into engagement with the pin 104 on the gear 102 to prevent rotation of the latter. The pawl 126 is, as will be readily understood, so pivoted as not to engage the pin 65

103. The first shutter curtain is thus released to open the shutter. When the timing pin 109 comes into engagement with the cam arm 125, it displaces the 70 latter out of its path and thereby releases the pawl 126 from the pin 104 and allows the latter to rotate. The second shutter curtain is thus actuated and the shutter automatically closed.

If a bulb exposure is to be made, the 75 timing pin 109 is first set to such a position that, after the release of the first shutter curtain, it will bear against the cam lever 128. The button B or the aforesaid operating lever is then pressed 80 as before and held in this position. The arm 122 will again swing pawl 110 out of engagement with the gear 99 and the pawl 127 out of engagement with the gear 102 and allow the gear 100 to rotate 85 and actuate the first shutter curtain, the pin 109 moving up to the said cam lever 128. At the same time, the pawl 126 is allowed to move under the action of its spring into engagement with the pin 104, 90 and prevents the second or closing shutter curtain from operating. The button B or operating lever is now released at the end of the required exposure time and the pawl 126 is consequently swung around 95 its axis and becomes disengaged from the pin 104 of the second or shutter-closing curtain, the pawl 127 meanwhile remaining disengaged owing to the position of the timing pin 109 in engagement with 100 the lever 128. The second or shutter closing curtain is thus actuated to close the shutter, the time of exposure in this case corresponding to the time during which the button B or the operating lever 105 remained pressed.

Lastly, if a longer time-exposure is to be made, the timing-pin 109 is set to such a position that it will not, on rotation of the gear 100, move the cam arm 125. 110 Thus, on pressing the button B or the operating lever, the arm 122 once more releases the pawl 110 and allows of rotation of the gear 100 with consequent release of the first shutter curtain to open 115 the shutter. As in the above cases, the pawl 126 becomes engaged with the pin 104 of the gear 102 and the pawl 127 is disengaged from the said gear. On release of the button or operating lever, the 120 pawl 126 is disengaged, by the pin 124, from the said pin 104, but the pawl 127 has in the meantime become re-engaged with the gear 102 and thus prevents rotation of the said gear. On a second pres- 125 sure being applied to the button B or the operating lever, the pawl 127 is again disengaged from the gear 102 and the second or shutter closing curtain is thereby released to close the said shutter. It 130

will be appreciated that the two pawls 126 and 127 pivoted together at opposite sides of the pin 124 of the operating lever for engagement with the pin 104 of the shutter gear 102 of the second or closing curtain and the gear itself respectively, together with their cams 125 and 128 co-acting with the timing pin 109, form an escapement for the shutter gear 102, one pawl being engaged while the other is disengaged.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A photographic camera of the roll-film type including a cassette, a film-winding spool, and a driving device for rotating the film-winding spool wherein the driving device has a one-way connection with the winding spool through the medium of a one-way clutch such that the said spool is positively coupled to the said driving device during movement thereof in one direction and is automatically uncoupled therefrom during movement of said device in the other direction to allow of free rotation of the said spool in the reverse direction independently of the said driving device, for the purpose of enabling the film to be rewound into the cassette.

2. A photographic camera as claimed in Claim 1, wherein means located externally of the camera casing and associated with the cassette spool are provided for effecting the rewinding operation.

3. A photographic camera as claimed in Claim 2, wherein the rewinding means comprises a pin loosely mounted in a bearing collar seated in the casing wall and having a head portion located externally of the camera casing and the said pin extending into the camera casing and being engageable at its inner end with the said cassette spool.

4. A photographic camera as claimed in Claim 3, wherein the head portion of the pin carries a pivoted yoke-like handle member.

5. A photographic camera as claimed in any of the preceding Claims, wherein the driving device for effecting the film winding movement includes an operating lever rigid with a sleeve rotatably mounted on the main film winding shaft, the said sleeve being adapted to be coupled to the said shaft, on rotation of the sleeve in one direction, by means of the one-way clutch.

6. A photographic camera as claimed in Claim 5, wherein the one-way clutch comprises a cam arm formed on the said sleeve, a toothed clutch disc fixed on the

winding shaft and a spring-pressed pawl, pivotally carried on a member loosely journaled on the shaft and normally held out of engagement with the clutch disc, whereby on the rotation of the said sleeve, the said cam arm causes the pawl to become engaged with the said clutch disc, thereby coupling the said winding shaft to the sleeve.

7. A photographic camera as claimed in any of the preceding Claims, wherein releasable means are provided for preventing inadvertent reverse rotation of the film spool.

8. A photographic camera as claimed in Claim 7, wherein the means comprises a one-way spring-pressed pawl or ratchet adapted to engage a pinion in constant mesh with a second pinion mounted on the winding shaft, so as to allow of rotation of the said shaft in winding direction only and releasable from the said engagement to allow of reverse rotation of the said shaft when required.

9. A photographic camera as claimed in Claim 5 or 6, wherein automatic means are provided for returning the said operating lever to its initial position at the end of its film winding movement.

10. A photographic camera as claimed in Claim 9, wherein the said means comprises a coiled spring, one end of which is attached to the sleeve and the other end to a member rigid with the camera casing, the said spring being thereby wound under tension on the working stroke of the said lever.

11. A photographic camera as claimed in any of the preceding Claims, wherein a cutting or severing device is arranged in the camera casing adjacent the cassette and operable from the outside of the said casing for cutting the rewound film.

12. A photographic camera as claimed in Claim 11, wherein the cutting device is slidably carried in a hollow shaft or casing rigidly mounted in the dark chamber of the camera.

13. A photographic camera as claimed in any of the preceding claims wherein a rotary driving head, carrying an exposure indicator, is mounted on, and adapted to be operatively connected to, the film-winding shaft.

14. A photographic camera as claimed in Claim 13, wherein the exposure indicator comprises a disc frictionally engaging within the driving head and provided with a circumferential series of marks or numbers for successively indicating the number of exposures made.

15. A photographic camera as claimed in Claim 14, wherein means, comprising a pair of diametrically opposed pins, are provided on the indicator for setting the

said indicator to zero position.

16. A photographic camera as claimed in Claims 14 and 15, wherein rotary gears and pinions are provided for stabilizing the reverse motion of the film and causing rotation of the indicator with respect to the driving head, during reverse rotation of the winding shaft.

17. A photographic camera as claimed in Claim 16, wherein a pinion keyed to the winding shaft is operatively connected, through a series of intermediate gears, to a second pinion freely rotatable with respect to the said shaft, which

latter pinion is provided with a hub with which the indicator disc is in frictional engagement.

18. The improved photographic camera of the roll-film type constructed and arranged substantially as hereinbefore described and illustrated in the accompanying drawings.

Dated the 28th day of June, 1937.

S. SOKAL,
1, Great James Street,
Bedford Row, London, W.C.1,
Chartered Patent Agent.

[This Drawing is a reproduction of the Original on a reduced scale.]

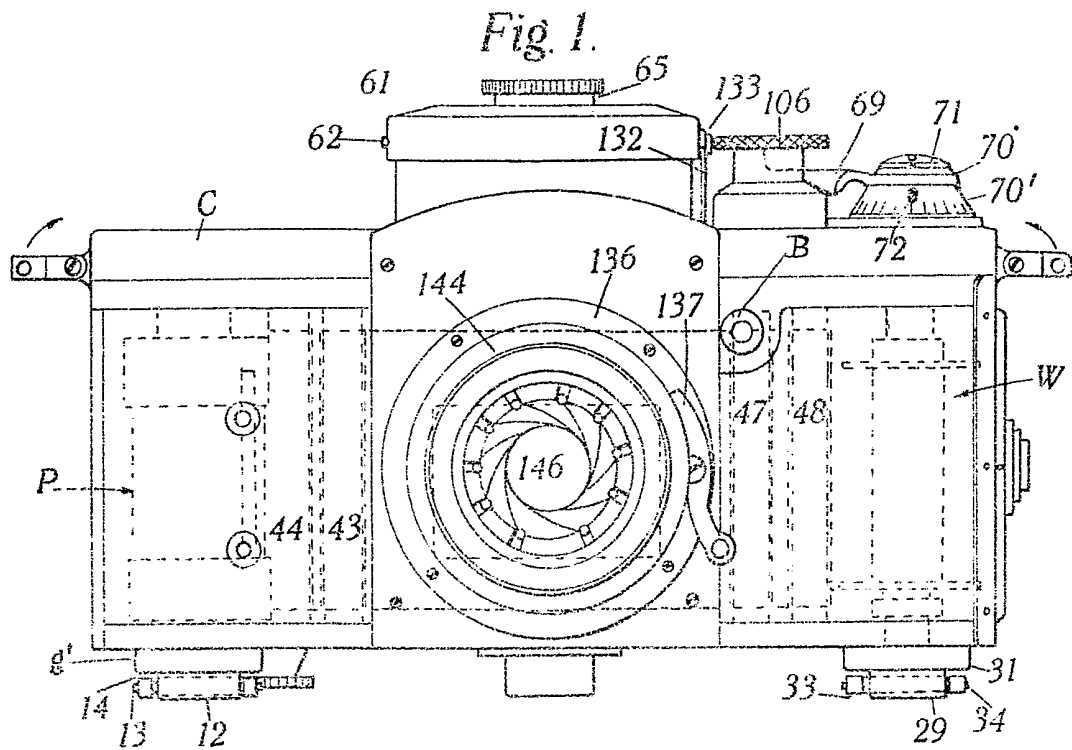


Fig. 4.

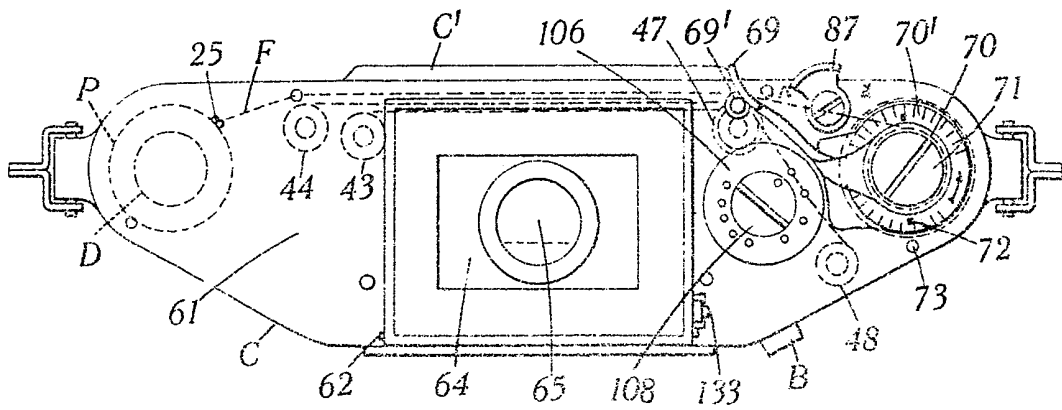


Fig. 5.

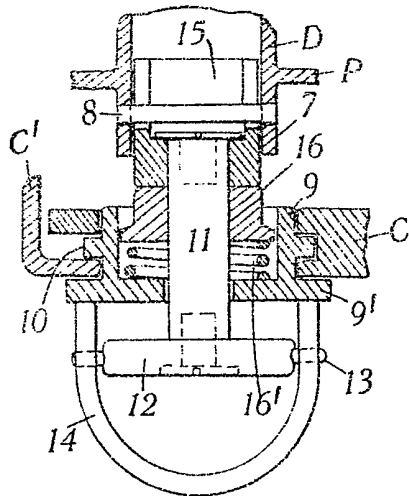


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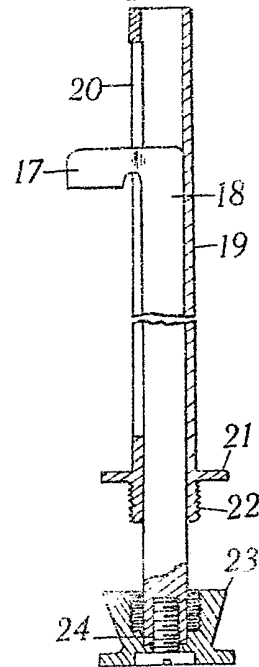
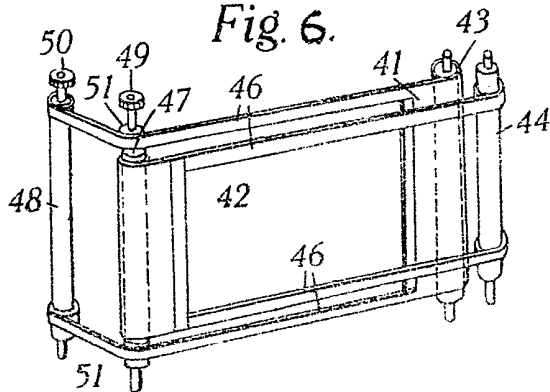


Fig. 6.



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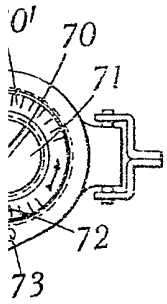


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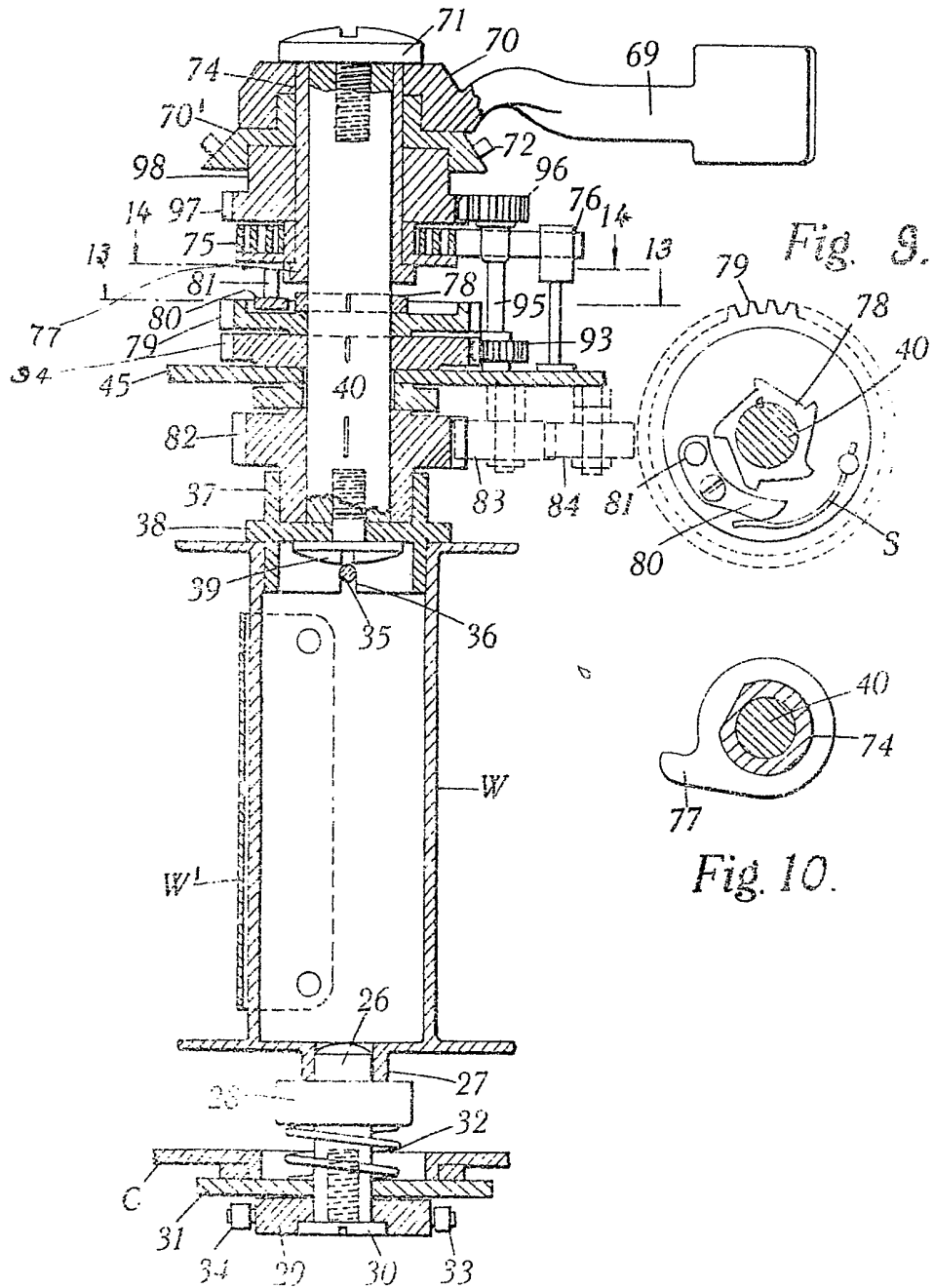


Fig. 9.

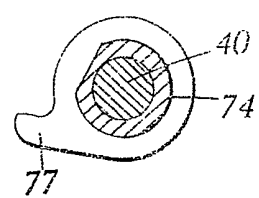
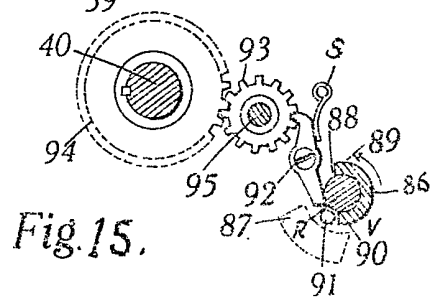
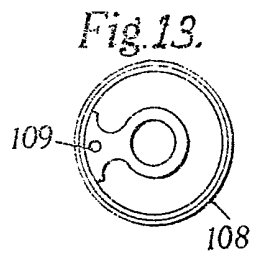
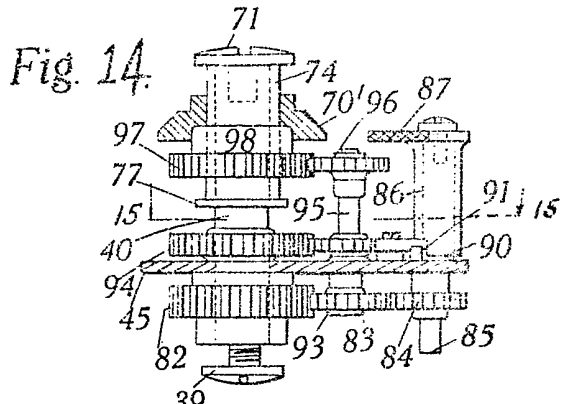
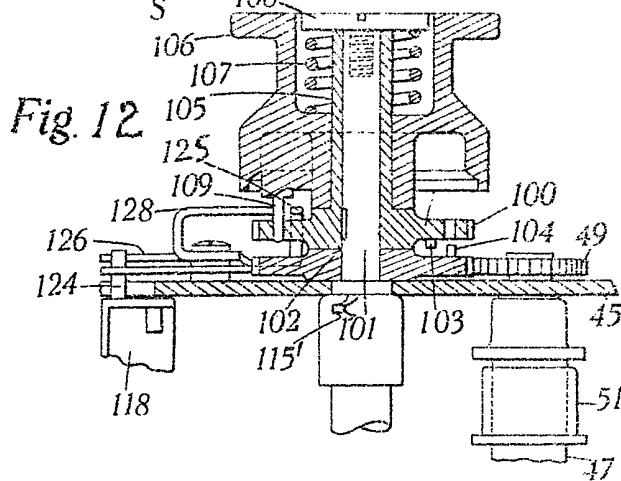
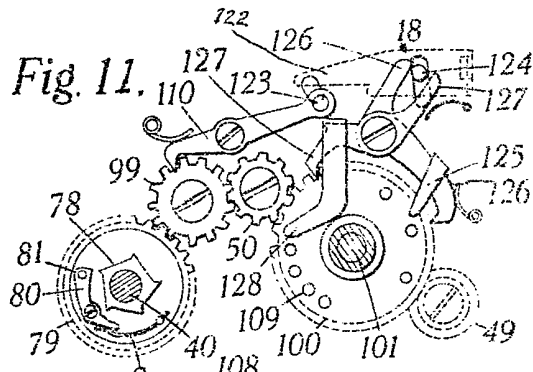


Fig. 10.

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Fig. 16.

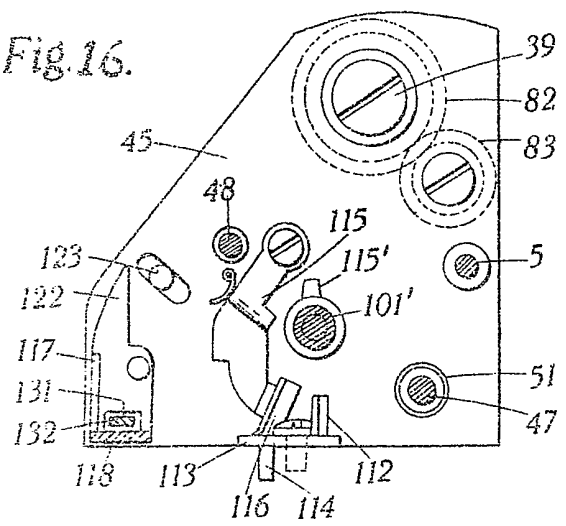
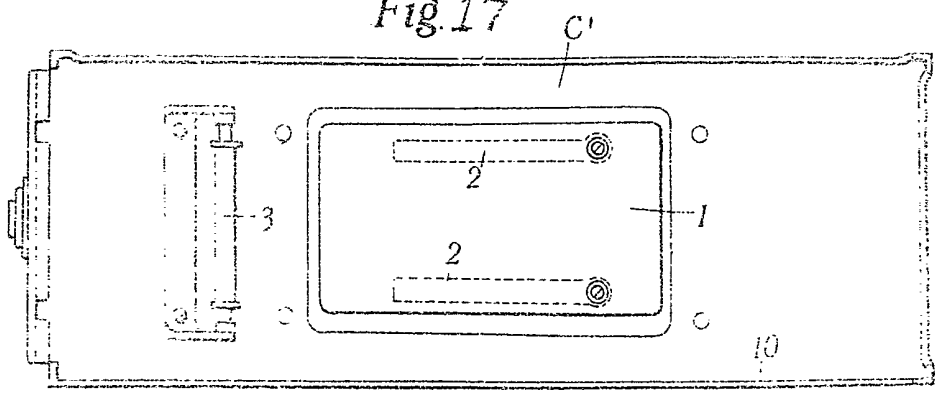
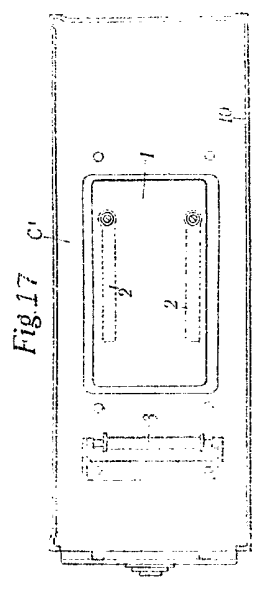
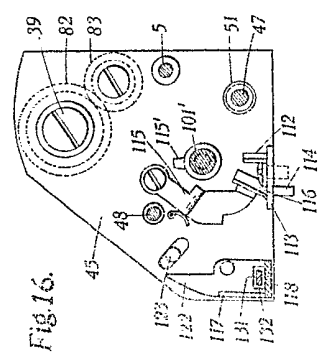
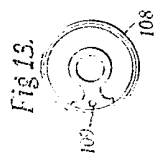
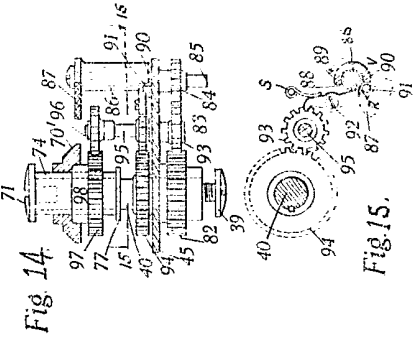
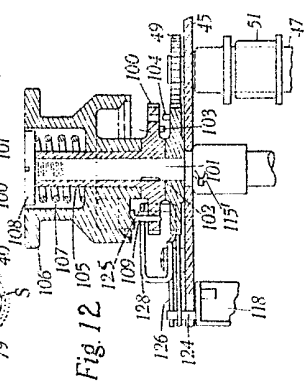
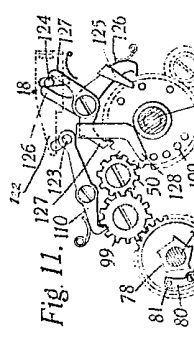


Fig. 17





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