

PATENT SPECIFICATION

483.053

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COMPLETE SPECIFICATION

Improvements in or relating to Photographic Shutters of the Pivoted-blade-between-lens Type

(A communication from IHAGEE KAMERA-WERK STEENBERGEN & COMPANY, of 24, Schandauer Strasse, Dresden A.19, Germany, a German firm).

5 I, SIEGMUND SOKAL, of 1, Great James Street, Bedford Row, London, W.C.1, a British subject, 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:—

10 This invention relates to photographic shutters of the pivoted-blade-between-lens type including a combined lever and escapement mechanism operable to regulate the time of exposure and the period between operation of the mechanism and operation of the exposure shutter, the said mechanism controlling the opening and closing of the blades of the shutter. Similar mechanisms are known in cameras having shutters operating by means of a slit, which mechanisms, in contradistinction to the known mechanisms employed in shutters of the pivoted-blade-between-lens type, render it possible to employ the course of the running down movement of the mechanism necessary for the period between operation of the mechanism and operation of the exposure shutter wholly or partly for the time of exposure or vice versa, but the application of a mechanism of this kind in shutters of the pivoted-blade-between-lens type presents inherent technical difficulties which are overcome by the present invention.

15 It has already been proposed to provide a photographic shutter operating mechanism in which the shutter operating ring is actuated by means of a cam or projection through the medium of shutter retarding mechanism, which cam or projection is formed on a main rotating master ring, the speed of which is controlled by a retarding escapement mechanism, whereby the time of operation of the said shutter retarding mechanism can be controlled as desired.

20 According to this invention, I provide a photographic shutter of the pivoted-blade-between-lens type including a combined lever and escapement

mechanism operable to regulate the time of exposure and the interval between operation of the mechanism and operation of the exposure shutter, and which controls the opening and closing of the blades of the shutter by means of two cam-like projections formed on concentric relatively rotatable rings and adjustable with regard to one another, the rocking arm of the shutter blades being constantly urged by the action of a spring to tend to move into the open position, but being retained in the closed position by two levers which are more strongly urged by spring action in the opposite direction, the first of the said springs being adapted to be lifted away by means of the release button, and the second being adapted to be lifted away by one of the two adjustable cam-like projections provided on the mechanism when the shutter is used for retarded exposures and being further adapted to be maintained in the lifted position by means of a control lever, which, at the same time, causes a stop to move into the path of the adjustable cam.

25 As a result of this arrangement, when preliminary running of the mechanism takes place, the following mode of operation is obtained: With the control lever inoperative, the completely wound mechanism is released by actuation of the release button, and at the same time the first closing lever is lifted away from the rocking arm of the shutter blades. One of the adjustable cam-like projections causes, by lifting the second closing lever, the opening of the shutter, whilst the other cam-like projection presses the rocking arm of the shutter blades back again into the closing position.

30 In the working operation when no preliminary running of the mechanism takes place, the locking lever being in the operative position, the mechanism, which has been wound up to the stop of one of the adjustable cam-like projections, is released by actuating the release button, and at the same time the first closing lever is lifted away from the rocking arm of the shutter blades, whereby the shutter is opened. Meanwhile the other cam-like

projection presses the rocking arm of the shutter blades back again into the closing position.

It is preferable to provide a locking catch which retains the first closing lever in the position in which it is lifted away and when the control mechanism has run down, or when the adjusting lever is put into operation, is placed out of action. Furthermore, another lever is provided which is swung by the second mentioned cam-like projection of the mechanism and thereby presses the rocking arm of the shutter blades into the closing position.

A preferred constructional form of shutter according to the invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a plan of the open mechanism of a pivoted-blade-between-lens type shutter in the wound condition.

Fig. 2 is a similar view to Fig. 1 at the moment of the release,

Fig. 3 is a similar view to Fig. 2 shortly before the termination of the predetermined preliminary running period.

Fig. 4 is a section taken on line *a-b* of Fig. 3,

Fig. 5 is a similar view to Fig. 3 immediately after the initiation of the operation of exposure,

Fig. 6 is a similar view to Fig. 4, the final position of the individual parts being indicated in dotted lines,

Fig. 7 is a similar view to Fig. 5 immediately before the termination of the operation of exposure,

Fig. 8 is a plan of the open housing of a pivoted-blade-between-lens type shutter in the run-down condition,

Fig. 9 is a similar view to Fig. 1, the preliminary running period being cut out,

Fig. 10 is a view of the exterior of the shutter,

Fig. 11 is a view of the back of the shutter, and

Fig. 12 is a section through the opened shutter.

Referring to the drawings:

On the rear side of the housing plate 1 (Fig. 11) the lamination ring 3, which is provided with fork-like carriers 4, is mounted around the aperture 2. On pivot pins 5 shutter blades 6 covering the ring 3 and the aperture 2 are rotatably mounted. The said shutter blades are each provided with a pin 7 extending into and engaging with the fork-shaped carriers 4. On the front side of the plate 1 a bell crank lever constituting a rocking arm 9, 10 is rotatably mounted on a pin 8. On the arm 10 of the said bell crank lever a tension spring 12 fixed at

the point 11 to the plate 1 acts. The lever arm 9 on the other hand is provided with a downwardly directed control pin 13 which extends through a slot 14 of the plate 1 and engages with a separate fork-like carrier 15 on the ring 3. Upon pressing down the lever arm 10 against the action of the spring 12 the shutter blades are brought into the position shown in Fig. 11. If, on the other hand, the lever 10 is set free, then the spring 12 swings the rocking arm 9, 10 in Fig. 1 in a counter-clockwise direction. Through the agency of the carrier pin 13 the lamination ring 3 mounted on the rear side of the plate 1 is turned in a clockwise direction. This movement is transmitted by means of the carrier forks 4 and the pins 7 to the shutter blades 6, which swing into their open position in which the aperture 2, in front of or behind which the lenses of the objective are mounted, is opened.

On the plate 16 (Fig. 10) which covers up the mechanism at the front, a scale 17 is provided on which the adjustment of the stop, which latter is not shown, is indicated by means of a pointer 18. Apart from this, from the housing formed by the plates 1 and 16 only the release button 19 and a control lever 20 project.

The opening and closing of the shutter as also the duration of the exposure depend upon the mode of operation of the rocking arm 9, 10. In the housing a device is provided which co-operates with the rocking arm 9, 10 and which is hereinafter described.

On the ring 21 which is rigidly mounted in the plate 1 and which carries the parts of the objective, two adjusting rings 22, 23 (Figs. 9 and 10) are rotatably mounted, the upper ring 23 carrying a time scale 24 which moves in front of a fixed indicator 25. The lower ring 22, on the other hand, is provided with bores or holes 26 and a carrier 27 with which a tension spring 28 operating the shutter engages. The spring 28 engages at its other end with a stationary support 29. Normally the spring 28 consists of a helical spring running several times round the ring 21. The adjusting ring 23 is provided on its under side with a carrier pin (not shown) which is adapted to engage with one of the bores 26 of the ring 22 and thereby to couple the two rings with one another. The ring 23 is adapted to be moved away from the ring 22 through a certain distance against the action of a spring (not shown) acting in the axial direction, so that the coupling pin can be inserted, as desired, in the one or the other bore or hole 26. The

ring 22 is further provided with a cam-like projection 30 extending radially outwards, whilst the ring 23 is equipped with a corresponding cam-like projection 31.

5 Apart from this the ring 22 is rigidly coupled with a pinion which is in engagement with the counter-wheel 33 of a braking or locking device comprising pinions 35, 36, 37, 38, 39, of a kind
10 known per se, mounted on a swinging support 34.

For the purpose of winding up the shutter the rings 22 and 23, which are previously correspondingly adjusted to
15 one another, are turned, against the action of the spring 28, in the direction of the arrow shown in Fig. 1, until the projection 30 of the ring 22 strikes against a fixed stop pin 40, as shown in Fig. 1.
20 During this winding up movement the pinions 32, 33 come out of engagement inasmuch as the carrier 34 together with the whole brake device is swung around its pivot pin 41 through a certain distance
25 by pressure exerted by the pinion 32. At the end of the winding up movement the pinions come into engagement again under the action of a spring (not shown), so that the shutter is maintained in the
30 locked position, inasmuch as the braking or locking device 35—39 is secured against rotation by means of a locking hammer 42.

In the wall 1 of the housing, six two-
35 armed levers 48—59 are mounted laterally beside the rings 22, 23 on five pivots 43, 44, 45, 46 and 47 respectively, the two-armed lever 52/53 carrying the control lever 20 projecting from the
40 housing 1.

The lever arm 48 of the two-armed lever mounted on the pin 43 rests on the arm 10 of the angle lever of the shutter blades, whilst the lever arm 49 is provided with a stop surface 60 on which the
45 release button 19 guided in the wall 61 of the housing rests. In addition to this the lever 49 forms a locking catch 62 which is adapted to co-operate from time
50 to time with the lever part 57 constructed as a locking hook. A tension spring 63 engaging with the free end of the lever 49 and attached to the wall 61 of the housing, tends to turn the lever 48, 49 in
55 a counter-clockwise direction, whereby the rocking arm 9, 10 is maintained in the position in which the shutter blades 6 cover up the aperture 2. At its free end the lever 49 also rests on the free end
60 of the locking hammer 42, whereby the latter is retained in its locking position and the braking or locking device 33—39 is secured in its position of rest.

The lever arm 50 of the two-armed
65 lever mounted on the pin 44 is provided

with a notch 64, which from time to time co-operates with the lever arm 52 constructed in the form of a locking catch. In addition to this to the front end of the lever arm 50 a tension spring 65 is con-
70 nected, which presses the end of the said arm 50 on to the rocking arm 10. The other part 51 of the two-armed lever extends into the field of action of the lever arm 59, which is provided on its
75 underside with a pin 66, the said pin resting on the free end of the lever arm 51. The two-armed lever 58, 59 is subjected to the action of a spring 67 which tends to turn the lever, as shown in Fig. 1, in a clockwise direction. The turning
80 movement is prevented by means of a stationary locking pin 68 which is mounted in the wall 1. The spring 67 is stronger than the spring 65. 85

In Figs. 4 and 6 the mounting of the two-armed lever 58, 59 is shown to a larger scale and from these figures it will be seen that the lever arm 58 is of wedge-shaped cross section, the inclination of the
90 wedge being oppositely directed to the inclination of the wedge-shaped part of the cam-like projection 31. The two-armed lever 58, 59 is moreover mounted on the pin 47 in such manner as to be
95 axially displaceable and a compression spring 69 is provided, which tends to press the lever into its lowest position. During the movement of the shutter the cam-like projection 31 moves beneath the
100 lever arm 58 in the direction indicated by the arrow in Figs. 4 and 6, whereby the said lever arm is lifted against the action of the spring 69 and is brought out of the field of action of the locking pin
105 68. In the raised position of the lever the spring 67 then comes into operation and swings it in a clockwise direction, whilst the two-armed lever 50, 51 is also turned together with it by the striking of the pin
110 66 on the lever arm 51.

Furthermore, the two-armed lever 54, 55 is entirely loosely mounted on the pin 45. The part 55 of the said double lever is made in the form of a guide surface
115 and co-operates from time to time with a pin 70 mounted on the projection 30. The lever arm 54 and also the levers 50 and 48 rest, on the other hand, on the lever arm 10 of the bell crank lever of the
120 shutter blades.

It should further be mentioned that the locking lever 56, 57 mounted on the pin 46 is subjected to the action of a spring 71 which tends to turn the lever
125 in a counter-clockwise direction and that on the lever arm 56 an upwardly directed stop 72 is mounted which extends into the field of movement of the cam-like projection 30. 130

The mode of operation of the shutter is as follows:

Let it be assumed that it is desired to operate with a certain preliminary running period the magnitude of which can be regulated by adjusting the two rings 22, 23. The shutter has been wound. The parts are located in the position shown in Fig. 1 and are secured by the brake device 33—39. If the release button 19 is pressed down, then the positioning of the parts shown in Fig. 2 takes place, i.e. the double lever 48, 49 is swung in a clockwise direction, the locking tooth 62 on the lever arm 49 comes into engagement with the locking lever 57 and the locking hammer 42 is set free. Opening of the shutter cannot yet take place, inasmuch as the rocking arm 9, 10 is still held by the lever 50. In consequence of the release of the locking hammer 42 the braking or locking device can now run down, during which operation the locking hammer swings to and fro. The shutter rings 22, 23 begin to turn under the action of the spring 28 until finally the position of the parts shown in Fig. 3 is attained. Finally in this position the cam-like projection 31 passes under the lever arm 58, whereby the latter is raised away above the locking pin 68 in the above described manner. The two-armed lever 58, 59 swings in a clockwise direction and thereby lifts the lever arm 50 away from the rocking arm 10. Since, on the other hand, the two-armed lever 54, 55 is mounted so as to be freely rotatable on its axle 45, it cannot secure the rocking arm 10, so that the latter now is moved under the action of the spring 12 into the position shown in dotted lines in Fig. 5. At this moment the shutter blades 6 are also moved into the open position in the manner described at the outset. The exposure thus begins (the position of the parts is as shown in Fig. 5). The cam-like projection 31 meanwhile runs over the lever arm 55, the stop pin 72 and the carrier 40 without hinderance, inasmuch as these parts cannot project into its path of movement. The shutter parts arrive on the running down of the adjusting rings 22, 23 finally into the position shown in Fig. 7 in which the cam-like projection 30 which runs beneath the lever part 55 presses through the medium of its stop 70 from below against the lever arm 55. The lever 54, 55 is turned so that finally the lever arm 54 presses on the rocking arm 10 and swings the latter against the action of the spring 12 into its closed position. Thereby the operation of exposure is terminated. Finally the cam-like projection 30 strikes also upon the

stop 72 of the locking lever 56, 57. The latter is lifted up and is moved into the position shown in Fig. 8. Meanwhile the locking catch 57 sets the locking tooth 62 free, whereby the two-armed lever 48, 49 under the action of the spring 63 is swung back into its initial position, and bears with its lever arm 48 on the rocking arm 10 and with its arm 49 on the locking hammer 42. The braking or locking device 35, 36, 37, 38, 39 is thereby likewise brought to rest. If it is desired to make a fresh exposure then the shutter must be wound up once more by turning the rings 22, 23 backwards against the action of the spring 28. During this winding movement the cam-like projection 31 strikes on the front end of the lever 58 as can be seen from Fig. 6. The lever 58 is thereby entrained. In consequence of its wedge-shaped construction it can pass over the locking pin 68 whilst in its end position shown in Fig. 1, it is again secured. On the other hand, however, the two-armed lever 50, 51 is moved back under the action of the spring 65 likewise into its initial position as shown in Fig. 1. When this has taken place a fresh adjustment and release of the shutter can be carried out.

If it is desired to operate without preliminary running or if time or bulb exposures, are to be made, then the control lever 20 is pressed downwards, and is held in the lower position by a stop member (not shown). During this operation the locking tooth 52 enters the recess 64 of the lever arm 50, which is at the same time lifted away from the rocking arm 10. On the other hand, the lever part 53 comes into the path of movement of the cam-like projection 31. At the same time the locking lever 56, 57 can also be swung by means of a control cam (not shown) into the position indicated in Fig. 8. If the shutter is not wound up, then by simply pressing down the release button 19 the lever 48, 49 is swung and consequently the rocking arm of the shutter blades 9, 10 is set free, inasmuch as the lever arm 54 does not form a hindrance. The shutter blades thus open until the release button 19 is set free. For time exposures the provision of an intermediate lever of a kind known per se is necessary, but for the sake of rendering the other parts clearer the said intermediate member has not been shown. Further description regarding bulb and time exposures is not of importance for the elucidation of the present invention.

If instantaneous exposures without preliminary running are to be made, then it is only necessary to turn the adjusting rings 22, 23 back in the direction of the

arrow shown in Fig. 9 until the projection 31 strikes against the lever part 53. In this position the shutter is wound up. As soon as the release button 19 is pressed down the release of the rocking arm 10 and opening of the shutter takes place. The exposure lasts until the projection 30 causes the closing of the shutter by actuation of the different levers in the manner already hereinbefore described.

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

1. A photographic shutter of the pivoted-blade-between-lens type including a combined lever and escapement mechanism operable to regulate the time of exposure and the interval between operation of the mechanism and operation of the exposure shutter and which controls the opening and closing of the blades of the shutter by means of two cam-like projections formed on concentric relatively rotatable rings and adjustable with regard to one another, the rocking arm, such as 9, 10, of the shutter blades being constantly urged under the action of a spring, such as 12, to tend to move into the open position, but being held in the closed position by means of two levers, such as 48, 50, which are more strongly urged by spring action in the opposite direction, the first, such as 48, of which levers is adapted to be lifted away by means of the release button, such as 19, whilst the second lever, such as 50, is adapted to be lifted away by one of the adjustable projections, such as 31, when the shutter is used for retarded exposures, and is furthermore adapted to be retained in the lifted position by means of a control lever, such as 20, 52, the said lever simultaneously causing a stop, such as 56, to move into the path of the adjustable cam-like projection, such as 31.

2. A photographic shutter as claimed in claim 1, wherein in the case in which the lever and escapement mechanism runs for a preliminary period, the control lever

(20) being out of action, the fully wound mechanism is released by the actuation of the release button (19) and at the same time the first closing lever (48) is lifted away from the rocking arm (9, 10) of the shutter blades, whilst the cam-like projection (31) causes the opening of the shutter by lifting away the second closing lever (50), whilst the cam-like projection (30) presses the rocking arm of the shutter blades back into the closing position.

3. A photographic shutter as claimed in claim 1, wherein, in the case in which delay action of the mechanism is omitted, the control lever (20) being in the operative position, the combined lever and escapement mechanism which has been wound up as far as the stop of the cam-like projection (31) is released by the actuation of the release button (19) and at the same time the first closing lever (48) is lifted away from the rocking arm of the shutter blades whereby the shutter is opened, whilst the cam-like projection (30) presses the rocking arm of the shutter blades back again into the closing position.

4. A photographic shutter as claimed in claim 1, 2 or 3, characterised by the provision of a locking member (56, 57), which retains the first closing lever (48, 49) in the lifted position and prevents it from causing closing of the shutter blades immediately after opening, and when the mechanism has run down or when the control lever (20) is put into action, is maintained out of operation.

5. A photographic shutter as claimed in claim 1, 2, 3 or 4, characterised by the provision of a lever (54) which is caused to be swung by the cam-like projection (30) of the mechanism and thereby presses the rocking arm (9, 10) of the shutter blades into the closing position.

6. The improved photographic shutter of the pivoted-blade-between-lens type constructed and arranged substantially as hereinbefore described and illustrated in the accompanying drawings.

Dated the 7th day of October, 1936.

S. SOKAL.

FIG. 1.

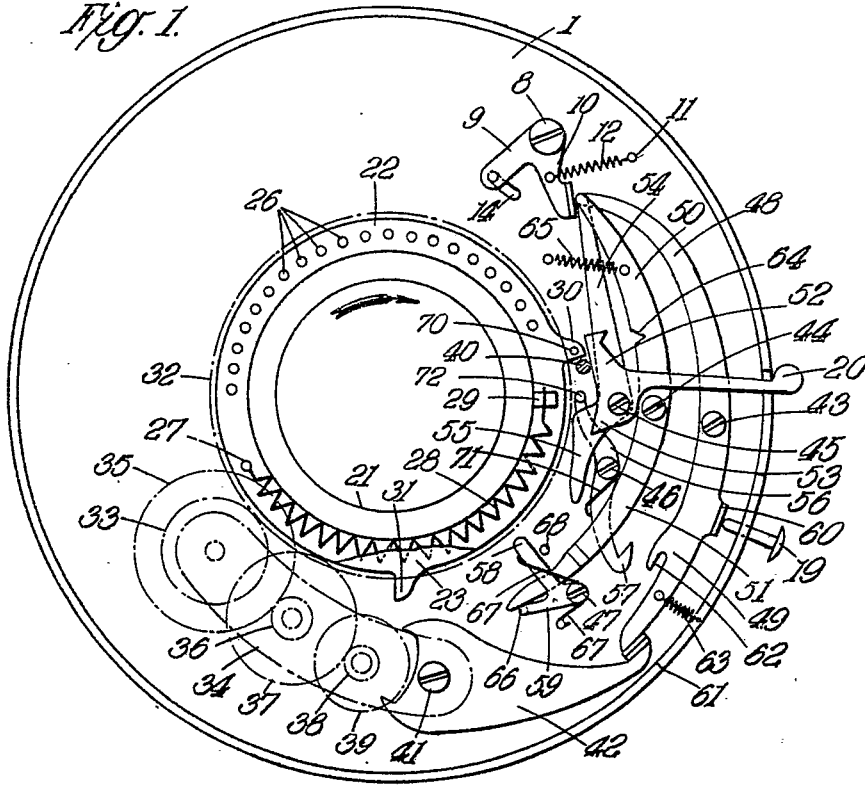
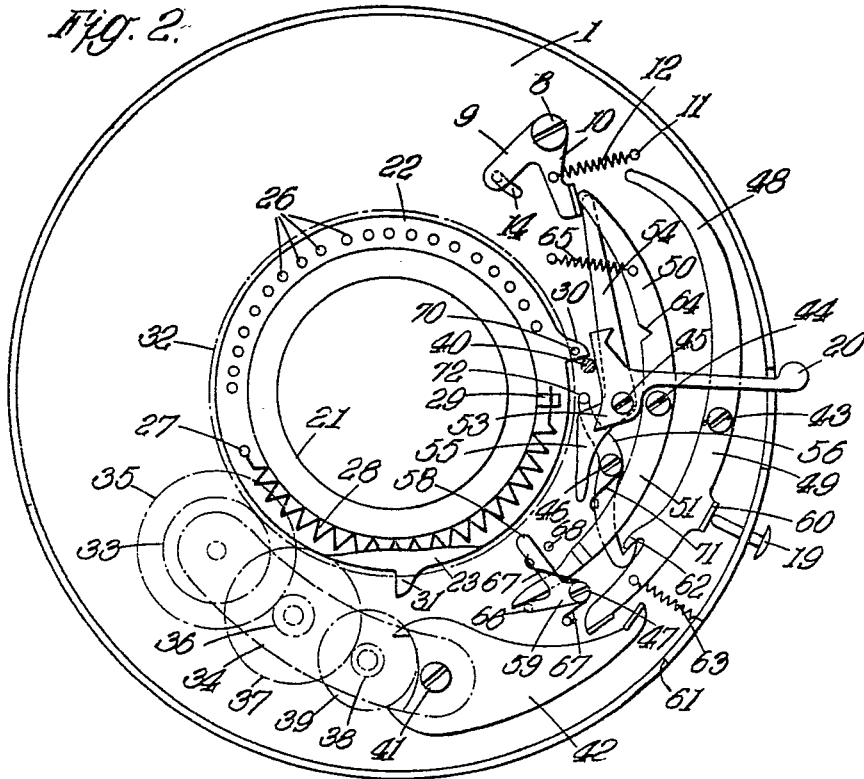


FIG. 2.



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Fig. 3.

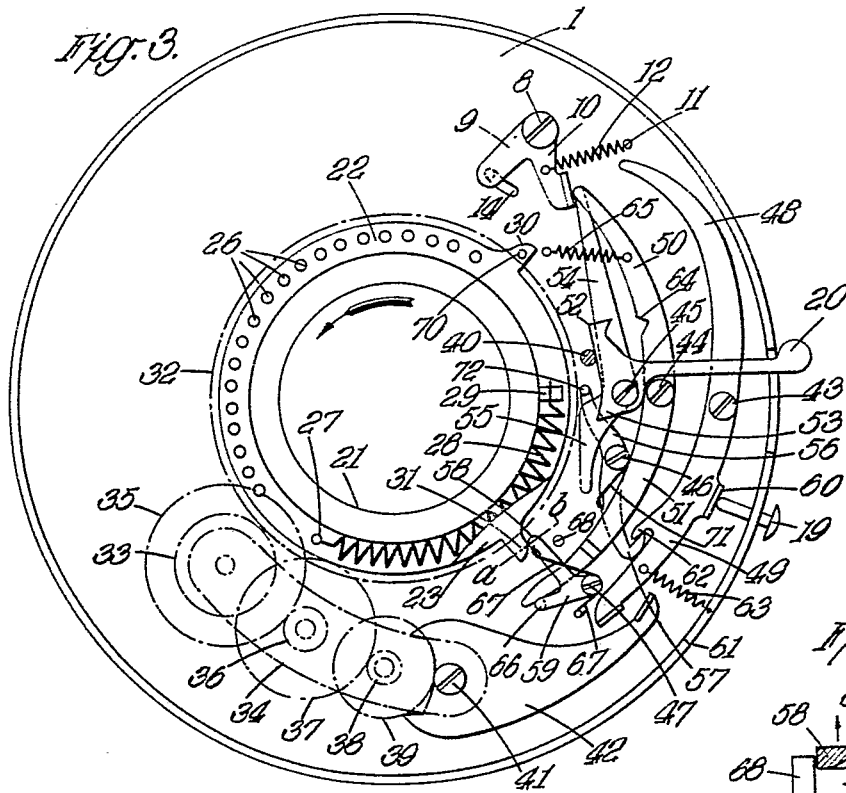


Fig. 4.

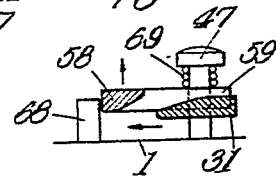


Fig. 5.

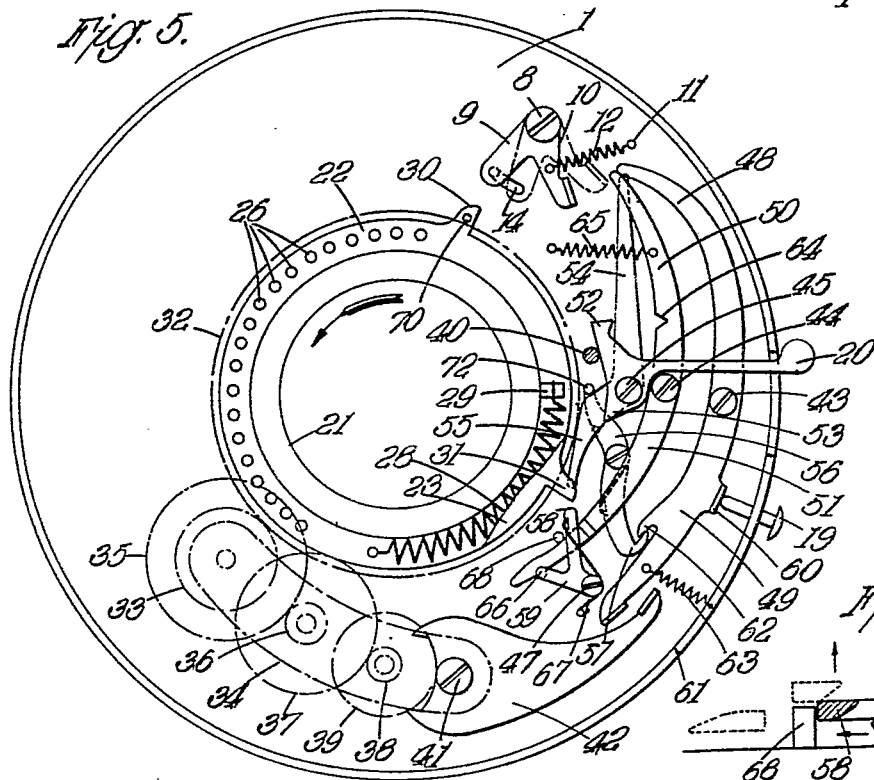
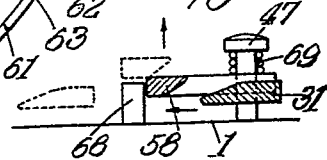


Fig. 6.



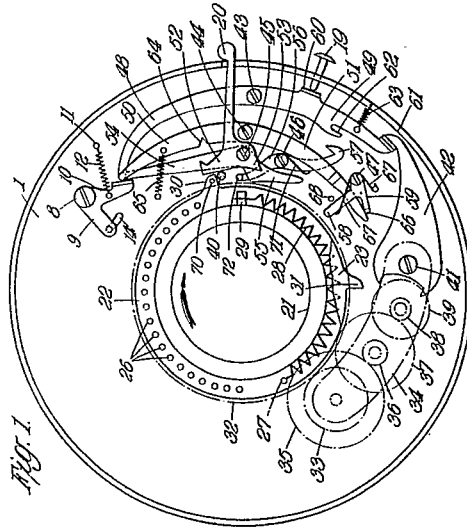


FIG. 1.

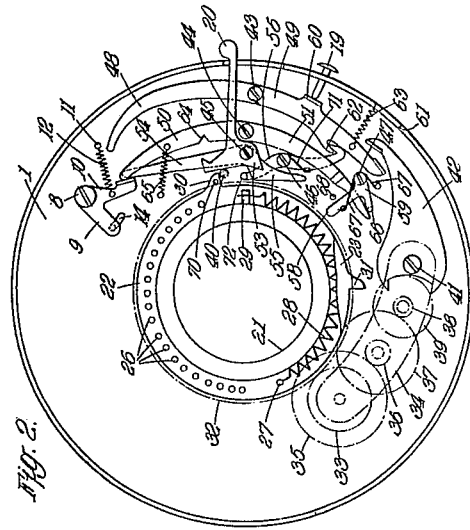


FIG. 2.

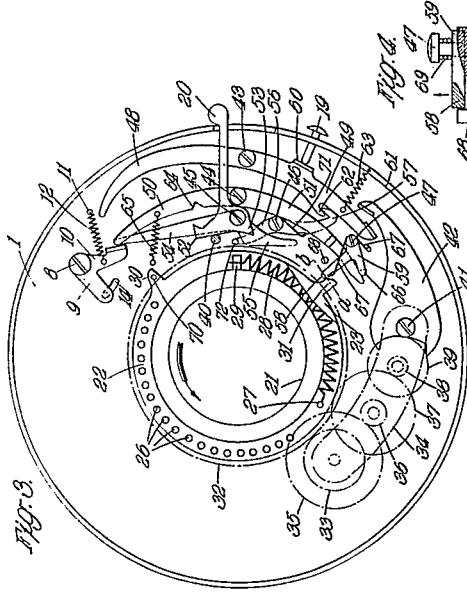


FIG. 3.

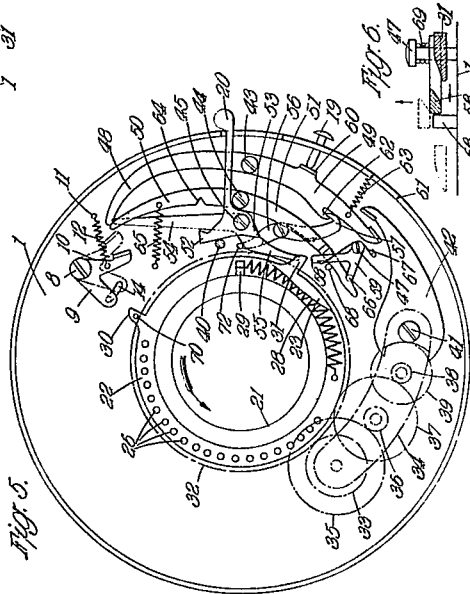
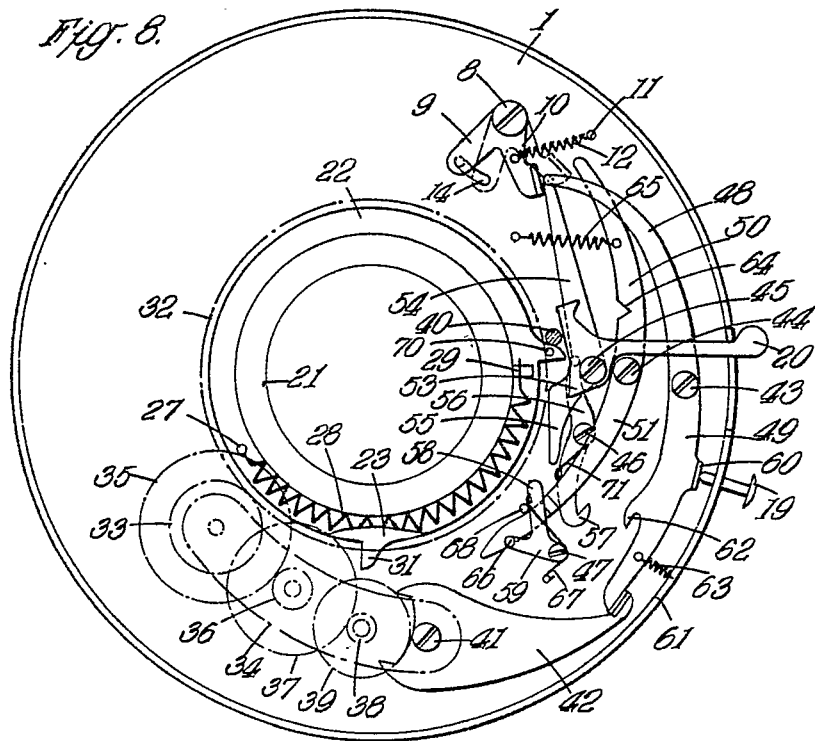
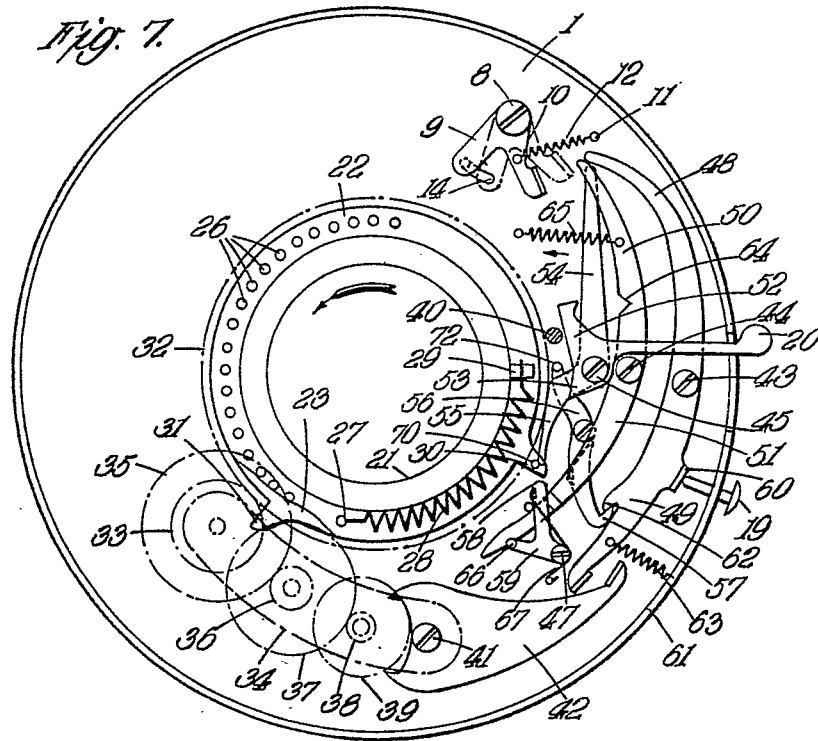
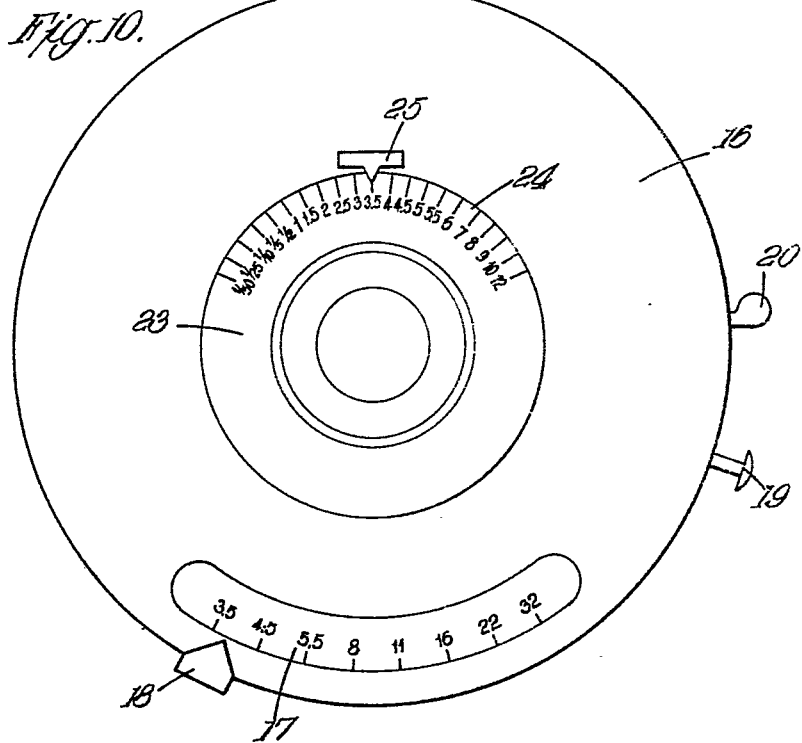
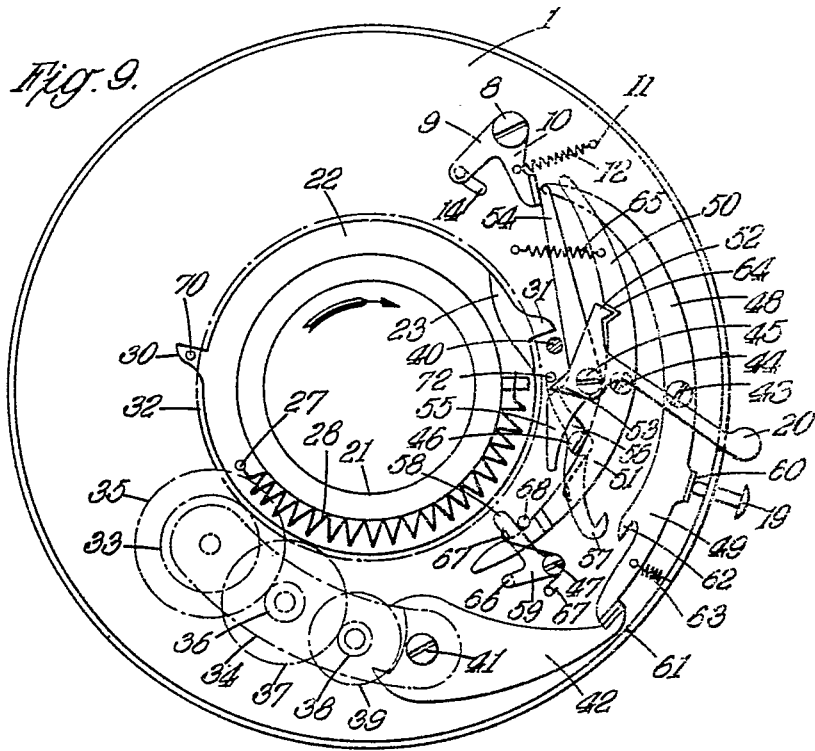


FIG. 4.

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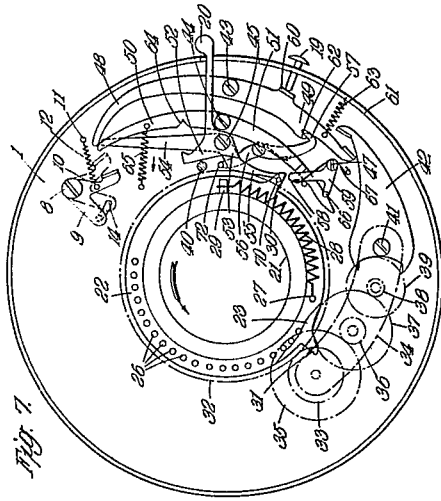


FIG. 7.

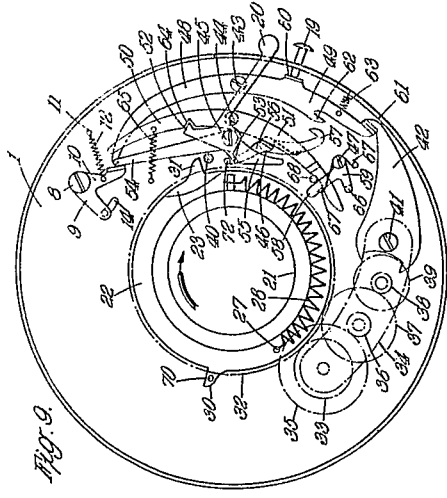


FIG. 9.

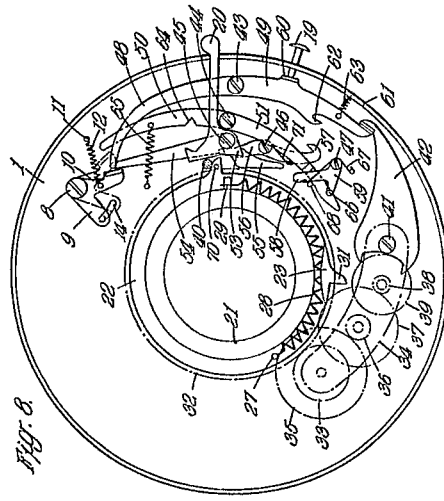


FIG. 8.

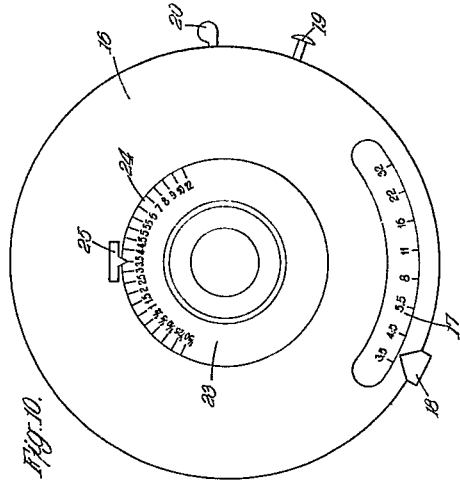


FIG. 10.

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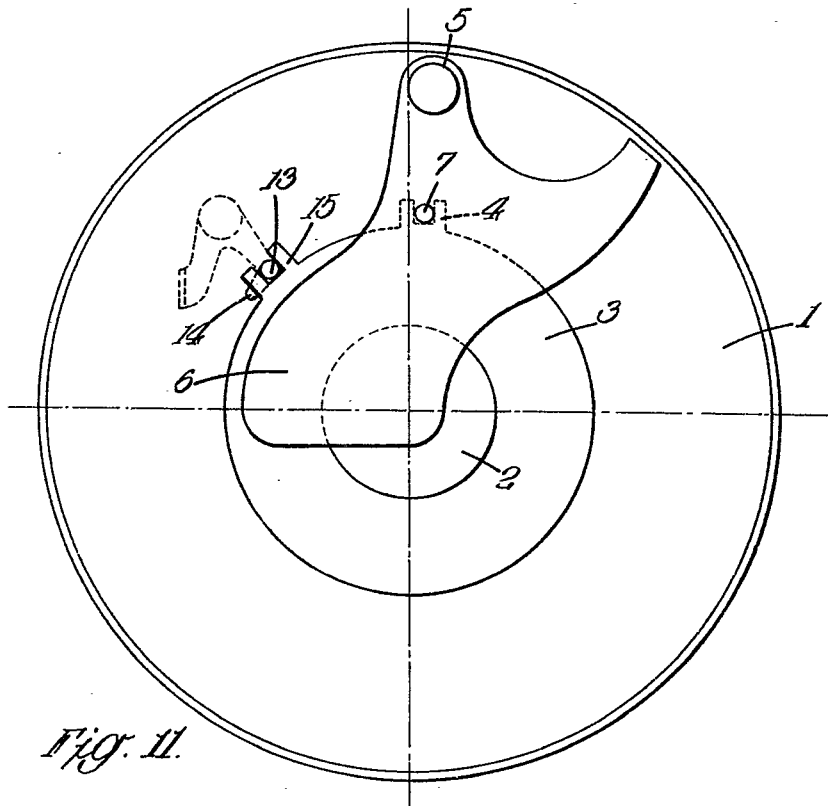


Fig. 11.

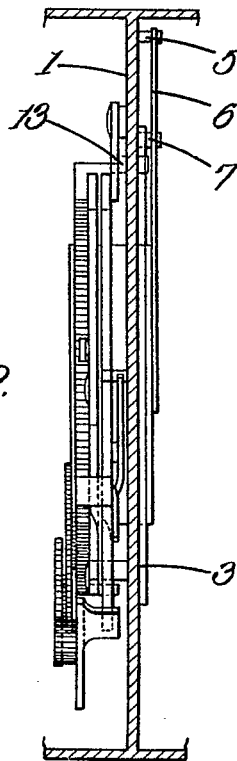


Fig. 12.

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