

C. SCHOU.
 PHOTOGRAPHIC RECORDING APPARATUS.
 APPLICATION FILED JAN. 6, 1913.

1,104,556.

Patented July 21, 1914.

5 SHEETS—SHEET 1.

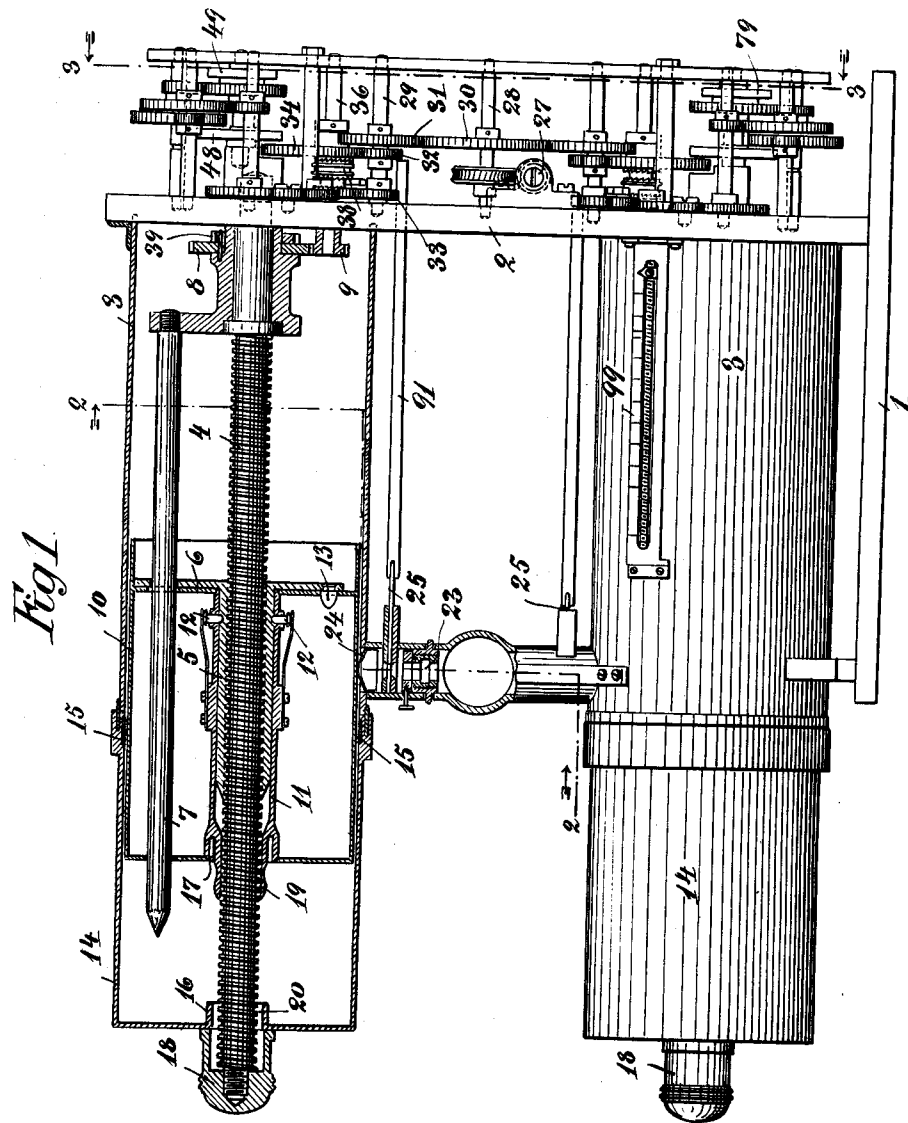


Fig 1

Witnesses
 Walter M. Chapin
 William C. Lang

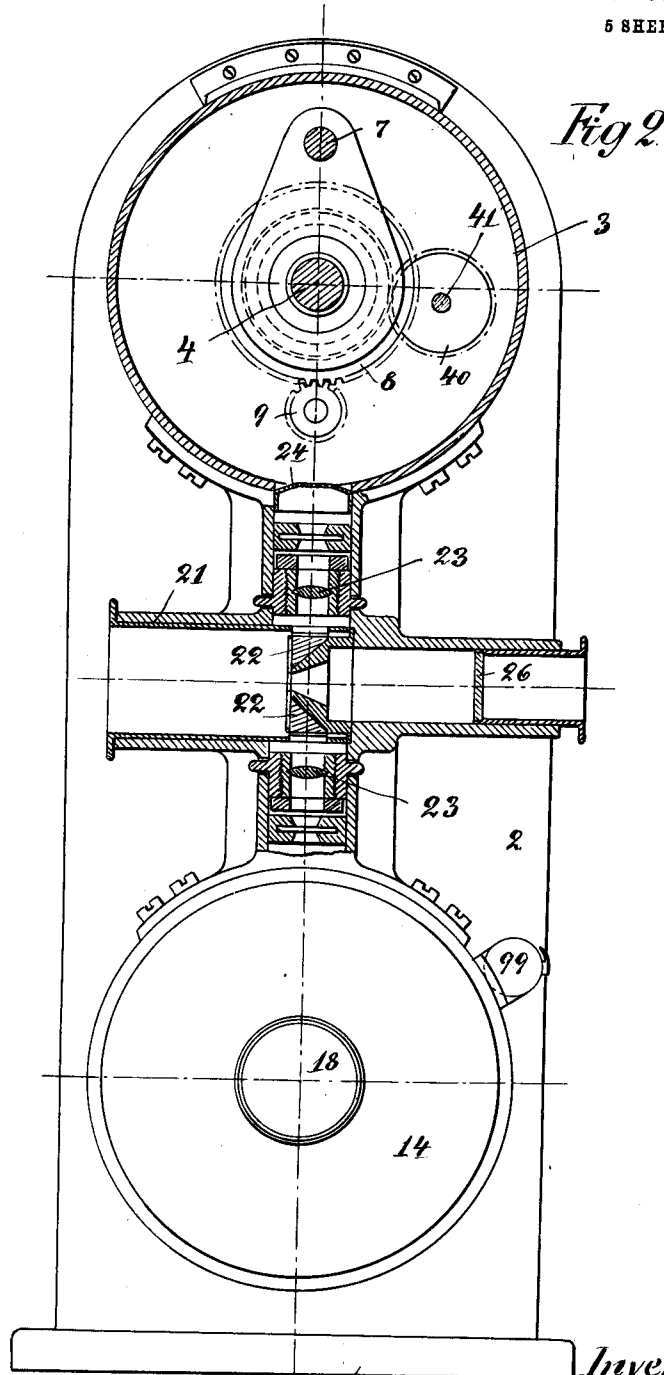
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Witnesses

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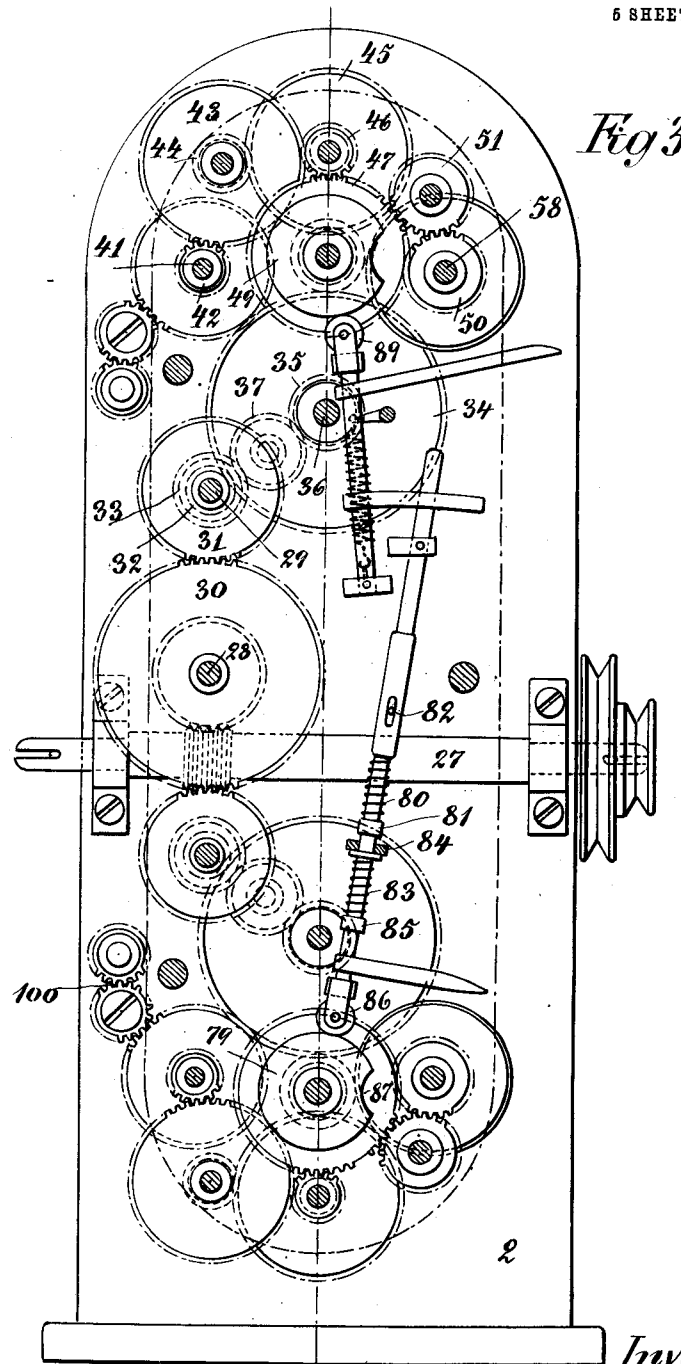
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6 SHEETS—SHEET 3.



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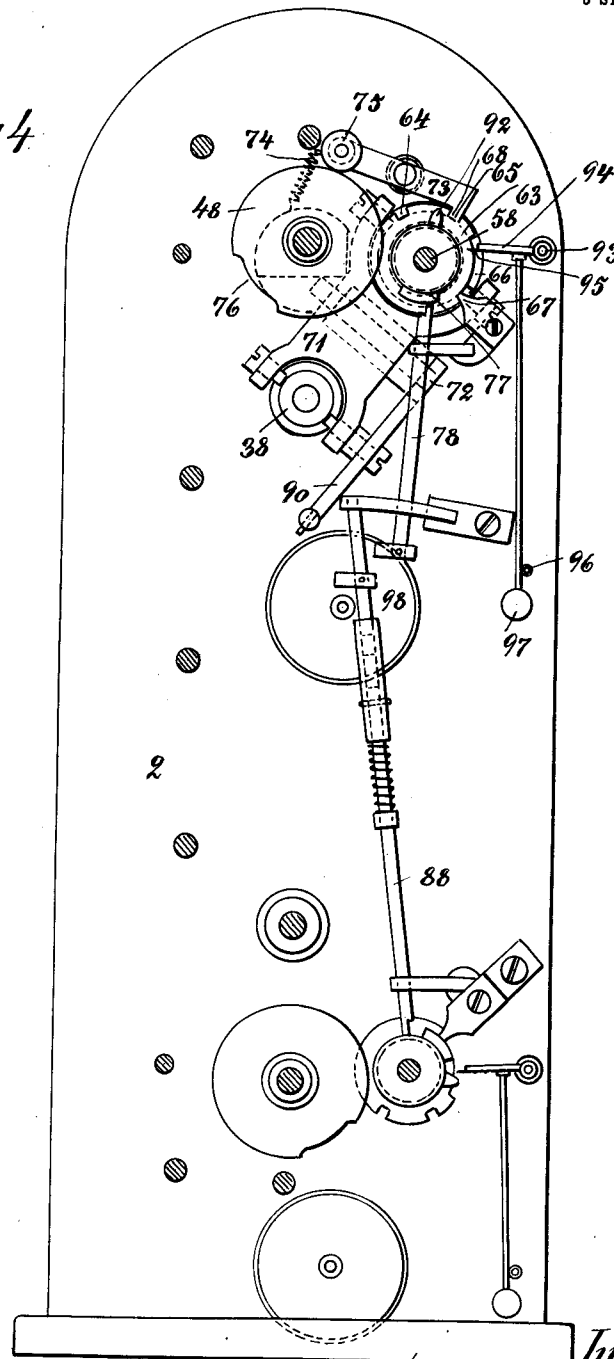
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5 SHEETS—SHEET 4.

Fig 4



Witnesses
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 William A. Chapin

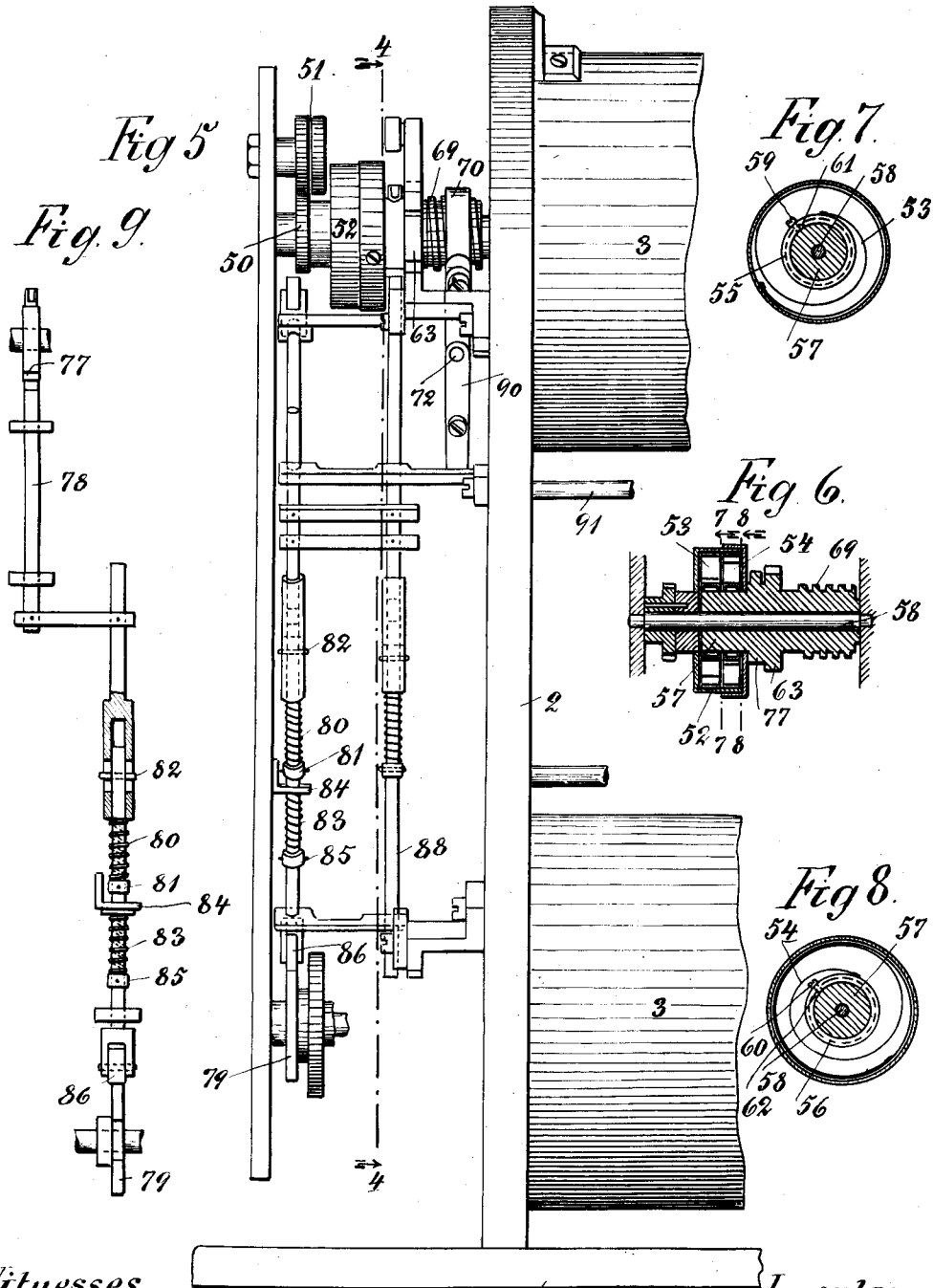
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6 SHEETS—SHEET 6.



Witnesses

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UNITED STATES PATENT OFFICE.

CARL SCHOU, OF HOLTE, DENMARK.

PHOTOGRAPHIC RECORDING APPARATUS.

1,104,556.

Specification of Letters Patent.

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Application filed January 6, 1913. Serial No. 740,356.

To all whom it may concern:

Be it known that I, CARL SCHOU, subject of the King of Denmark, residing at Holte, Denmark, have invented certain new and useful Improvements in Photographic Recording Apparatuses, of which the following is a specification.

The invention relates to a photographic recording apparatus especially intended for recording of telegraphic signals in cable- or wireless rapid telegraphy. The apparatus belongs to the kind of recording apparatuses in which the recording is effected on sheets of sensitive paper or the like arranged on rotating drums. Two such drums are found and used alternately so as to leave time for exchanging one of them while the recording is effected on the other one, and such arrangement is provided for that the recording commences on one drum before the other one has fully run out, so that provisions are made for none of the continuously arriving signals getting lost during the exchanging.

The invention further relates to the special manner in which the drums are moved, so that one drum is screwed forward on a fixed screw at a certain speed past the place where the light falls upon its circumference, while the other drum, which is provided with new photographic paper, is found at the starting point of its traveling, where it remains until it is released by the first drum. It then commences its traveling and reaches the place where the light strikes it at a time a little prior to the first drum having reached its outer position, so that during a short period recording takes place on both drums. The first drum thereafter rapidly returns to its starting position, on its way back being protected against the light by a shutter. When having reached its starting position it stops and can then be exchanged while the recording is effected on the other drum. After having been provided with fresh paper and replaced, it is started being released when the other drum has reached a certain point of its traveling etc. The drums are during the whole time inclosed in light-tight capsules, unless when paper is taken out or put on, which takes place in a dark-room.

A further feature of the invention is the manner in which the light is let into the apparatus, the bundle of light in a way being

divided into three parts, two of which being reflected each to one of the drums by means of mirrors or prisms, while the third part is used for the adjustment of the apparatus. It is hereby obtained that movable optical parts are avoided.

In order to make my invention fully understood I shall now disclose an example in the following specification with reference to the annexed drawings.

Figure 1 shows a modification of such an apparatus partially in section and partially in elevation; Fig. 2 an end-view of the apparatus partially in section on the line 2—2, Fig. 1 on a larger scale; Fig. 3 a section according to the line 3—3 Fig. 1, on a larger scale; Fig. 4 a section on the line 4—4, Fig. 5, on a larger scale; Fig. 5 part of the apparatus seen from the opposite side of Fig. 1 on a larger scale; Fig. 6 a detail showing a section through a spring casing; Fig. 7 a section on the line 7—7, Fig. 6; Fig. 8 a section on the line 8—8, Fig. 6; Fig. 9 a detail.

In all of the figures certain parts are left out for sake of clearness.

Referring to Fig. 1, 1 is a foot plate on which is arranged a vertical plate 2 carrying two light-tight cylinders 3 and two fixed screws 4, one of which only being visible in this figure. On each of the screws is screwed a long nut 5 provided with a flange 6. The nut is rotated by means of a dog 7 passing through a hole in the flange 6. The dog is turned around the fixed screw 4 by means of a gear 8 and a pinion 9. The drum 10 can be placed on the nut 5, said drum being provided with a central tube 11 and secured thereon in any appropriate manner, for instance by springs and taps 12 as shown. The drum is carried around with the nut 5 by means of the stud 13 on the flange 6. When the drum is found in its outermost position to the left (the starting position), it is found in a light-tight cylinder 14. The cylinders 14 in connection with the fixed cylinders 3 form light-tight capsules in which travel the drums 10. When a drum is to be taken off in order to have the sensitive paper exchanged, it is found inside the cylinder 14 during the transport to and from the dark-room. The cylinders 14 are inside provided with a brim of velvet 15 and light-locks 16, 17 in order to secure light-tightness. The cylinders 14 are secured in their places by means of caps 18

screwed on the ends of the screws 4, as shown, and handles 19 on the drums 10 protrude through an opening 20 in the bottom of the cylinders 14, when the drums are found in their outermost position.

Between the cylinders 3 is found the optical system shown in Fig. 2. In the tube 21 is arranged two prisms 22 used as mirrors reflecting the light which falls in from the left side upward or downward through cylinder-lenses 23 and diaphragms 24. The light passes through openings which can be shut by means of shutters 25, Fig. 1, moved in the manner described later on. Between the prisms 22, Fig. 2, is found a small aperture through which part of the light falls upon a focusing screen 26 which is found at the same optical distance from the object of which a picture is formed as the paper on the drums 10.

The manner in which the various parts are moved can be varied, and the manner described in the following has in practice proved to be appropriate, but is only named by way of example.

The shaft 27 is driven for instance by means of an electromotor and drives the shaft 28 by means of worm and worm gear (Figs. 1 and 3), and from these the two drums are driven by means of suitable gearings. These latter are identical for the two drums, wherefore only one is to be described. From the shaft 28 is driven the shaft 29 through the gears 30 and 31 and besides the shaft 29 carries the gears 32 and 33 engaging the gears 34 and 35 on the shaft 36, the latter through the intermediate gear 37. The two gears 34 and 35 are loose upon the shaft each carrying a clutch member, (*vide* Fig. 1), which members will thus rotate in opposite directions.

38 is a clutch sleeve which is displaceable on the shaft 36, but by key- and groove connection the latter is carried around with it. The sleeve can be brought into engagement with one of the clutch members 34 and 35 or assume an intermediate position in which no engagement takes place. The shaft 36 carries on one end the pinion 9, by means of which the gear 8 is rotated. Dependent of whether the sleeve 38 is placed in the position to the right or to the left in Fig. 1, the drum 10 will be screwed slowly to the right (forward) or rapidly to the left (backward), the gearing being different in the two cases. If the sleeve 38 is in its intermediate position, the drum stands still. The displacement of the sleeve 38 is effected by means of the mechanisms described below.

In firm connection with the gear 8 is arranged a gear 39. This gear is meshing with the gear 40 on the shaft 41 (Fig. 2). Through the gears 42, 43, 44, 45, 46, (Fig. 3) the motion is transmitted to the gear 47

which is connected with the cam disks 48 and 49 (Figs. 1, 3 and 4) and therefore the same are rotated with the said gear.

At the various gearings above described the speed of rotation of the said cam disks is so much reduced that the disks only perform part of a revolution while the drum moves from one outermost position to the other. The gear 47 further drives the gear 50 through the intermediate gear 51. The gear 50 is firmly connected to a spring casing 52 separately shown in Figs. 6-8. This casing contains two spiral springs 53 and 54 wound oppositely and counteracting each other, their outer ends being secured on the spring casing, their inner ends on rings 55 and 56 which are loose on the bushing 57, which latter is freely rotatable on the fixed shaft 58.

The rings 55 and 56 have the profile shown in Fig. 6 and in the inner grooves protrude the ends of stop screws 59 and 60 (Figs. 7 and 8). On the bushing 57 are found pins or stops 61 and 62 against which the ends of the screws 59 and 60 can rest, as shown. When the spring casing 52 is left alone the spiral springs bear against the inner circumference of the spring casing, and the screws 59 and 60 against the stops. If the bushing 57 be kept immobile and the spring casing by means of the gear 50 be turned in one direction, one of the springs, for instance the spring 53, will be tightened while the ring 56, belonging to the other spring, will be rotated on the bushing 57, the screws 60 leaving the stop 62. The bushing 57 will hereby become spring-actuated and will, if it be let free, turn in the same direction as that in which the spring casing was turned on the tightening of the spring. If the spring casing from the position of equilibrium be turned in the opposite direction, the two springs will change parts and the bushing 57 will become spring-actuated in the opposite direction. The bushing 57 carries a disk 63 (Fig. 4), the circumference of which is provided with two notches 64 and 65, and a broader gap 66. The turning of the bushing 57, which is to be effected by means of the springs in the spring casing, is only a fraction of a revolution, the turning being limited by the tooth 67 engaging the gap 66, as shown.

The bushing 57 can by means of the disk 63 and the hook 68 be retained in two positions dependent on whether the hook engages the notches 64 or 65. Integral with the bushing 57 is a worm 69 (Fig. 5). The worm is surrounded by a nut 70, which is turnable on pins in the fork-shaped end of a lever 71, (*vide* Fig. 4). This latter is turnable on a fixed shaft 72. The other end of the lever 71 is likewise fork-shaped and engages the clutch sleeve 38 mentioned above (*vide* also Fig. 1). It will be understood that when

the hook 68 is found in the notch 65, the nut 70 is in its outermost position to the right, and the clutch sleeve 38 engages the clutch member on the gear 34, Fig. 1, which incurs that the drum 10 moves slowly to the right (forward). The other end of the lever 73 with the hook 68 is actuated by a spring 74 and carries the roll 75 resting against the circumference of the disk 48 previously mentioned, which on its circumference has a gap 76. During the traveling of the drum 10 from the left to the right the spring 53 will become tightened, and the bushing 57 will become spring actuated, but is retained by the hook 68, as explained above. When in the meantime the drum 10 has moved to its outermost position to the right, the disk 48 has turned so much that the roll 75 falls into the gap 76, whereby the hook 68 is lifted up and the bushing released. It then turns, under the influence of the spring 53, so far as the tooth 67 in cooperation with the gap 66 allows; hereby the worm 69 is turned and effects reversing by means of the mechanisms described above. The disk 48 is now slowly turned back, and the roll 75 is lifted up from the gap 76, whereby the hook 68 is lowered into the notch 64 and again locks the bushing 57, until the disk 48 has been turned so far that the roll 75 falls into the other end of the gap 76, which takes place at the same time as the drum 10 has traveled to its outermost position to the left. The spring casing 52 has in the meantime been turned so much to the opposite side that the spring 54 has now been tightened, and the bushing 57 is now spring actuated in the opposite direction.

It has now been described how the forward and backward traveling of the drum 10 takes place and how the reversing is effected. The corresponding mechanisms belonging to the undermost drum are as stated above identical with those described. It is now to be described how the stopping of the motion of the drums is effected during the exchanging of the paper, which stopping is always effected when the drum in question is in its outermost position to the left, Fig. 1, and how the starting is effected subsequent to each stopping, which starting of each of the drums always takes place when the other drum has reached a certain place near to the end of its traveling to the right.

On the bushing 57, Figs. 4 and 6, is found a cam 77, one end surface of which can coact with a rod 78. In the position shown in Fig. 4 the rod, which is spring influenced, rests against the top of the cam 77. When the bushing 57 is turned in the direction of the hands of a watch, Fig. 4, the rod 78 will under influence of its spring be pushed forward sliding down the cam behind the same. When the bushing 57 is released, the

hook 68 leaving the notch 64 the rod 78 will be in the path of the cam 77 and stop the bushing 57 in the middle of its traveling. This will incur that the clutch sleeve 38 stops in its neutral intermediate position, and the drum 10, which is now in its outermost position to the left, stands still. This lasts until the rod 78 is redrawn and releases the cam 77. When this takes place the bushing 57 will continue its commenced but interrupted turning until it reaches the position shown in Fig. 4, and the drum 10 will then be moved to the right. The movement of the rod 78 is controlled from the other drum, the rod being redrawn on a certain point of its traveling.

The mechanism driving the undermost drum is, as mentioned, all through identical with that driving the drum 10, and to the cam disk 49, Figs. 1 and 3, the cam disk 79 (Fig. 5) is corresponding as regards the undermost drum. The rod 78 and the cam disks are shown in Fig. 9. The rod is displaceably journaled and consists of two parts which can be a little telescoped as shown, a spring 80 resting against a shoulder 81 tends to giving the rod the greatest possible length which is limited by a pin 82, as shown. Further the rod is acted upon by a spring 83 resting against the fixed bearing 84 and a shoulder 85 on the rod. The spring 83 presses the roll 86 against the circumference of the cam disk 79. It is understood that when the roll 86 enters the gap 87 on the cam disk, the rod 78 is drawn downward by the spring 83, and the upper end of the rod is drawn away from the cam 77, Fig. 4. A rod 88 is provided with a roll 89, which in the same manner coacts with the cam disk 49 and in exactly the same way serves for stopping and starting the undermost drum.

On the lever 71 is fixed an arm 90 actuating a rod 91 with the shutter 25, and corresponding organs are found as regards the undermost drum.

On the bushing 57 is found a projection 92, which, when turned in the direction of the hands of a watch, Fig. 4, goes past a spring 95 on a lever 94 turnable on a tap 93 without the lever being turned, same being retained by the stop 96 while the spring is bent downward. If, however, the projection 92 is passed by the spring in the opposite direction of rotation, it will carry along with it the lever 94 and cause the clapper 97 to strike the bell 98 so that a signal is given each time the drum is to be exchanged. The corresponding mechanism is likewise found for the lowermost drum.

In order to ascertain at any time where the drums are found during their traveling, a scale is arranged on their capsules and a hand driven by a screw, one of which mech-

anisms 99 is shown in Figs. 1 and 2. The screw is driven from the gearings through the gears 100, Fig. 3.

For sake of clearness the whole acting of the apparatus will now be recapitulated: It be for instance presumed that the uppermost drum is on its way forward (to the right), while the undermost drum stands still in its outermost position to the left. When the uppermost drum has reached a certain point of its traveling, the undermost drum is automatically started at such a time that the paper on the same has reached under the light opening a short time before the uppermost drum has completed its traveling, so that during a short time recording is effected on both of the drums. When the uppermost drum has completed its traveling forward, the direction of rotation is reversed, and the drum rapidly returns, during which movement the shutter belonging to it protects the same against the light. When fully returned the corresponding bell is stricken and the drum stops, whereafter it is exchanged. It still lasts some time before the undermost drum has reached the point at which the uppermost drum shall be started again, so there is ample time for exchanging of paper.

Having now particularly described and ascertained my said invention, what I claim to secure by Letters Patent of U. S. A. is:

1. An automatic recording apparatus for the photographic recording of signals comprising two drums each adapted to receive a sensitive film, means for rotating each of said drums on its axis and simultaneously displacing it longitudinally forwardly and backwardly therealong, means for dividing and reflecting part of a light-beam against each of said drums, and means for cutting off the light to each of them during their respective backward movements.

2. An automatic recording apparatus for the photographic recording of signals comprising two drums each adapted to receive a sensitive film, means for rotating each of said drums on its axis and simultaneously

displacing it longitudinally forwardly and backwardly therealong, means for dividing and reflecting part of a light-beam against each of said drums, a focusing screen placed a determined distance from the object whose movements are to be recorded which distance is such that images will be produced on the said drum and the said screen simultaneously, and means for cutting off the light to each of said drums during its backward movement.

3. An automatic recording apparatus for the photographic recording of signals comprising two drums, each adapted to receive a sensitive film, means for rotating each of said drums and for simultaneously displacing it longitudinally forwardly and backwardly therealong, means for controlling the rotation of each of said drums each of said last-named means comprising a spring actuated part having two spring members adapted to exert their tensions in opposite directions, connections operatively associated with said drum for placing one of said members under tension during the forward travel of said drum and the other of said members under tension during the backward travel of said drum, mechanism actuated by said actuated part for reversing and stopping said drum, said spring-actuated part acting under its own tension for controlling the reversing of the rotation of the drum at the end of the forward travel of the same, a stop co-acting with said spring-actuated part for controlling the stopping of said drum at the end of the backward travel of the same, and means actuated by the other of said drums for releasing said spring actuated part from said stop to permit said part to again act under its own tension to control the starting of the drum on its forward travel.

In testimony whereof I have affixed my signature in presence of two witnesses.

CARL SCHOU.

Witnesses:

CECIL V. SCHOU,
VIGGO BLOM.