

June 13, 1944.

J. P. CARACCILO ET AL

2,351,399

PHOTOGRAPHIC APPARATUS

Filed May 26, 1942

6 Sheets-Sheet 1

FIG. 1.

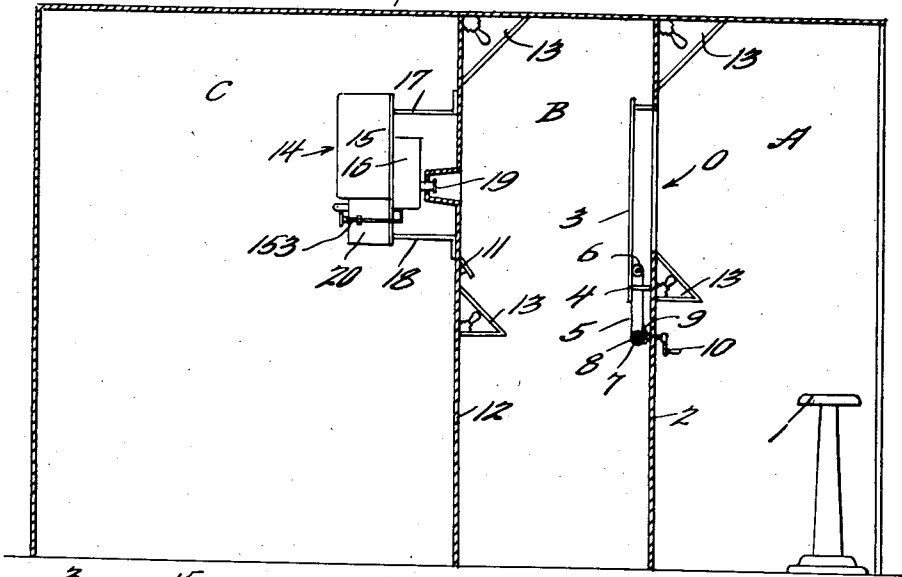
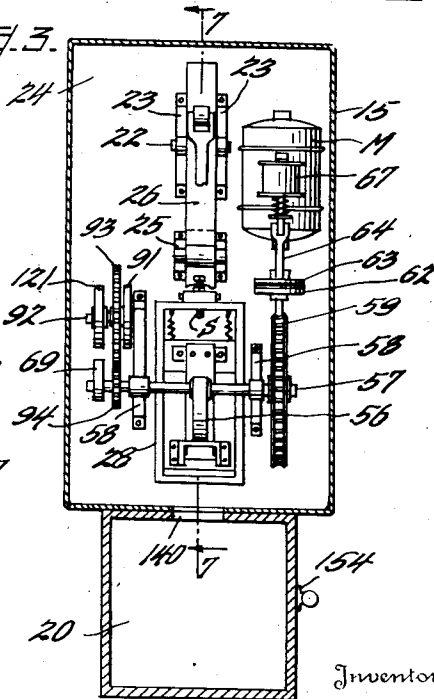


FIG. 3.



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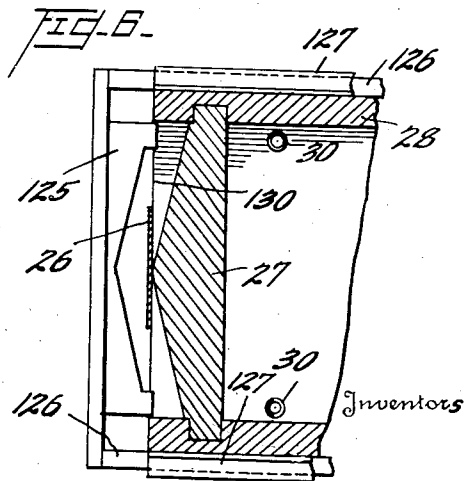
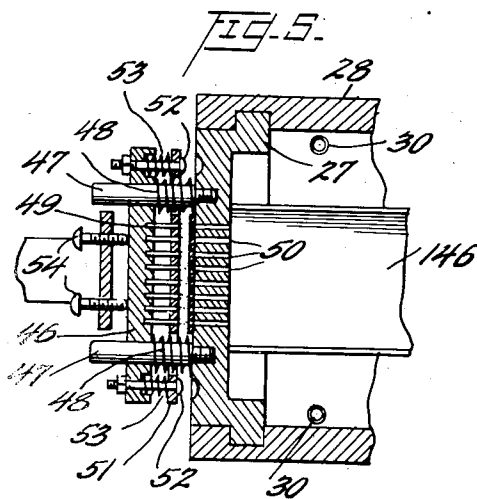
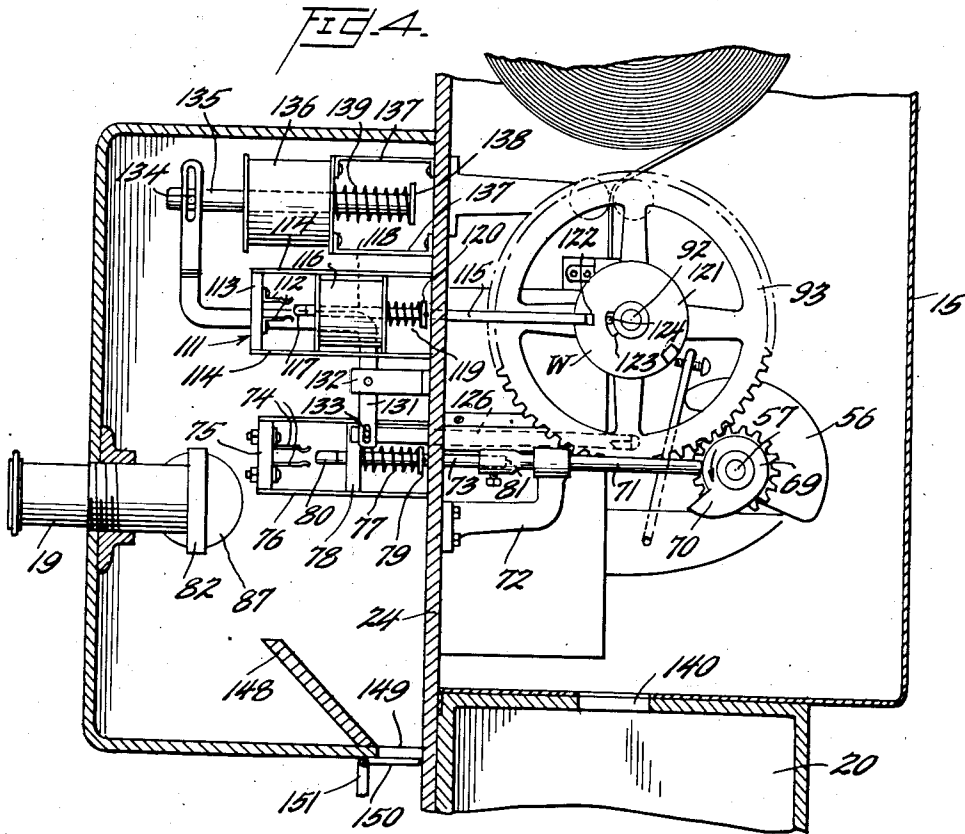
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6 Sheets-Sheet 2



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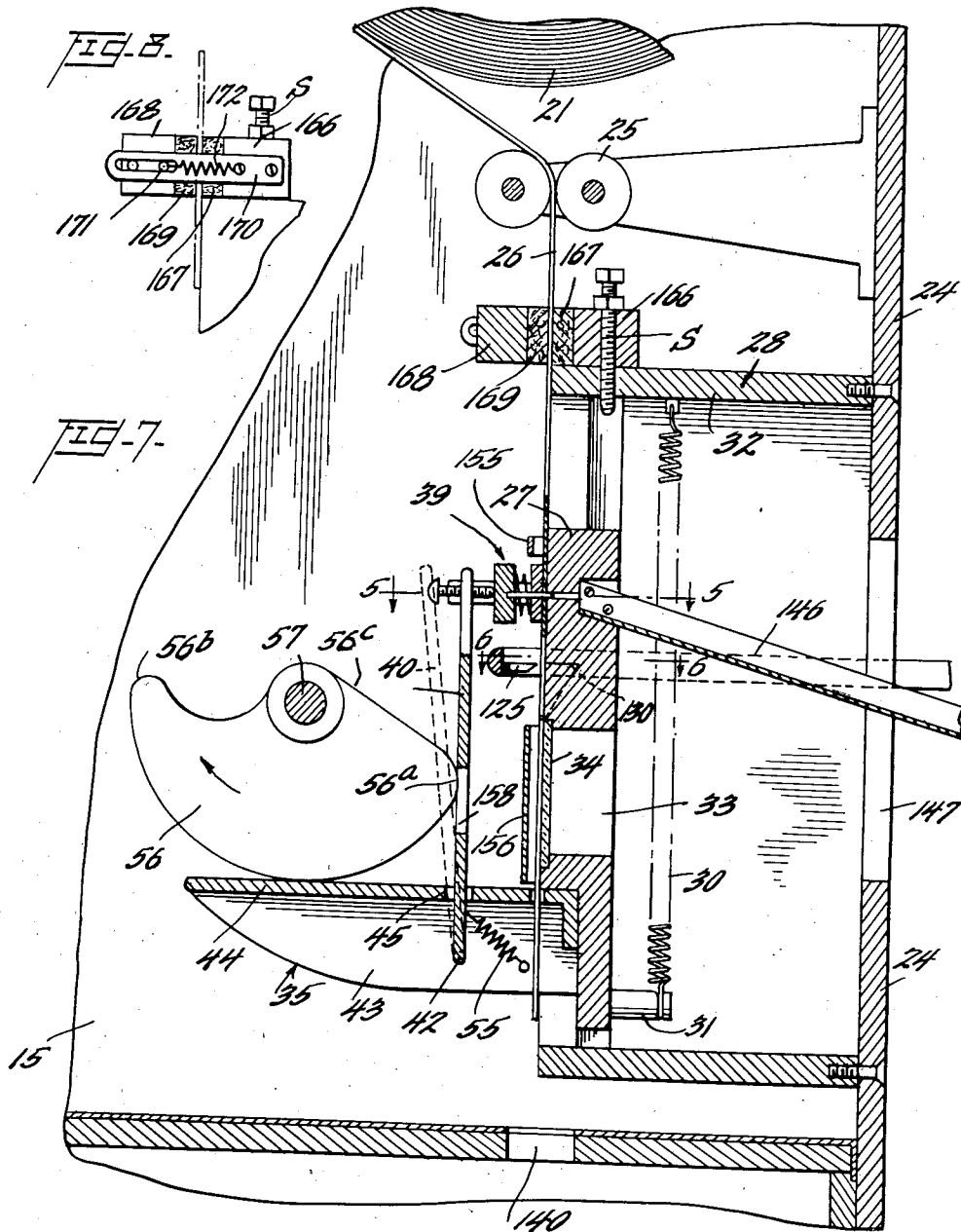
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PHOTOGRAPHIC APPARATUS

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FIG. 10.

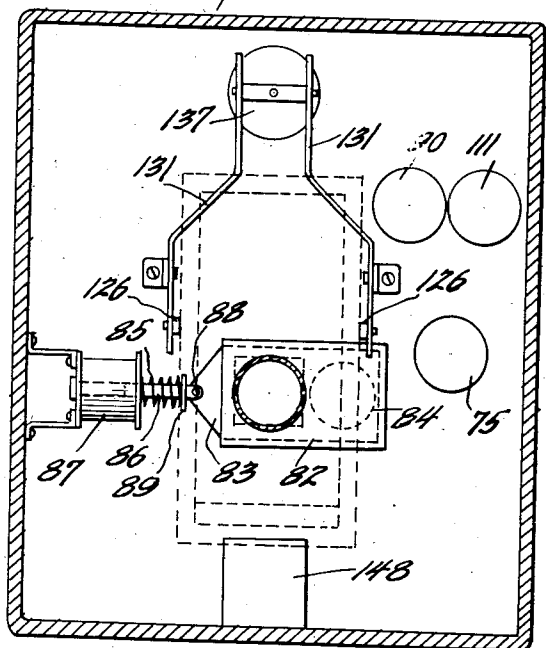


FIG. 9.

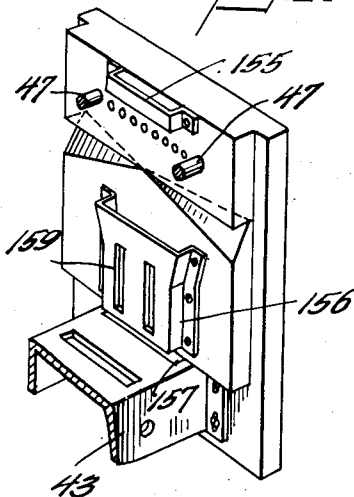
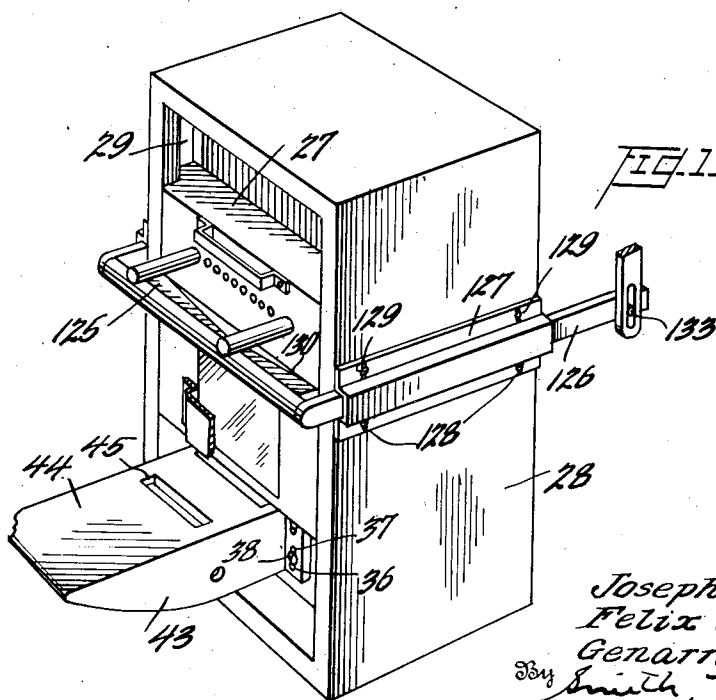


FIG. 11.



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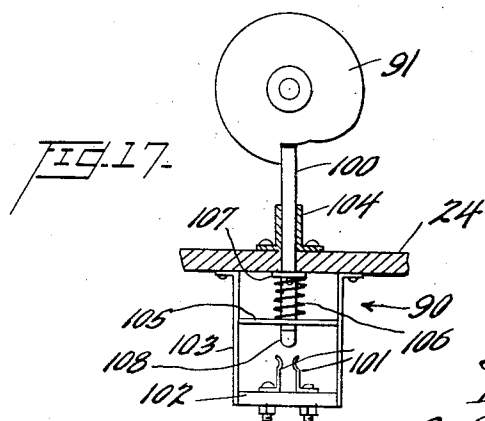
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2,351,399

6 Sheets-Sheet 5



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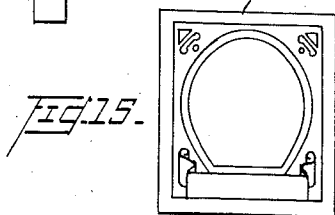
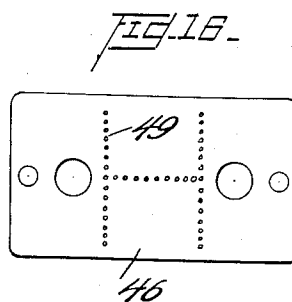
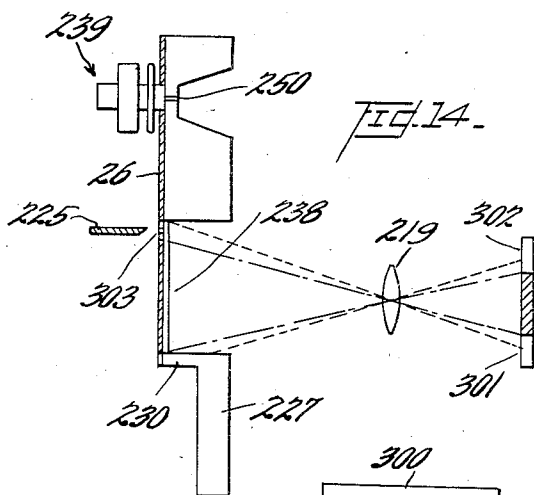
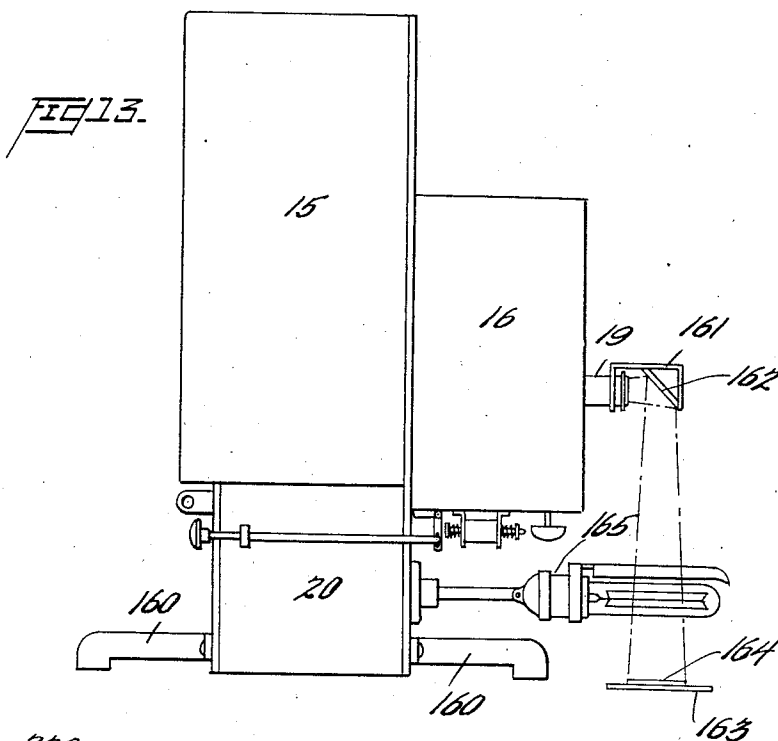
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PHOTOGRAPHIC APPARATUS

Filed May 26, 1942

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,351,399

PHOTOGRAPHIC APPARATUS

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Application May 26, 1942, Serial No. 444,574

25 Claims. (Cl. 88—18.4)

This invention is a photographic apparatus designed particularly to produce photographs of substantially the size and appearance of postage stamps, but it is constructed and arranged so as to be applicable generally for photographic operations such as copying and reproducing records, and for making portrait photographs and composite photographs.

One object of the invention is to provide an automatic, or semi-automatic photographic apparatus, which includes a supply of sensitized paper, together with means for feeding the paper across the light axis of a camera in timed relation with the operation of the camera shutter so as to produce a strip of exposures, adjacent exposures being separated by perforations such as characterize the usual postage stamps. Means are provided for severing the exposed portion of the strip from the supply after a predetermined number of exposures have been made.

Another object of the invention is to provide means whereby the perforating mechanism may be employed to feed the strip of sensitized paper across the light axis of the camera in definite timed relation to the operation of the camera shutter, whereby to preclude the possibility of slippage between the paper and the paper feeding means.

A further object of the invention is to provide interrelated power driven mechanism for operating the paper feeding and perforating means, the paper cutting means and the shutter mechanism of the camera, to insure proper and repeated operation of these instrumentalities in timed relation to one another.

Another feature of the invention is to provide means in an apparatus of the character described, which will enable an operator to set the machine in operation, for a predetermined number of exposure cycles, after which the machine will automatically stop with all parts thereof in position to respond to a subsequent "start" operation on the part of the operator.

Another object of the invention is to provide a combined strip feeding and perforating mechanism operable from a single actuating instrumentality, such as a rotating cam.

Another object of the invention is to provide, in combination with strip perforating mechanism mounted upon a reciprocating strip feeding member, means for collecting and disposing of the waste strip material from the perforating means.

Another object of the invention is to provide in a photographic apparatus of the character de-

scribed, means for adjusting the shutter operating mechanism so as to vary the "open" period of the shutter while maintaining substantially constant R. P. M. of the actuating means.

These and other objects of the invention will become apparent from reading the following specification in connection with the accompanying drawings wherein we have illustrated and described preferred embodiments of the invention. In the accompanying drawings:

Figure 1 is a diagrammatic view of a studio arrangement in which the present invention is installed.

Fig. 2 is a side elevation of the camera, with the casing in section as viewed from the same side as is shown in Fig. 1.

Fig. 3 is a rear elevation of the camera, with parts of the casing shown in section, as viewed along the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary side elevation of parts of the apparatus as viewed from the side opposite to that shown in Fig. 2, parts of the casing being shown in section.

Fig. 5 is a detail view, partly in section, of the perforating mechanism as viewed substantially on line 5—5 of Fig. 7.

Fig. 6 is a detail view, partly in section, of the knife as viewed substantially on the line 6—6 of Fig. 7.

Fig. 7 is an enlarged detail view, partly in section, showing the feeding and perforating mechanism as viewed substantially on the line 7—7 of Fig. 3.

Fig. 8 is a detail view of the strip clamping means.

Fig. 9 is a detail perspective view with parts in section, showing the assembly of parts carried by the reciprocable member of the strip feeding means.

Fig. 10 is an enlarged sectional view, taken substantially on the line 10—10 of Fig. 2.

Fig. 11 is an enlarged detail view, with parts in section, showing the general assembly of the knife and the reciprocable member of the strip feeding means.

Fig. 12 is a diagrammatic view of the control circuit for the driving motor and the several magnets.

Fig. 13 is an elevation of a modified form of the invention.

Fig. 14 is a diagrammatic view of a further modification of the invention.

Fig. 15 is a plan view of a preferred form of picture frame.

Fig. 16 is a diagrammatic view of a preferred

arrangement of punch elements for the perforating unit.

Fig. 17 is a detail of the shutter delay switch and cam operator.

Referring more particularly to the drawings, wherein like reference numerals are used to designate like parts throughout, Fig. 1 diagrammatically shows one arrangement of a studio in which the photographic apparatus forming the subject-matter of the present invention may be effectively utilized. The studio may include a room or compartment A which is provided with a stand or support 1 designed to support or position the person or object to be photographed before an opening O in one wall of said compartment. The opening O in the wall 2 of the compartment is preferably positioned with respect to the stand 1 so that the head and shoulders of a person seated thereon will be exposed through said opening in proper position to be photographed. On the opposite face of the wall 2, and within a separate compartment B is provided a suitable frame member 3 which surrounds the opening O. The frame member 3 may carry any suitable decoration which will appear in the finished photograph as a decorative frame or background surrounding the picture of the subject, and at the lower portion of the frame there is provided an opening 4 through which are exposed letters, numerals or other identifying characters which may be mounted upon a plurality of endless bands 5, trained over spaced rollers 6 and 7 and about which the bands 5 are movable through the instrumentality of intermeshing gears 8 and 9 carried, respectively, by the rollers 7 and plurality of hand cranks 10, the latter extending through the partition wall 2 and terminating within reach of the person seated upon the stand 1. Thus, a person to be photographed may, by operating the several hand cranks 10, bring desired identifying characters within the opening 4 at the bottom of the form 3. To enable the person to properly align the several characters within the opening 4, a mirror 11 is provided within the compartment B on the opposite wall 12 of said compartment, which mirror can be seen by the person within compartment A through the opening O of the wall 2. The compartments A and B and the subject positioned on the stand 1, may be properly illuminated as by lighting fixtures indicated at 13.

The photographic apparatus comprising the present invention is mounted on the opposite face of the wall 12 within compartment C and is indicated generally in Fig. 1 by the reference character 14. The apparatus 14 may be suitably housed within casing members 15 and 16 and is shown supported from the wall 12 by suitable bracket members 17 and 18. The apparatus 14 includes a lens unit 19 which, as shown, projects through the wall 12 in the general direction of the frame member 3, the opening O and the head and shoulders of the person seated on the stand 1 which are visible through said opening. With the studio thus arranged, it is contemplated that a person desiring to have a photograph taken, will sit upon the stand 1 and after properly arranging the identifying characters within the opening 4 at the bottom of the frame, can operate a control instrumentality such as a coin controlled or manually operated switch (not shown in Fig. 1) by which the automatic photographic apparatus will be put in operation to take a predetermined number of exposures, after which the exposed portion of a sensitized strip

of paper or film will be severed from the supply roll and automatically deposited within the container 20 from which it may be withdrawn by an operator working within compartment C, to be subsequently processed and delivered to the person in compartment A.

The apparatus housed within the casing members 15 and 16 is designed to intermittently feed a light sensitive strip across the light axis of the camera in timed relation to the operation of shutter mechanism operatively associated with the lens and cutting mechanism designed to sever the exposed portion of the strip from the unexposed portion thereof, so that, depending upon the adjustment of said mechanism, a predetermined number of exposures will be made on said strip, and the exposed portion thereof then severed from the unexposed portion and deposited in the receptacle 20. As previously indicated, the strip feeding mechanism has associated therewith strip perforating mechanism for perforating the strip around each exposure so that the finished photographs resemble postage stamps in general appearance.

Referring more particularly to the mechanism, I provide means for supporting a roll of light sensitive strip material 21 within the casing member 15. The roll may be supported upon a core member 22, rotatably mounted in supporting standards 23, secured in any suitable manner to a supporting baseboard 24. The roll 21 is, as shown, positioned in the upper part of the casing 15 and is arranged to feed the strip downwardly across the light axis of the lens 19. I provide suitable guide rollers 25 mounted upon the board 24, and through which the strip 26 is directed.

The strip feeding mechanism comprises a member 27 mounted for reciprocation in a substantially vertical plane in the frame member 28, secured in any suitable manner to the baseboard 24. As shown in Fig. 11, the frame member 28 is in the form of a hollow rectangular frame, the inner faces of the vertical side members of which are provided with opposed guideways 29, in which the reciprocable member 27 is slidingly mounted. The reciprocable member 27 is spring biased to its uppermost position by springs 30, tensioned between spring supports 31 carried by the underside of the member 27 near its lower end, and the inner face of the upper end piece 32 of the frame member 28. The member 27 is further provided with an exposure aperture 33 which, when the member 27 is in its uppermost position, is out of alignment with the light axis of the lens 19, but which, when moved to its lowermost position, as will be hereinafter explained, is in alignment with said lens. The exposure aperture 33 is preferably closed at the end thereof remote from the lens, with a glass or other transparent sheet 34, to give proper support to the strip 26 at the point of exposure.

The reciprocable member 27 is provided near its lower end with an outstanding cam follower 35. The cam follower is provided with attaching flanges 36 at its lower end, said flanges being provided with elongated apertures 37, through which pass suitable securing devices 38 for securely mounting the cam follower on the member 27. The elongated apertures 37 provide means for proper adjustment with respect to the operating cam, presently to be described, to insure proper alignment of the exposure aperture 33 with the lens 19 at the time an exposure is made.

The means for perforating strip 26 comprises

a perforating unit indicated generally by the reference character 39 in Fig. 7. As there shown, the unit 39 is mounted on the member 27 near the upper end thereof and is arranged to be actuated by an arm 40, the upper free end of which overlies said unit 39. The arm 40 may be mounted in any convenient manner and I have shown it mounted upon a pivot member 42, supported transversely of the member 27 in the side plates 43 of the cam follower 35. Wall 44 of the cam follower, which engages the operating cam, is slotted at 45 so that the arm 40 extends through the slot 45 in a position generally parallel to the member 27.

The perforating unit 39, as best shown in Fig. 5, comprises a bar 46 mounted for sliding movement upon spaced guide pins 47, mounted upon and extending substantially perpendicularly from the surface of the member 27 which lies adjacent to the strip 26. The bar 46 is maintained in spaced relation to the member 27 by coil spring 48 mounted upon the pins 47 between the bar 46 and said member 27. A plurality of perforating punches 49 are carried by and project from the under side of the bar 46 and are arranged to cooperate with a plurality of aligned punch receiving recesses 50 provided in the member 27. Normally, the spring members 48 bias the bar 46 and the punch 49 carried thereby to a position in which the free extremities of said punch members are in spaced relation to adjacent surfaces of the member 27 whereby to permit free movement of the strip therebetween. The perforating unit 39 includes means for stripping the strip 26 from the punch members 49 after a punch operation, and to this end a combined stripping and pressure plate 51 is mounted upon the bar 46 and occupies a position between said bar and the member 27, as clearly shown in Fig. 5. The pressure or stripping plate 51 is carried by bolt members 52 secured thereto and which pass freely through the bar 46. Spring members 53 are mounted upon the bolts 52 to maintain the pressure plate 51 in spaced relation in respect to the bar 46. Thus, when the bar 46 is actuated to perform the perforating operation of the strip 26, as will be hereinafter described, the pressure plate 51 first contacts the strip and maintains the resilient pressure thereon until after the punch members 49 have entered and have been withdrawn from the punch receiving recesses and have again assumed a position in spaced relation to the strip 26.

The arm 40 carries at its free upper end a pair of adjustable contact screws 54 whereby to regulate and properly maintain a desired range of movement for the punch members 49. In order to maintain the arm 40 in contact with the bar 46, I provide spring members 55 tensioned between the side plates 43 of the cam follower 35 and arm 40, as shown in Fig. 7. It will be understood, of course, that the tension springs 55 just referred to are strong enough only to maintain contact of the arm 40 with the bar 46, but not to overcome the springs 48 which maintain the punch members 49 in spaced relation to the strip 26.

The cam follower 35 is designed to cooperate with the rotatable cam 56, shaped as shown in Fig. 7, and designed to impart reciprocatory movement to the member 27, and oscillatory movement to the arm 40 when rotated. The cam 56 is mounted upon a transverse shaft 57, supported in suitable shaft hangers 58 mounted

in any convenient manner upon the baseboard 24. The shaft 57 adjacent the right hand end thereof as viewed in Fig. 3, is provided with a gear member 59 which is arranged to be driven by a worm shaft 60 supported in suitable bearing members 61 secured to the baseboard 24. The shaft 60 is arranged in a generally vertical position and is driven by an electric motor M mounted upon the base 24 near the upper end thereof. In order to insure instantaneous stopping of the shaft 57 and associated parts when the motor is deenergized, we provide a solenoid-released, spring-applied brake to the shaft 60. Thus, as shown in Fig. 2, the shaft 60 has secured thereto a friction disk 62 with which cooperates a relatively movable friction disk 63 carried by a lever 64, one end of which is pivotally secured to a bracket 65 mounted on the baseboard 24. The lever 64 and the friction disk 63 carried thereby are resiliently urged into engagement with the disk 62 carried by the shaft 60. Thus, the lever 64 is provided at its upper extremity with an end portion disposed substantially parallel to the shaft 60, which end is connected to a core member 66 of a solenoid 67. The core member is biased by the spring 68 to a position partly outside of the solenoid winding so that when the winding is energized, the core moves against the tension of the spring 68 to pull the lever 64 and the attached brake disk 63 out of engagement with the disk 62. The solenoid 67 is connected in circuit with the motor M so that it is energized and deenergized simultaneously with the energization and deenergization of said motor, and so that the brake-disk 63 is urged against the disk 62 under the influence of the spring 68 when the motor is deenergized.

The shaft 57 adjacent the left hand end thereof as viewed in Fig. 3, has a cam 69 secured thereon for rotation with the shaft. The cam 69, as shown in Figs. 4 and 12, is generally circular throughout the major portion of its periphery, but is provided with a high point 70 positioned to actuate a push rod 71 mounted, as shown in Fig. 4, for rectilinear motion through the baseboard 24 and substantially perpendicularly to the plane thereof. The push rod 71 may be mounted and guided in any suitable manner, such as by a guide member 72 mounted upon the baseboard 24. The push rod 71 carries an adjustable extension 73 extending through an aperture in the baseboard 24 into the space within the casing 16 and into operative relation with a pair of spaced switch contacts 74. The switch contacts 74 are mounted upon a supporting block 75 which is mounted in spaced relation to the baseboard 24 by side bracket member 76. The push rod 71 is urged into operative engagement with the periphery of the cam 69 by a coil spring 77 mounted upon the extension 73 between a transverse brace member 78 and a suitable abutment 79 mounted upon said extension member. From this construction it is apparent that, as the cam member 69 rotates with the shaft 57, the push rod 71 and its extension 73 are reciprocated in the members 72 and 78 to move an electrical contact 80 carried by the extremity of the extension member 73, into and out of circuit closing position with respect to the contacts 74. In order to adjust the time interval during which electrical contact is maintained between the contacts 74 and the contact 80, the extension member 73 is adjustably mounted within a socket member 81 carried by the push rod 71. Thus, by varying the overall length of

the push rod 71 and the extension 73, the time period of engagement between the contact 80 and the contact 74 may be varied. As will be hereinafter explained, the contacts 74 are in circuit with shutter operating mechanism.

The lens unit 19 mounted in the forward wall of the casing 16 is provided with shutter mechanism shown more clearly in Fig. 10. The said shutter mechanism comprises a housing 82 mounted upon the inner end of the lens unit, said housing having slidably mounted therein a shutter 83 provided with an aperture 84. The shutter 83 is normally urged to a position in which the aperture 84 is out of alignment with the light axis of the lens by means of a coil spring 85 mounted upon a core armature 86 operatively associated with a solenoid 87, mounted in any suitable manner within the casing 16. The core 86 is pivotally attached to the shutter 83 at the point 88. The spring 85 is compressed between an end of the solenoid 87 and an abutment 89 carried by the core member. Thus, as the solenoid 87 is energized the shutter 83 is moved against the tension of the spring 85 to a position in which the aperture 84 is in alignment with the light axis of the lens, and when the solenoid is deenergized the spring 85 moves the shutter to closed position.

As previously indicated, the apparatus is designed to make a predetermined number of exposures on the strip 26 and I find it convenient and desirable to provide means for making five exposures during the operative cycle of the machine. Furthermore, we find it desirable, although not necessary, to provide means for insuring that the strip of exposures which is made during one cycle of operation of the machine, will have an unexposed tab portion at either end thereof to facilitate handling of the strip of exposures during processing after it has been severed from the unexposed portion of the strip. To this end we provide means associated with the circuit of the shutter operating solenoid 87, which will delay operation of the shutter mechanism in a predetermined manner. Thus, as shown in Figs. 12 and 17, we provide a shutter delay switch unit indicated generally by the reference character 90. The shutter delay switch unit includes a cam member 91 mounted upon a stationary shaft 92, as shown in Fig. 3. The shaft 92 is fixedly mounted upon one of the shaft hangers carried by the baseboard 24, and has mounted thereon a gear 93 which meshes with a gear 94 carried by the shaft 57. The cam 91 is secured to and driven by the gear 93. Inasmuch as the present apparatus is designed to provide an exposed strip having five exposures and an unexposed tab portion at either end, each said portion being equivalent to one-half of an exposure, the gear ratio between the gears 93 and 94 is one to six. It will be understood, however, that this is purely an arbitrary relationship based upon convenience and desire, and that the ratio between these two gears may be varied in accordance with the number of exposures that are desired upon a single segment of the strip 26. As best shown in Figs. 12 and 17, the major portion of the periphery of the cam 91 is substantially concentric to its axis of rotation but is provided with a high point 95, and a portion of variable diameter 96 connecting the low point 97 with the circular portion 98. The cam 91 is designed to actuate a switch, indicated generally at 90 in Fig. 12, in timed relation to actuation of the switch 74—80, both of said switches,

as indicated in Fig. 12, being included in series in the circuit of the shutter actuating solenoid 87. Thus, the switches 74—80 and 90 must both be closed before the circuit to the solenoid 87 is complete. The cam 91 is synchronized with respect to the cam 69 so that the push rod 100, operatively associated with the periphery of the cam 91, rides over the portion 96 of the cam 91 as the shaft 57 begins to move. The peripheral extent of the portion 96 is such as to insure the cam 69 making one complete revolution before the follower 100 reaches the concentric portion 98 of the cam 91, which portion is dimensioned to insure closing of the switch 90. Thus, the cam 69 and the shaft 57 to which it is secured, will make one complete rotation to feed an unexposed portion of the strip forwardly with the member 27 before the switch 90 closes. Thus, the first actuation of the switch 74—80 is ineffective to energize the solenoid 87 as at this time the switch 90 is open. For all succeeding operations of the switch 74—80, however, the solenoid 87 is energized to operate the shutter mechanism, inasmuch as the switch 90 closes after the first revolution of the cam 69. Due to the six to one ratio of rotation between the cams 69 and 91, the switch 90 will remain closed for the five succeeding rotations of the cam 69. The arrangement and construction of the switch 90 is similar to that of switch 74—80, and as shown in Fig. 17, comprises a pair of contact members 101 mounted upon a base 102 which is secured in spaced relation to the base 24 by bracket members 103. The push rod 100 passes through the base plate 24 and through a transverse brace member 105 carried by the bracket 103. A coil spring 106 is mounted upon the push rod between the member 105 and an abutment 107 carried by the push rod whereby to maintain the push rod in operative engagement at all times with the periphery of the cam 91. The lower end of the push rod carries an electrical contact 108 for operative engagement with respect to the contacts 101.

As hereinbefore indicated, we provide means under the control of an operator, or a person desiring to take a picture, which will, when actuated, set the machine in operation to perform a predetermined cycle of operation and to then stop in position to be subsequently re-started to perform a similar cycle of operation. To this end we provide means for energizing the motor M and to maintain it energized throughout a predetermined cycle of movement of the mechanism driven thereby. In Fig. 12 we have shown a switch 109 preferably positioned within the compartment A. The switch 109 may be of any convenient form, such as a coin-operated switch or a manually-operated switch of any desired type. The switch 109 is effective to connect a suitable source of potential 110 to the control circuits of the apparatus. As shown in Fig. 12, the switch 109 is arranged to connect the source 110 with the motor M and the brake solenoid 67 through a main switch indicated generally at 111. The switch 111 is disposed within the casing 16 and, as shown in Figs. 4 and 12, comprises a pair of contact members 112 mounted upon a base 113 carried by bracket members 114 supported from the baseboard 24. Operatively associated with the contact members 112 is a push rod 115 slidable through the base 24 and carrying a core member which passes axially through a solenoid 116 supported within the bracket members 114. When energized, the solenoid 116 functions

to urge an electrical contact 117 carried by the lower end of its core 118, into bridging relation with the contacts 112. The push rod 115 is urged to the right as viewed in Fig. 4 by a spring 119 mounted upon said push rod between the solenoid 116 and an abutment 120 carried by the push rod. The shaft 92 carries a disk member 121, freely rotatable on said shaft. The disk member 121 is provided with a radial notch 122 in its periphery dimensioned to receive the upper end of the push rod 115, as clearly shown in Fig. 4. The disk 121 is provided with a weight W at a point in its periphery designed to cause said disk to rotate in a clockwise direction, as viewed in Fig. 4, when the push rod 115 is withdrawn from the notch 122, by reason of energization of the solenoid 116. Thus, the push rod 115, having once been withdrawn from the notch 122, cannot re-enter said notch if the solenoid is immediately deenergized, because the disk 121 will have shifted under the influence of the weight W to a position to carry the notch 122 out of alignment with the path of movement of the rod 115. I provide means for again bringing the notch 122 in alignment with the rod 115 after a predetermined cycle of movement of the apparatus, and to this end we provide a lost-motion connection between the disk 121 and the gear 93. The lost-motion connection comprises an arcuate slot 123 in the disk 121, concentric with the axis of rotation thereof, and a pin 124 carried by the gear 93 and disposed within said slot. This lost-motion connection will cause the disk 121 to be driven by the gear 93 through the pin 124 engaging the end wall of the slot 123, and will remain in driving relation to the gear until the slot 122 is brought into alignment with the rod 115. The solenoid 116 being deenergized, the spring 119 will urge the rod into said notch to cause opening of the switch 111 and thus deenergize the motor M. Having in mind that the gear ratio between the shaft 57 and the shaft 92 is six to one, it will be apparent that once the motor has been energized and the apparatus set in motion, the shaft 57 will make six complete revolutions before the motor is deenergized and the apparatus brought to rest.

We also provide means for severing the exposed portion of the strip 26 from the unexposed portion thereof, comprising a knife mechanism shown more clearly in Figs. 7 and 11. Referring to the knife mechanism as shown in Fig. 11, the same comprises a transversely disposed knife blade 125 mounted for reciprocatory movement in a plane transverse to the plane of reciprocation of the member 27. Thus, the knife 125 is supported by arms 126 slidably supported in suitable guide members 127 secured to the longitudinal side members of the frame 28. The guide members 127, as shown, are provided with elongated slots 128 for reception of the bolt or screw members 129, whereby said guide members 127 may be adjusted longitudinally of the frame member 28 to thereby adjust the knife blade 125 with respect to a transverse cutting edge 130 carried by the member 27. The blade 125, as shown more clearly in Fig. 6 is preferably of inverted V-shape, whereby to cut the strip 26 from its opposite longitudinal edges and thereby preclude any tendency of the strip to shift transversely of its path of movement. The knife 125 is spring-biased to cutting position in which the blade 125 lies across the path of movement of the strip 26. Thus, the knife operating arms 126 pass through the baseboard 24 and are, within the

casing 16, attached to pivoted lever members 131, as shown in Figs. 4 and 10. The lever members 131 are pivotally mounted in suitable brackets 132 carried by the baseboard 24, one end of said lever arms 131 being connected by pin and slot connections 133 to said knife operating arms 126, and the opposite ends thereof being connected by pin and slot connections 134 to the core armature 135 of the solenoid 136 mounted in spaced relation to the baseboard 24 by bracket members 137. The core member 135 is provided at its inner end with an abutment 138, and a coil spring 139 is positioned between the end of the solenoid 136 and said abutment 138, operating to place the knife blade 125 under the spring bias hereinbefore referred to, which urges it normally into a position obstructing the path of movement of the strip 26. The solenoid 136, as shown in Fig. 12, is arranged to be energized simultaneously with the closure of the main switch 111 to immediately raise the knife 125 to a position in which the strip 26 may be freely advanced therebeneath.

When the solenoid 136 is deenergized by opening of the main switch 111, the knife will operate under the influence of the biasing spring 139 to move to cutting position to thereby sever the exposed portion of the strip 26 from the unexposed portion thereof. When thus severed, the exposed portion of the strip drops downwardly through a slot 140 provided in the bottom wall of the casing 15, into the receiving compartment 20. The compartment 20 is provided with a hinged closure member 141 by which access to the compartment may be had by an operator stationed within the compartment C.

In view of the fact that we propose to make a plurality of exposures on the strip 26 before severing it from the unexposed portion thereof, we find it desirable to give a signal indication to the operator, or to the person whose photograph is being taken, following each exposure, so that the subject may change position between one exposure and another. To this end we provide an audible signal in the form of a single-tap bell 142 carried at the lower outside end of the casing 16 or at any other convenient location. The bell 142 is arranged to be sounded by the armature 143 of a solenoid 144 which, as shown in Fig. 12, is connected in parallel with the shutter solenoid 87. The magnetic portion 143^a of the armature 143 is spring-biased to a substantially non-central position by coil springs 145, so that when the solenoid 144 is energized simultaneously with the energization of solenoid 87, the armature moves to place said biasing spring under compression. Concurrently with deenergization of the shutter solenoid 87 following an exposure, the magnet 144 is deenergized and the biasing spring 145 operates to project the armature into engagement with the bell 142.

We have also provided means for removal of the waste strip material from the perforating unit 39. Thus, as shown in Fig. 7, we provide a trough member 146 secured to the member 27 at the discharge end of the punch receiving recesses 50. The trough 146 may be secured to the member 27 in any convenient manner and is arranged to move with the same as it is reciprocated under the influence of the cam 56. The baseboard 24 is slotted as at 147 and the trough 146 projects through said slot into the space within the casing member 16. The discharge end of the slot 147 is disposed to deposit the waste strip material from the punch recesses into the space between the

baseboard 24 and an inclined partition member 148 provided upon the lower inner wall of the casing 16. The inclination of the partition member 148 is such as to urge the waste material deposited thereon downwardly toward a discharge aperture 149 in the casing wall, said aperture being closed by a manually controlled pivoted closure member 150. The closure member is pivotally supported upon the outer end wall of the casing 16 and may be moved to and from closed position by an arm 151 carried by the closure and connected at its lower end by a pin and slot connection 152 with a push rod 153 mounted in suitable guide brackets 154, mounted upon the outside vertical side wall of the compartment 20, as shown in Figs. 2 and 3. The slot 147 in the baseboard 24 is aligned with the light axis of the lens 19 and the exposure aperture 33 of the member 27 so that free passage of light between the lens and the strip 26 is insured.

The member 27 is provided with strip guides 155 and 156, and the cam follower 35 is similarly provided with a strip guiding slot 157, whereby to insure retention of the strip 26 in substantially the focal plane of the lens 19. In order initially to properly focus the lens with respect to the strip 26, we provide the arm 40 with a sight aperture 158 and we similarly provide the strip guide 156 with sight apertures 159, it being understood that, as shown in Fig. 7, the apertures 158, 159, 33, and the slot 147, may be aligned along the light axis of the lens at the time of focusing the lens 19.

As previously indicated, the apparatus forming the subject-matter of this invention is designed for use in composite photography such as in taking pictures of a composite subject comprising a photograph and a miniature frame. Thus, as shown in Fig. 13, we show our apparatus as previously described, provided with suitable supporting feet or base members 160 and the lens unit 19 provided with a reflecting attachment 161. The reflecting attachment comprises an angularly disposed reflecting mirror or prism 162 arranged forwardly of the plane of the lens 19 so as to reflect the image of a composite object comprising a picture 163 upon which is superimposed a miniature frame member 164, said composite subject being disposed upon the table or other surface upon which the apparatus is supported. For properly illuminating the subject, we provide a light unit 165 which may be connected in the control circuit, as shown in Fig. 12.

The frame member 3, as shown in Fig. 1, and the frame 164, as shown in Fig. 15, are preferably provided with a white margin 300, so that each exposure, when made on the strip 26, will be surrounded by a white band. It is of course understood that the apparatus herein described contemplates utilizing the conventional light sensitive paper used in automatic machines of this general character, which, when exposed, is characterized by light areas corresponding to those which have been exposed to light, and dark areas corresponding to those which have not been exposed to light.

In the form of our apparatus as shown more particularly in Fig. 7, the cutting and perforating mechanisms are associated with the reciprocating member 27 in a manner to provide a strip of five exposures having perforations between adjacent exposures and having short, unexposed portions at each end of the strip. By way of example, if the finished photographs are to meas-

ure one inch from one line of perforations to the next, the distance between the punch receiving apertures 50 and the cutting edge 130 carried by the member 27 is exactly one-half inch, and the distance from the cutting edge 130 to the far edge of the aperture 33 is one and one-half inches. Furthermore, the cutting edge 130 is positioned one-half inch from the nearest edge of the exposure aperture 33.

It is sometimes desirable to arrange the apparatus so that it will produce a strip of exposures separated by perforations but without the handling tabs which characterize the strip as produced by the apparatus shown in Fig. 7. For producing a strip without such handling tabs, I rearrange slightly the relative positions of the knife and perforating units, as shown in Fig. 14. In this arrangement, the reciprocating member is indicated by the reference character 227, the stationary cutting edge 230, the exposure aperture 238 and perforating unit 239. The movable knife 225 cooperates with the cutting edge 230 of the member 227 in a manner previously described in respect to the apparatus as shown in Fig. 7. In the modification as shown in Fig. 14, if the apparatus is designed to produce photographs measuring one inch from one line of perforations to the next, the perforating unit 239 and the punch receiving apertures 250 are positioned seven-eighths of an inch from the near edge of the exposure aperture 238. The exposure aperture 238 is one inch wide and the distance between the cutting edge 230 and the near edge of the aperture 238 is one-sixteenth inch. The exposure aperture is positioned slightly off center with the light axis of the lens 219 so that the lower edge 301 of the white margin 300 of the frame, as shown in Fig. 14, is fully projected upon that portion of the strip 26 overlying the exposure aperture 238 and immediately adjacent the upper edge of said aperture, whereas the upper white margin 302 of the frame is projected through the lens upon the inner wall of the aperture 238, but not upon the strip 26. By thus arranging the several parts of the apparatus, it is apparent that when the cam mechanism 56, having an effective throw of one inch, as previously described, rotates to reciprocate the member 227 and operate the perforating mechanism 239 in timed relation thereto, the portion of the strip 26 which overlies the exposure aperture 238 when the member 227 is moved into alignment with the light axis of the lens, as shown in Fig. 14, will stop with the line of perforations 303 made by the previous operation of the perforating unit 239, lying within the upper margin of the exposure aperture 238 and spaced one-sixteenth of an inch from the upper edge of the aperture. Thus, when an exposure is made, the lower margin 301 of the frame member will be projected upon the strip 26 an equal distance on either side of said line of perforations. As the operating cam continues to rotate, the strip 26 is freed from the member 27 as the punches are retracted, and the said member moves upwardly under the influence of its biasing spring until the cutting edge 230 is opposite the knife 225 and directly beneath the perforations 303. The cam, upon further rotation, causes the punches to penetrate the strip and move it with the member 227 downwardly for another exposure. It will be understood that the knife 225, in the arrangement shown in Fig. 14, is arranged to be actuated to cutting position when the member 227 is in its extreme upper

position, rather than in its extreme downward position as shown in connection with the apparatus illustrated in Fig. 7. This is necessary because the cutting edge 230 is positioned below the exposure aperture 238 rather than between it and the perforating unit, as in the apparatus of Fig. 7. This will of course require a relative shifting of the disk 121 on its shaft 92 substantially 180° from the position it occupies when utilized to drive the apparatus of Fig. 7, so that the main switch 111 will be opened to stop the apparatus when the member 227 is in the extreme upper position. The general sequence of operation of the shutter timing switch will be the same as previously described with the exception that there is no need for the shutter delay switch 90 in the present modification.

If it is desired to perforate the strip 26 on all four sides of each exposure, the bar 46 of the perforating unit may have the punch elements 49 thereof disposed in the form of the letter H, as shown in Fig. 16, whereby at each operation of the punch, the strip 26 is perforated between adjacent exposures and half way along the top and bottom edges (or opposite side edges) of adjacent exposures.

The initial adjustment of the apparatus includes positioning the cam follower 35 on the reciprocating member 27 in a position to insure the exposure aperture 33 being aligned with the light axis of the lens when the member 27 is in its extreme lower position. This adjustment is made by slightly shifting the cam follower on the member 27 as provided for by the elongated apertures 37 in the foot flanges 36. It is also desirable to provide means for adjusting the upper limit of reciprocation of the member 27 under the influence of the biasing springs 30 in order to compensate for manufacturing inaccuracies in the cam 56, and the wear between the cam and the cam follower. To this end the cam is made slightly over-size and adjustable stop means in the form of set screws S are provided in the upper end of the frame 28 and in line with the path of reciprocation of the member 27. This arrangement permits the set screws S to be adjusted to limit the upward range of movement of the member 27 under the influence of the springs 30 to accurately determine the amount of paper which is fed from the roll 21 at each feeding movement of the mechanism. This is important in order that the line of perforations made by the punch will be accurately disposed midway between the margins of adjacent photographs in the finished strip.

The general operation of the apparatus is as follows: The several parts of the apparatus, when the machine has stopped following a complete cycle of operations, are as shown in Fig. 7. The member 27 is at its lowermost position with the punch members 49 of the perforating unit passing through the strip into their respective receiving apertures 50. As the switch 109 is momentarily closed, the main switch 111 is closed (through energization of the solenoid 116 associated therewith and the release of weighted device 121), and simultaneously also the knife solenoid 136 is energized to raise the knife out of the path of travel of the strip 26. The motor being energized, the shaft 60 is rotated to drive shaft 57 and attached cam 56. The shaft 57, through interconnected gears 94 and 93, drives the weighted disk 121 and thus keeps the motor energized throughout the predetermined cycle of operation. Rotation of the shaft 57 and cam 56 will cause the high point 56^a of the cam to move away from the arm 40 so

that the biasing springs 48 of the perforating unit will retract the punch elements 49 from the punch receiving recesses 50 and raise the arm 40 into dotted line position as shown in Fig. 7. Continued rotation of the cam 56, which is substantially concentric between the two high points 56^a and 56^b thereof, will maintain the follower block 35 of the member 27 stationary until the high point 56^a has passed out of engagement with the face 44 of the cam follower. Thereupon the springs 30 become effective to retract the member 27 independently of the strip 26, the member 35 following along the cam contour 56^c to the hub portion of the cam, whereupon the member 27 has reached its upper limit of travel. Further rotation of the cam 56 will bring the high point 56^b into contact with the arm 40 to operate the perforating unit and force the punch members 49 through the strip into the recesses 50. Further rotation of the cam brings the high portion 56^b thereof into contact with the cam follower 35 to urge the member 27 against the tension of springs 30 into a position in which the exposure aperture 33 is in alignment with the light axis of the lens 19. After the shaft 57 completes one revolution the shutter timing switch 74—80 is closed by the push rod 71 reaching the high point 70 of the cam 69, the shutter delay switch 90 remaining open because of the traveling of the push rod 100 across the low portion 96 of cam 91. Thus, the first actuation of the shutter timing switch is ineffective to cause energization of the shutter actuating solenoid 87. Due to the fact that the throw of the cam 56 is substantially one inch and the distance between the cutting edge 130 and the punch receiving apparatus 50 of the member 27 is substantially one-half inch, this first rotation of the cam will have moved the strip 26 one inch forwardly so that it will project substantially half way across the exposure aperture 33. The next rotation of the cam 56 will advance the strip 26 another inch forwardly, bringing the first full exposure area thereof into alignment with the light axis of the lens and within the exposure aperture 33. At the completion of the second revolution of the cam, the closure of the shutter timing switch is effective to energize the shutter operating solenoid 87, because the push rod 100 of the shutter delay switch 90 has passed on to the concentric portion 98 of the cam 91, in which position the follower rod 100 has closed the switch 90. Energization of the solenoid 87 moves the shutter mechanism to open position to make an exposure on the strip 26. The shutter mechanism is immediately closed under the influence of its biasing spring as the push rod 71 falls off of the high point 70 of the cam 69 to open the switch 74—80. Continued operation of the cam results in periodic operation of the shutter mechanism in timed relation to the reciprocation of the member 27 until five exposures have been made, at which time the disk 121 driven by the gear 93 moves to a position in which the notch 122 thereof is again aligned with the rod 115, which thereupon snaps into said notch under the influence of its biasing spring 119 to open the main switch 111 and thus deenergize the motor and bring the spring-applied braking disk 63 into engagement with the disk 62 to instantaneously stop the parts in the position shown in Fig. 7. It will be understood that the disk 121 is prevented from advancing under the influence of the weight W, as the same passes over the upper center point, due to the friction between the said disk and the end of the rod 115. Opening of the main switch 111 deenergizes the knife magnet

136 with the result that the knife is moved to its lower cutting position under the influence of the biasing spring 139. The severed portion of the strip drops through the guideways 156 and 157, through the aperture 148 and into the strip receiving compartment 20, from which it is removed by the operator within the compartment C to be developed, dried and have glue or mucilage applied to the back thereof so that the individual exposures or pictures thereon may be severed along the lines of the perforations and applied to any desired surface by moistening the applied adhesive.

In order to prevent any possibility of retrograde movement of the strip 26 during upward movement of the reciprocating member 27, we provide suitable strip clamping means shown in Fig. 8. The strip clamping means comprise a stationary block 166 carried by the upper transverse end member of the frame 28, said block being disposed transversely of the path of movement of the strip 26 and carrying a pad of felt or other suitable friction material, said pad 167 having its outer face disposed substantially in the plane of movement of the strip 26. Opposed to the pad 167 is a movable block 168 carrying a cooperating piece of felt 169, and which, together with the felt pad 167, engages the strip 26 on its opposite faces. The block 168 is supported in guide brackets 170 secured to opposite ends of the block 166, the block 168 being provided with guide pins 171 extending outwardly into the slots provided in the guide members 170. Tensioned spring members 172 are provided between the block 166 and the laterally extending guide pins 171 to maintain the upper block resiliently in frictional engagement with the lower block. Thus, we effectually maintain the strip 26 in the position to which it has been advanced by the strip feeding mechanism.

The operation of the modification shown in Fig. 14 is generally similar to that of the apparatus shown in Fig. 7, just described, except that due to the relatively different position of the disk 121 on its shaft 92, the reciprocating member 227 and associated parts will stop in a position in which the cam follower 235 is against the hub or low portion of the cam 56, and with the member 227 in its uppermost position. Also, due to the fact that no unexposed portion of the film is provided at opposite ends of the severed strip, as characterizes the apparatus in Fig. 7, the shutter delay switch mechanism is not necessary, and, accordingly, the shutter operating solenoid is energized for each actuation of the shutter timing switch 74-80. It is also apparent that if the said gear ratio of six to one is provided between the shafts 57 and 92, as proposed in Fig. 7, the apparatus arranged as proposed in Fig. 14, will produce an exposed strip having six exposures instead of five. If a five exposure strip is desired, the substitution of proper gears for gears 93 and 94, to provide a five to one ratio, can readily be made.

The casing members 15, 16 and 20 may be made of stamped metal, wood, plastic or the like and are removably attached to the baseboard 24 in any convenient manner. The inner surfaces of the casing members are preferably painted or otherwise coated with some dark, light-absorbing material such as dull black paint, and all joints of the casings are sealed against the entrance of light by felt or in any other convenient manner. If desired, an indicator I may be provided within the casing 15, visible through a ruby glass G

fitted in an aperture in the casing wall, to show the operator how much of the strip material 26 remains upon the roll 21. The indicator I comprises an arm having an end thereof bearing upon the periphery of the roll and urged thereagainst by a weight member carried by an arm on the indicator shaft. The shaft also carries a calibrated drum positioned so that the calibrations thereof are visible through said ruby glass.

The lens unit 19 may be of any desired and known construction and may include any known means for adjusting the lens axially along the light axis of the camera whereby to focus the lens with respect to the subject and to the strip 26.

While we have shown the modification illustrated in Fig. 13 arranged to take photographs of a composite subject including a photograph and superimposed frame member, it will be understood that the apparatus as herein disclosed may be readily employed for reproducing or copying documents, records and the like, and in such use, the frame member shown may be discarded.

It will be understood that although we have described a preferred embodiment of the invention as including perforating means for assisting in fixing the light sensitive strip to the member 27 in order to feed the strip across the light axis of the lens, it is entirely possible to dispense with the punch members if the perforations between adjacent exposures are not desirable. In this event, the pressure bar 51 would function to clamp the strip firmly upon the member 27 during the feeding movement of the paper and, if necessary, the contacting face of the plate 51 may be provided with a covering of rubber, felt or other friction material.

In conclusion, it is apparent that we have provided an automatic or semi-automatic photographic apparatus capable of producing a strip of photographs of the general size and appearance of postage stamps and with adjacent exposures separated by perforations to facilitate separation of the individual photographs. It will be understood that while we have herein shown and described preferred embodiments of means for accomplishing the various objects hereinbefore specified, the description and illustrations are but for the purpose of example only and various changes may be made in size and proportion of parts as fairly fall within the scope of the appended claims without departing from the spirit of the invention as defined in said claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A photographic apparatus comprising a lens, means for intermittently feeding a light sensitive strip across the light axis of said lens at substantially the focal point thereof, including a member mounted for reciprocation across the light axis of the lens substantially at the focal point thereof but between the path of said strip and said lens, said member having an exposure aperture movable into and out of alignment with the light axis of the lens as said member is reciprocated, means movable with said member and operable when actuated to hold said strip in fixed relation to said reciprocable member, means for reciprocating said member and for intermittently actuating said strip holding means in timed relation whereby to move said member in one direction independently of the strip to bring a portion of said strip in overlying relation to said exposure aperture, and then to move the strip and said member together

in the opposite direction to bring the exposure aperture into alignment with the light axis of the lens.

2. A photographic apparatus of the character described comprising a lens, means for supporting a light sensitive strip substantially at the focal point of the lens, means for intermittently feeding said strip across the light axis of the lens including a reciprocable member having an exposure aperture therein movable into and out of alignment with the light axis of the lens as said member is reciprocated, strip gripping means carried by said member, and means for reciprocating said member and for intermittently actuating said gripping means in timed relation whereby to move said member independently of said strip in one direction when the gripping means is inactive and to move the member and said strip together in the opposite direction when the gripping means is active to grip the strip, to thereby move said strip and member to a position in which said exposure aperture is aligned with the light axis of the lens.

3. A photographic apparatus of the character described comprising a lens, means for supporting a light sensitive strip at substantially the focal point of the lens, means for intermittently feeding said strip across the light axis of the lens including a reciprocable member, said member including an exposure aperture movable into and out of alignment with the light axis of the lens as said member is reciprocated, strip perforating means including a punch member movable into and out of inter-penetrating engagement with said strip and said member, and means for reciprocating said member and for intermittently actuating said perforating means in timed relation to move said member in one direction independently of the strip to a position in which the exposure aperture is out of alignment with the light axis of the lens when the punch member is retracted, and to move said member and said strip together in the opposite direction to a position in which the exposure aperture is in alignment with the light axis of the lens when the punch is projected into inter-penetrating engagement with the strip.

4. The apparatus described in claim 3, wherein the strip perforating means is mounted upon and moves with the reciprocable member.

5. The apparatus described in claim 23, wherein said strip perforating means is mounted upon said reciprocable member in spaced relation thereto and includes a punch member movable into and out of inter-penetrating engagement with a punch receiving recess provided in said reciprocable member, whereby said punch member passes through the strip in moving into the punch receiving recess to thereby perforate the strip and to retain the strip in fixed relation to the reciprocable member while so related.

6. The apparatus described in claim 23, wherein said strip perforating means is mounted upon said reciprocable member in spaced relation thereto and includes a punch member movable into and out of inter-penetrating engagement with a punch receiving recess provided in said reciprocable member, whereby said punch member passes through the strip in moving into the punch receiving recess to thereby perforate the strip and to retain the strip in fixed relation to the reciprocable member while so related, a receptacle within the camera for receiving the waste strip from the punch, and means movable

with said reciprocable member for conveying said strip waste from the punch to said receptacle.

7. The apparatus described in claim 23 wherein said strip perforating means is mounted upon said reciprocable member in spaced relation thereto and includes a punch member movable into and out of inter-penetrating engagement with a punch receiving recess provided in said reciprocable member whereby said punch member passes through the strip in moving into the punch receiving recess to thereby perforate the strip, and to retain the strip in fixed relation to the reciprocable member while so related, a receptacle within the camera for receiving the waste strip from the punch, means movable with said reciprocable member for conveying said strip waste from the punch to said receptacle, and means accessible from the exterior of the camera for discharging the contents of said receptacle.

8. In a camera including a lens and a shutter mechanism therefor, means for intermittently feeding a light sensitive strip across the light axis of the lens, means for opening and closing the shutter mechanism, actuating means for operating the strip feeding means and said shutter mechanism in timed relation to make an exposure on said light sensitive strip, strip cutting means including a cutting member movable across the path of movement of said strip and into engagement with a cooperable cutting element carried by said strip feeding means to sever the exposed portion of said strip from the unexposed portion thereof, means biasing said knife into cutting position across the path of movement of said strip, means for moving the knife out of cutting position against the force of said biasing means including a solenoid, means for energizing said solenoid simultaneously with the initiation of movement of said actuating means, and means responsive to predetermined movement of said actuating means for deenergizing said solenoid after an exposure has been made whereby to cause the knife to operate under the force of said bias to sever the exposed portion of the strip from the unexposed portion thereof.

9. A photographic apparatus of the character described comprising a lens, means for intermittently moving a light sensitive strip across the light axis of the lens substantially at the focal point thereof, said means including a reciprocable member mounted for movement across the light axis of the lens and having an exposure aperture movable into and out of alignment with the light axis of the lens, strip perforating means mounted on said member and a rotatable cam positioned to operatively engage the reciprocable member and said strip perforating means, and means for rotating said cam to reciprocate said member and to intermittently actuate the strip perforating means in timed relation to move the reciprocable member independently of the strip in one direction and to move the strip and said member together in an opposite direction.

10. The apparatus described in claim 9 wherein shutter mechanism is provided, operatively associated with said lens, and cyclically driven means for causing opening and closing of said shutter mechanism in predetermined timed relation to the rotation of said cam.

11. The apparatus described in claim 9 wherein shutter mechanism is provided, operatively associated with said lens, means for biasing said shutter to closed position, a solenoid for opening the shutter, means including a circuit and a

switch for energizing said solenoid, and cyclically driven means for closing and opening said switch in timed relation to the rotation of said cam.

12. The apparatus described in claim 9 wherein shutter mechanism is provided, operatively associated with said lens, means for biasing said shutter to closed position, a solenoid for opening the shutter, means including a circuit and a switch for energizing said solenoid, and cyclically driven means for closing and opening said switch in timed relation to the rotation of said cam, and means for varying the period of energization of said solenoid while maintaining substantially constant R. P. M. of the cam.

13. The apparatus described in claim 9 wherein shutter mechanism is provided, operatively associated with said lens, means for biasing the shutter to closed position, a solenoid for opening the shutter against the force of said biasing means, means for energizing said solenoid including a circuit and a plurality of switches connected in series in said circuit, cyclically driven means for periodically closing and opening one of said switches once in each revolution of said cam, and means driven in timed relation to said cam for closing said second switch after a predetermined number of revolutions of said cam whereby to feed a portion of said strip across the light axis of the lens without exposure.

14. The apparatus described in claim 9 wherein shutter mechanism is provided, operatively associated with said lens, and cyclically driven means for opening and closing said shutter mechanism in predetermined timed relation to the rotation of said cam, signal means, and means for actuating said signal means after each exposure.

15. The apparatus described in claim 9 wherein shutter mechanism is provided, operatively associated with said lens, means for biasing said shutter to closed position, a solenoid for opening the shutter, means including a circuit and a switch for energizing said solenoid, cyclically driven means for closing and opening said switch in timed relation to the rotation of said cam, signal means including a solenoid connected in parallel with said shutter actuating solenoid, an armature, and armature biasing means placed under stress when said signal solenoid is energized and operative when the solenoid is deenergized to actuate said armature to signaling position.

16. The apparatus described in claim 9 wherein means including an electric motor is provided for rotating the cam, a circuit for energizing said motor, a switch in said circuit, means biasing said switch to open position, means including a solenoid for actuating said switch to closed position when the solenoid is energized, and cyclically operating means driven by the motor for maintaining said switch closed for a predetermined time after said solenoid is deenergized and then cause the switch to open under the influence of said bias.

17. A photographic apparatus comprising a lens, a frame member positioned between the lens and the focal point thereof, a reciprocable member slidably supported in said frame for movement transversely of the light axis of the lens in a plane substantially parallel to the plane of the lens, said reciprocable member being provided with an exposure aperture, means biasing said member to a position in which the exposure aperture is out of alignment with the light axis of the lens, a cam follower carried by said member, an arm mounted on said follower for pivotal

movement about an axis substantially parallel to the plane of reciprocation of said member, strip perforating means mounted upon reciprocable member beneath the free end of said arm, biasing means normally maintaining the arm and perforating means in spaced relation to said member, means for guiding a strip of light sensitive material between the perforating means and said reciprocable member, a cam positioned to operatively engage said arm and said cam follower when rotated, means for rotating the cam to move the perforating means into interpenetrating engagement with the strip and said member, and while so positioned to move the member against the force of its bias to a position in which the exposure aperture is aligned with the light axis of the lens, shutter mechanism operatively associated with the lens, cyclically driven means for causing opening and closing movement of the shutter mechanism to expose a portion of the strip overlying the exposure aperture when the latter is aligned with said lens, said first and second mentioned biasing means being effective as the high portion of the cam recedes to elevate the perforating means and to return the reciprocable member to normal position independently of said strip.

18. The apparatus described in claim 17 wherein there is provided a cutting mechanism for severing the exposed portion of the strip, said cutting mechanism including a knife mounted for movement between said reciprocable member and said arm, means for guiding said knife in a plane transverse to the plane of reciprocation of said member, a cooperating cutting edge on said member, and means operating in timed relation to said cam for actuating said knife following an opening and closing movement of said shutter mechanism.

19. An apparatus of the character described comprising means for supporting a strip of material for movement across a source of light, means for intermittently moving the strip across said source of light including a member mounted for reciprocation and being provided with a light aperture movable into and out of alignment with the source of light as said member is reciprocated, means for intermittently securing the strip to said member, and means for reciprocating said member and for intermittently actuating the strip securing means to cause the strip and said member to move in one direction together and to cause the member to move independently of the strip in the opposite direction to successively expose portions of the strip to the source of light through said light aperture.

20. A photographic apparatus of the character described comprising a lens, means for intermittently moving a light sensitive strip across the light axis of the lens substantially at the focal point thereof, said means including a reciprocable member mounted for movement across the light axis of the lens and having an exposure aperture movable into and out of alignment with the light axis of the lens, spring means urging said reciprocable member in one direction, strip perforating means mounted on said member and a rotatable cam positioned to operatively engage the reciprocable member and said strip perforating means, means for rotating said cam to move said member in one direction against bias of said spring means and to intermittently actuate the strip perforating means in timed relation to move the reciprocable member independently of the strip in one direction and

to move the strip and said member together in an opposite direction, and stop means for engaging the reciprocable member to limit its movement in the direction to which it is urged by said spring means whereby to control the amount of light sensitive strip advanced at each reciprocation of said member.

21. A photographic apparatus of the character described comprising a lens, means for intermittently moving a light sensitive strip across the light axis of the lens substantially at the focal point thereof, said means including a reciprocable member mounted for movement across the light axis of the lens and having an exposure aperture movable into and out of alignment with the light axis of the lens, spring means urging said reciprocable member in one direction, strip perforating means mounted on said member and a rotatable cam positioned to operatively engage the reciprocable member and said strip perforating means, means for rotating said cam to move said member in one direction against bias of said spring means and to intermittently actuate the strip perforating means in timed relation to move the reciprocable member independently of the strip in one direction and to move the strip and said member together in an opposite direction, and adjustable stop means for engaging the reciprocable member to vary the range of reciprocation of said reciprocable member to thereby control the degree of said movement of said light sensitive strip.

22. In a camera, means for intermittently advancing a light sensitive strip across the light axis of the camera, comprising a reciprocable member, means for reciprocating said member across the light axis of the camera, means for guiding a light sensitive strip adjacent to and substantially parallel to the path of reciprocation of said member, strip contacting means movable with said member and including a pressure member movable into and out of pressure contact with the reciprocable member, resilient means normally maintaining said pressure member in spaced relation to said reciprocable member, and means for positively and intermittently actuating said strip contacting means against the force of said resilient means into contact with said reciprocable member in timed relation with respect to the reciprocation of said member, whereby said member moves independently of said strip on one direction when said pressure member is out of contact with said strip, and said member and said strip move together in an opposite direction when said pressure member is in contact with said strip.

23. In a camera, means for intermittently advancing a light sensitive strip across the light axis of the camera, comprising a reciprocable member, means for reciprocating said member across the light axis of the camera, means for guiding a light sensitive strip adjacent to and substantially parallel to the path of reciprocation of said member, strip perforating means movable with said member and operable into and out of perforating relation with said strip, and means for intermittently actuating said strip perforating means in timed relation with respect to the reciprocation of said member, whereby said member moves independently of the strip in one direction when said strip perforating means is out of perforating relation with respect to said strip, and said member and said strip move together in an opposite direction when said strip perforating means is in perforating relation with respect to said strip.

24. The apparatus described in claim 19 wherein the means for securing the strip to said reciprocable member comprises a series of punch members carried by said reciprocable member and disposed transversely of the path of movement of said strip, together with means for normally maintaining said punch members out of contact with the strip, means for projecting said punch members through said strip, and wherein strip cutting means is provided and which includes a cutting element carried by the reciprocable member and the cooperable cutting element movable across the path of movement of said strip, and means for actuating said cooperable cutting element in predetermined timed relation to the projection of said punch members and the means for reciprocating said member whereby to sever the strip in predetermined relation to the line of perforations made by said punch members in said strip.

25. The apparatus described in claim 19 wherein strip cutting mechanism is provided, said cutting mechanism including a cutting element movable transversely of the path of movement of said reciprocating member and a cooperating cutting element carried by said reciprocating member, and means for actuating said movable cutting element in timed relation with respect to the reciprocating movement of said reciprocating member.

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