Aug. 30, 1932. A. W. CAPS 1,875,215

PHOTOGRAPHIC EXPOSING AND DEVELOPING APPARATUS

Filed March 1, 1929 4 Sheets-Sheet 1

Fig. 1

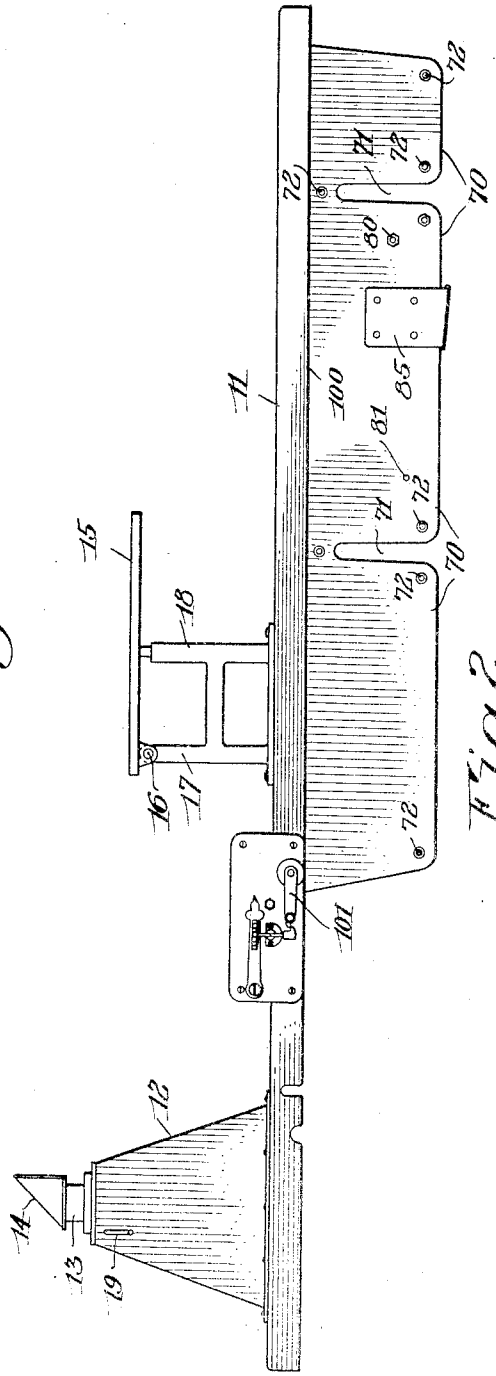
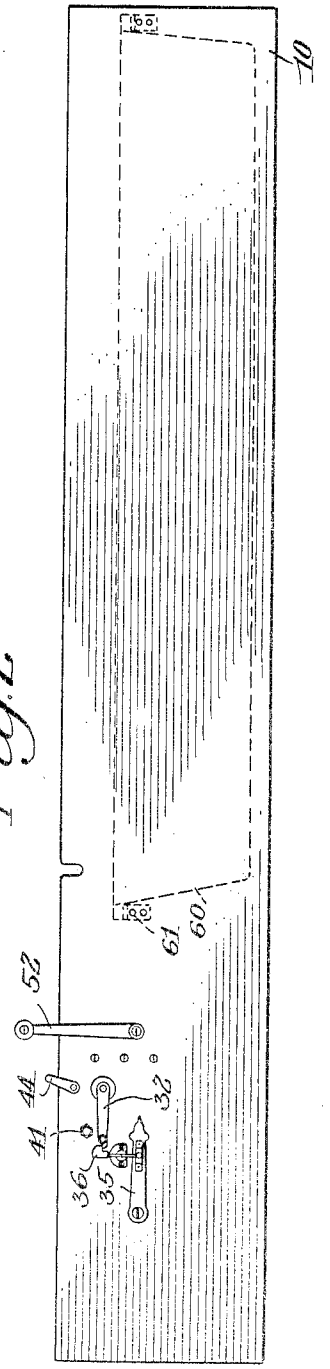



Fig. 2




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PHOTOGRAPHIC EXPOSING AND DEVELOPING APPARATUS

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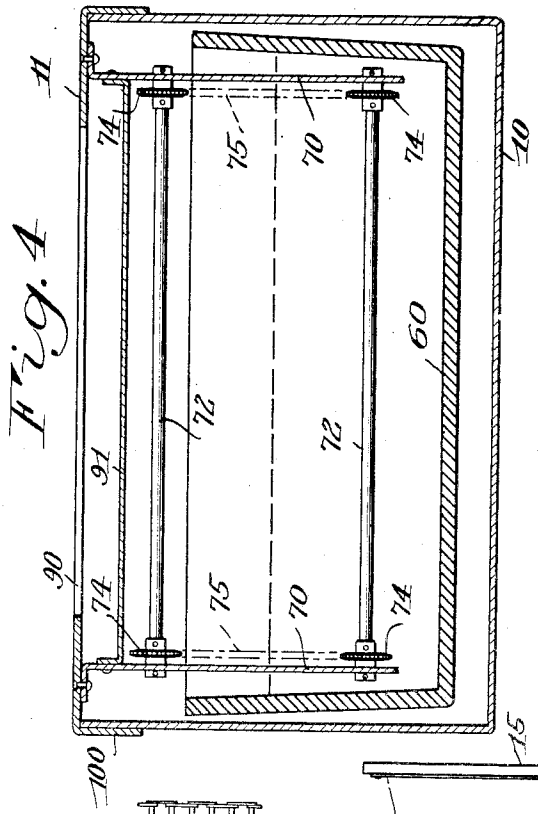


Fig. 4

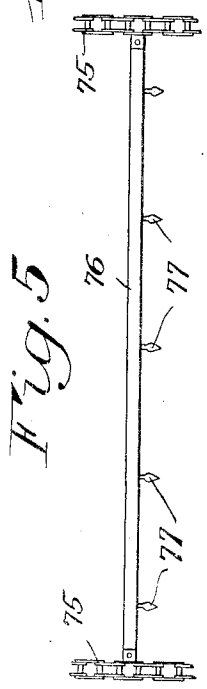


Fig. 5

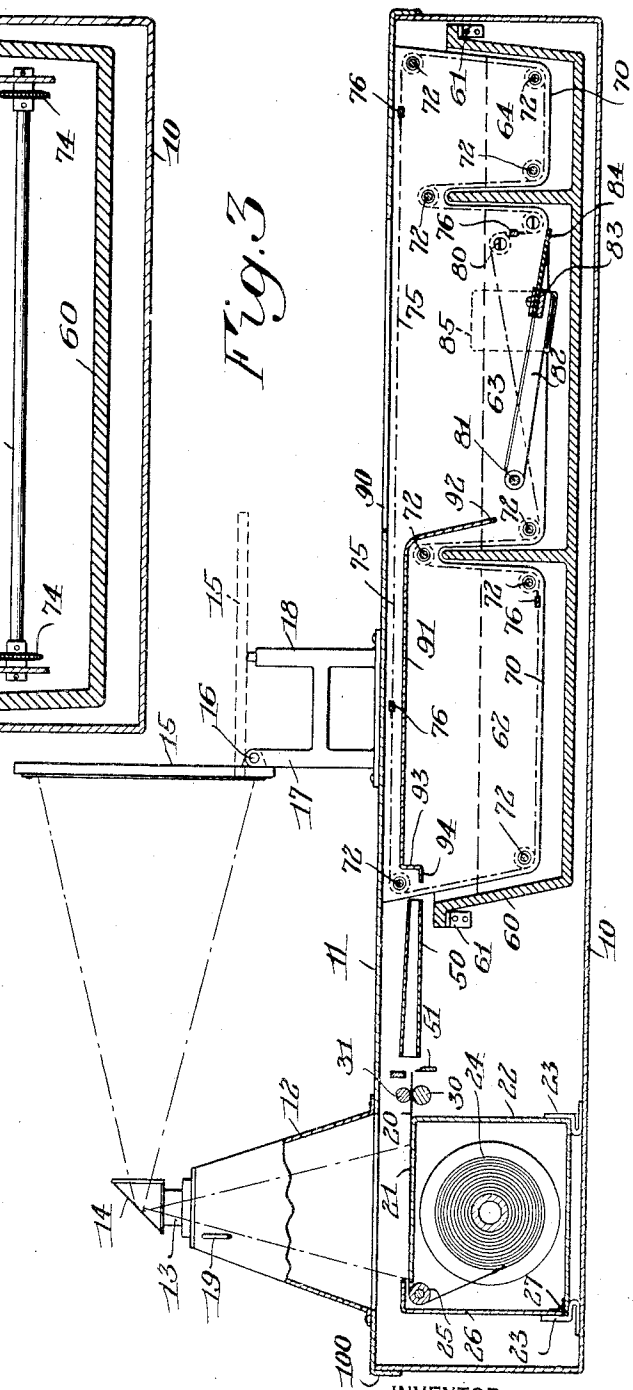


Fig. 3

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PHOTOGRAPHIC EXPOSING AND DEVELOPING APPARATUS

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Fig. 6

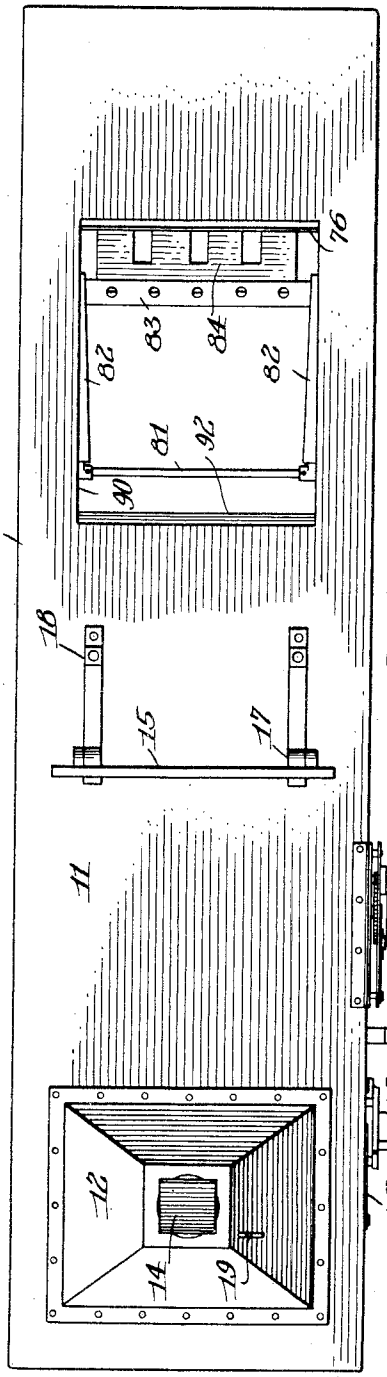
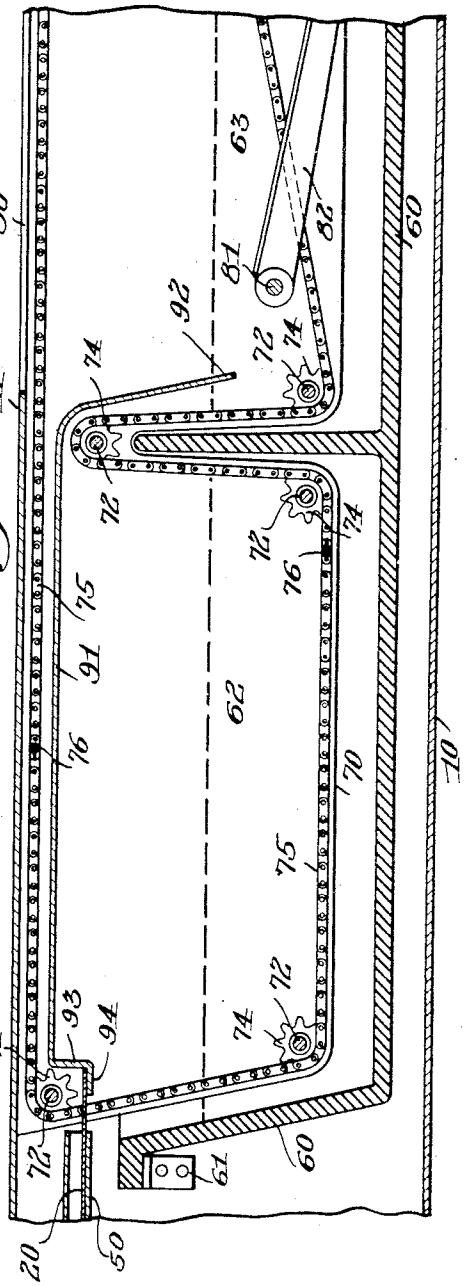



Fig. 7




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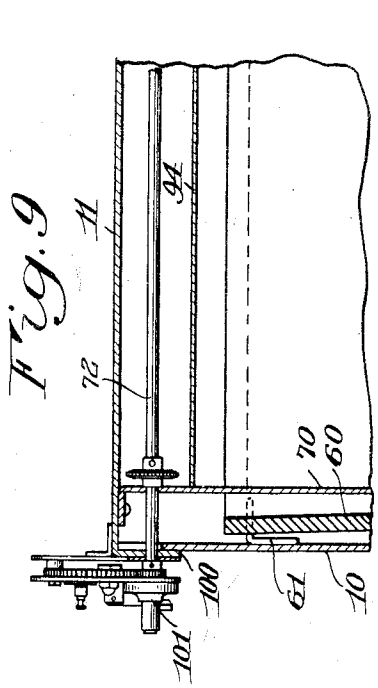



Fig. 9




Fig. 8

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Patented Aug. 30, 1932

1,875,215

# UNITED STATES PATENT OFFICE

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## PHOTOGRAPHIC EXPOSING AND DEVELOPING APPARATUS

Application filed March 1, 1929. Serial No. 343,654.

My present invention relates to photographic apparatus, and more particularly to photographic exposing and developing mechanisms of the general nature familiarly known as "commercial cameras," having for their purpose primarily the photographing of flat objects, such as documents and the like, which are placed upon a copyholder and which after exposure are developed in the same machine, and the invention has for its object to provide a small, efficient and convenient machine of this character, which may also be produced at a relatively low cost. The improvements are directed in part to the relative arrangement of the camera or photographic element, the copyholder for the object, and the developing apparatus, whereby these results are attained, and there is produced a unitary structure that occupies relatively small floor space, and is most accessible at all points for the manipulation of the parts. The improvements are further directed to features of the developing apparatus in combination with the other major elements whereby the functions of the elements are harmonized.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a side elevation of the cover of the apparatus and parts carried thereby, removed from the casing;

Fig. 2 is a side elevation of the body or casing of the apparatus, with the cover removed;

Fig. 3 is a vertical section taken longitudinally through the apparatus;

Fig. 4 is a transverse vertical section through the apparatus;

Fig. 5 is a plan of part of the print conveying means, illustrating details thereof;

Fig. 6 is a plan of the apparatus;

Fig. 7 is a fragmentary longitudinal vertical section illustrating certain details somewhat more clearly than shown in Fig. 3;

Fig. 8 is a fragmentary side elevation of the apparatus, and

Fig. 9 is a fragmentary transverse vertical section illustrating parts of the drive mechanism for the print conveying means.

Similar reference numerals throughout the several views indicate the same parts.

The invention concerns photographic apparatus arranged to take pictures of various objects to be copied, such as documents, record cards, or the like, and to develop and fix the photographic prints thus made. According to a preferred embodiment of the invention, there is provided a casing or body 10, shown in side elevation in Figs. 2 and 8, which casing is provided with a cover 11 adapted to be lifted off or replaced on the casing at will. Near one end of the cover an upward extension 12 is provided, which may be in the shape of a frustum of a pyramid, as shown, and at its upper end this extension 12 carries a lens tube 13 containing any suitable lens system. A prism 14 is provided on top of the lens tube 13, to bend the rays of light through substantially 90° so that the camera may be used to photograph objects held on a copyholder 15 pivoted at 16 to a bracket 17 mounted on the top of the cover 11. As is illustrated most clearly in Fig. 3, the copyholder 15 is arranged to assume a vertical position while objects held thereby are being photographed. When the copyholder is being loaded or unloaded, however, it may be turned down to the horizontal position illustrated in dotted lines in Fig. 3, in which position it rests upon a rear leg 18 of the bracket 17. Thus an extremely convenient loading position is provided, and it is but the work of an instant to swing the copyholder upwardly to the exposure position illustrated by full lines in Fig. 3, in which position it will be held by gravity. A suitable shutter (not shown) is operated by the handle 19.

Light rays from objects held on the copyholder 15 enter the prism 14 and are transmitted downwardly through the extension 12, as shown in Fig. 3, into the body of the apparatus. There the light rays fall upon suitably supported sensitized material, so that a photographic print may be made. This

sensitized material may comprise a sheet 20 stretched horizontally across the top 21 of a roll box indicated generally by the numeral 22, which roll box rests removably in guides 23 fixed to the bottom of the casing 10. The roll box contains a roll 24 of sensitized sheet material, successive portions of which are adapted to be drawn over a roller 25 and across the top 21 of the box so that they lie in the focal plane of the camera, to be exposed. One side 26 of the roll box is pivoted at 27 to the body of the box, so that when the cover 11 of the apparatus is removed, the roll box may be taken out of the casing and the side 26 may be swung open to place a fresh roll of sensitized material in the box.

When an exposure has been made, the exposed portion of the sheet material may be fed rearwardly by suitable feeding means such as the rollers 30 and 31 illustrated in Fig. 3. One of these rollers, preferably the roller 30, has its shaft extended through the side of the casing 10 and is provided with an operating handle or crank 32 by which this roller may be rotated to feed the sheet material.

Automatic stop mechanism is preferably provided for indicating to the operator when to stop turning the crank 32. This stop mechanism may include a disc 33 rotated by movement of the crank 32, this disc having a hole arranged to receive a pin 34 on an arm 35 when the disc reaches a predetermined position. The dropping of the pin into the hole moves the arm 35 and causes a stop member or latch 36 to be shifted into the path of movement of the crank 33, so that rotation of the crank is stopped at a predetermined point until the mechanism is again released by the operator. This stop mechanism is described in detail in Patent No. 1,057,412 to Gilbert S. Dey, for Feeding mechanism for cameras, dated April 1, 1913, and need not be further described here.

The other feed roller 31 preferably has its ends mounted on links 40 (Fig. 8) pivoted at 41 to the side walls of the casing 10 of the apparatus, each of these links having an arm 42 cooperating with flat spots on a shaft 43 extending across the apparatus, so that when this shaft is turned by means of an operating arm 44, it will act upon the arms 42 of the links 40 so as to raise the roller 31 and separate it slightly from the roller 30, thus permitting the sensitized sheet material to be threaded easily between the rollers.

Rotation of these feed rollers 30 and 31 feeds the sheet material 20 rearwardly through a guide or chute 50 and delivers it to conveying mechanism which will be described hereafter. When the feeding motion has been completed, the exposed portion of the sheet material is then severed from the remainder of the strip by suitable severing mechanism such as the knife 51 (Fig. 3) operable by means of a handle 52 (Fig. 8) which is connected to arms 53 which cooperate with slide members on which the knife 51 is mounted.

The means for treating the photographic print preferably comprises suitable treating baths, such as a developing bath and a fixing bath, and suitable means for conveying the prints through these baths. In the preferred embodiment of the invention, the baths are contained within a unitary tray or container 60 of hard rubber or the like, which is removably supported at its four corners on brackets 61 fixed to the side walls of the casing 10 of the apparatus. The tray 60 preferably has three compartments, the forward one 62 of which is arranged to contain a developing bath. The middle compartment 63 holds a fixing bath of hypo or the like, while the rearmost compartment 64, somewhat smaller than the others, contains a washing bath for cleansing the print conveying means.

The print conveying means, according to the present invention, preferably is supported on or carried by the cover 11 of the apparatus, so that when the cover is removed, the conveying means is lifted out as a unit with it. This is an extremely desirable arrangement since the conveying mechanism may be entirely removed from the bath tray in an instant, leaving the compartments of the tray entirely clear of all obstructions, so that they may be cleaned thoroughly and easily, or the tray may be lifted out of the casing.

Preferably a pair of downwardly extending flanges 70 is provided on the under side of the cover 11, one flange near each side of the apparatus. When the cover is in place, these flanges extend downwardly within the compartments 62, 63 and 64 of the container, as is illustrated clearly in Figs. 4 and 7, the flanges being cut away at 71 so as not to interfere with the partitions separating one compartment from another. A number of shafts 72 extend across the apparatus in the positions illustrated in Fig. 3, and have their ends journalled in the downwardly extending flanges 70. Each of these shafts 72 carries a sprocket 74 near each end, and endless members such as the chains 75 are threaded over these sprockets in the manner indicated in Fig. 3. Thus there is one chain adjacent each side of the apparatus, and a plurality of pick-up devices is mounted on these chains for conveying the prints along as the chains are moved.

These pick-up devices may include, for example, what might be termed pin bars, one of which is illustrated in detail in Fig. 5. Each of the pin bars comprises a bar 76 extending across the apparatus, one end of the bar being attached to one of the chains 75 and the other end to the other chain. A number of pins 77 are mounted on each pin bar 76 and extend forwardly or in the direction of travel of the pin bars. As these pin

bars move along when the endless members 75 are moved, the pins 77 pierce the photographic print held in the chute 50 and impale this print on the conveying means so that further movement of the conveying means draws the print successively through the developing and fixing baths.

A number of pin bars 76 are used, spaced at suitable intervals along the endless member 75. Preferably as illustrated in Fig. 3, they are so arranged that when one pin bar is near the rear corner of the developing bath 62, another pin bar will be near the rear corner of the fixing bath 63, while other pin bars which have already passed through the baths will be ready upon continued movement of the conveying means to pick up other prints and to move them through the baths.

Mechanism is preferably provided for removing the prints from the conveying means while they are within the fixing bath 63, the prints then being picked up and taken out of the fixing bath by hand. The print removing mechanism comprises sprockets on short shafts 80 projecting inwardly a short distance from the inner sides of the downwardly extending flanges 70. These shafts and sprockets are so placed as to cause the pin bars 76 during their paths of travel to move substantially vertically downwardly through a short distance, near the rear corner of the fixing bath 63, as illustrated in Fig. 3. A shaft 81 extends across from one of the flanges 70 to the other and has a pair of arms 82 mounted on it, as shown in Figs. 3 and 6. The rear ends of the arms 82 carry a crossbar 83 to which is attached a strip 84 of flexible material such as rubber or the like. Brackets 85 (Figs. 1 and 3) fixed to the flanges 70 extend inwardly at the bottom edges of these flanges and limit the downward motion of the arms 82, the inward extensions on these brackets preferably being covered by resilient material to avoid jars when the arms fall downwardly onto the brackets.

As a pin bar 76 passes along its path of movement when the continuous members 75 are driven, the pin bar comes into contact with the under sides of the arms 82 in a manner which will be apparent from Fig. 3, and forces these arms upwardly. Then as the pin bar passes over the upper pair of sprockets on the shafts 80, the arms 82 fall downwardly by gravity and the strip 84 of rubber or the like wipes the print which was impaled on the pin bar off of the pins 77 on this bar, so that the print is freed from the conveying means and remains within this fixing bath 63 when the conveying means moves onwardly.

To prevent contamination of the developing bath 62 by fixing solution which might be drawn over into the developing bath by the parts of the conveying mechanism, the bath 64 is provided to wash the conveying means to remove the fixing solution therefrom. This bath preferably comprises clean water, and it will be observed that the conveying means passes through it after the prints have been removed and before the conveying means returns to pick up another print. Since the prints themselves never enter the washing bath 64, the water within this bath does not become contaminated rapidly by developer carried over by the prints, as would occur if the prints entered this bath.

A comparatively large opening 90 (Figs. 6 and 7) is provided in the cover 11 in a position over the fixing bath 63, so that the operator may reach in through this opening to remove prints from the fixing bath. In order to prevent the light entering the casing through this opening from reaching the developing bath 62 and fogging prints which are not fully developed, a light guard is provided which comprises a plate 91 extending across the top of the developing bath from one of the depending flanges 70 to the other. The rear end of this plate 91 extends downwardly at 92 to a point somewhat below the surface of the liquid in the fixing bath 63, thus providing an effective seal against entrance of light into the developing bath.

The forward end of the light guard plate 91 extends vertically at 93 and has a short forwardly projecting flange or shelf 94 which extends close to the path of travel of the conveying means, and is in alinement with or slightly below the level of the bottom of the chute or guide 50. As the sheet material 20 is fed rearwardly through the chute by operation of the feeding means, the rear edge of the sheet passes onto the ledge or shelf 94 in the manner shown in Fig. 7, while the vertical portion 93 serves as a stop to limit the rearward motion of the print. The shelf 94 of the light guard thus serves as supporting means for holding the print in position to be picked up by the conveying means.

Any suitable mechanism for driving the conveying means may be employed. Preferably one of the shafts 72, such as the forward shaft adjacent the chute 50, has an end extended to a point outside of the marginal flange 100 on the cover 11, and is there provided with operating means such as the crank 101, by means of which the conveying mechanism may be driven manually. Preferably stop mechanism is provided for automatically limiting the amount which the conveying means is driven at each separate operation of the crank 101, so that the pin bars 76 will always be stopped in predetermined position relative to the baths 62 and 63. This stop mechanism may be in general of the same type above described in connection with the feeding rollers 30 and 31, and disclosed in greater detail in the patent to Dey above mentioned. Use of stop mechanism such as this permits the pin bars to be stopped be-

tween actuations in positions in which the attached prints will remain in the respective baths so that they will be developed or fixed uniformly. If such mechanism were not provided, the operator would have no way of telling in what position the pin bars might be, and he would be apt to cease actuating the conveying means at a time when a print was perhaps half in the developing bath and half out of it, which would be extremely undesirable.

In operation, the object to be photographed is inserted in the copyholder 15 when the latter is in its horizontal or loading position, illustrated in Fig. 1. The copyholder is then turned up to the vertical position shown in Fig. 3, and an exposure is made by operating the shutter by means of the shutter operating handle 19. This causes the image of the object held by the vertical copyholder to be thrown upon the sensitized sheet material 20 held horizontally in the focal plane of the camera.

The crank 32 is then operated, after releasing the stop mechanism thereof, and this feeds the exposed sheet material rearwardly into and through the chute 50, until the rear edge of the sheet material rests upon the ledge 94. The feeding crank 32 is automatically stopped when it has been rotated through the proper amount, by means of the stop mechanism. The handle 52 is then moved rearwardly or to the right when viewed as in Fig. 8, which operates the severing knife 51 and severs the exposed portion of the sheet material from the fresh unexposed portion which has been drawn into the focal plane preparatory to making another exposure.

The operator then releases the automatic stop associated with the conveying means crank 101, and turns this crank until it is stopped by the stop mechanism. Turning of this crank drives the endless members 75 and causes one of the pin bars 76 to pass the position at which the exposed print lies, so that the print is impaled on the pins 77 and picked up and carried along by the conveying means into the developing bath. When the automatic stop mechanism stops further rotation of the crank 101, the print will come to rest in the developing bath 62.

Another exposure is then made, the exposed portion is fed and severed as before, and the conveying means is again actuated. This second actuation of the conveying means carries the first print over from the developing bath 62 into the fixing bath 63, where it is automatically removed from the conveying means by the removing device 84, and carries the last exposed print down into the developing bath 62.

When another exposure is made, the subsequent actuation of the crank 101 will cause the first pin bar to pass through the washing bath 64, thus cleansing it of fixing solution so that when it next passes through the developing bath, the developer will not be contaminated by the fixing solution. The bath 64 also cleanses all portions of the endless members 75 of the conveying means.

The prints deposited by the conveying means in the fixing bath 63 may be removed manually through the opening 90. They may be taken out one at a time if desired, or a number of prints may be allowed to accumulate and they may then be removed all at once.

When it is desired to obtain access to the interior of the apparatus for any reason, such as for loading a fresh supply of sheet material into the roll box 22, or for filling or emptying the baths 62, 63, and 64, the cover 11 of the apparatus may be lifted off by a simple upward movement, and easy access may then be obtained to all parts. Since the conveying means is carried entirely from the cover and is removed as a unit therewith, it follows that the compartments of the bath container will be left entirely clear when the cover is removed, so that they may be cleaned easily. As the entire bath container 60 is supported simply by resting on the bracket 61, it may be lifted out of the casing 10 when it is desired to empty it.

The placing of the copyholder upon the top of the casing makes a compact construction and greatly reduces the amount of floor space which would be necessary if the copyholder projected from the side or end of the casing, or if a separate copyholder were used. It will be seen that an extremely simple construction has been provided, which is sturdy, not likely to get out of order, and which may be moved very easily from place to place. It may be described as self-contained, since it comprises in one unitary article all the equipment necessary for holding the documents to be copied, making photographic prints of them and developing and fixing the prints.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is therefore not to be limited to the precise details shown, but is intended to cover all variations and modifications thereof falling within the spirit of the invention or the scope of the appended claims.

I claim as my invention:

1. In a photographic apparatus, the combination with a casing, of photographic print treating mechanism within said casing, a copyholder mounted over said casing, and a camera including optical elements projecting above the body of said casing so that said camera may photograph objects held by said copyholder.

2. In a photographic apparatus, the combination with a casing, of photographic print treating mechanism within said casing, a

copyholder mounted on the top of said casing and arranged to stand substantially vertically, and a camera including a chamber projecting upwardly from the body of said casing, and having optical means adjacent the top of said upward projection so that said camera may photograph objects held by said copyholder.

3. In a photographic apparatus, the combination with a casing, of photographic print treating mechanism mounted within said casing, a copyholder mounted on the top of said casing and arranged to hold articles to be photographed in a substantially vertical position, a camera including optical means arranged above said casing to change the direction of beams of light to throw an image of articles held by said copyholder downwardly, means for holding sensitized sheet material in substantially horizontal position within said casing to receive said image, and mechanism for delivering exposed portions of said sheet material to said photographic print treating mechanism.

4. In a photographic apparatus, the combination with a casing, of photographic print treating mechanism within said casing, a copyholder mounted on top of said casing for pivotal movement from a substantially horizontal position for loading to a substantially vertical position for taking exposures, a camera including optical means above said casing arranged to receive an image of objects held by said copyholder when in said vertical position, and to transmit said image downwardly into said casing, means for holding sensitized material within said casing in position to receive said image, and mechanism for delivering exposed sensitized material to said photographic print treating mechanism.

5. In a photographic apparatus, the combination with a casing, of photographic print treating mechanism within said casing, a copyholder mounted on said casing, an upwardly projecting portion on said casing, optical means mounted on said upwardly projecting portion for receiving an image of an object held by said copyholder and for transmitting said image downwardly through said upwardly projecting portion, means for holding sensitized material in position to receive said image, and mechanism for delivering exposed sensitized material to said photographic print treating mechanism.

6. In a photographic apparatus, the combination with a casing and photographic print treating mechanism therein, of a copyholder mounted on top of said casing for holding objects to be photographed in substantially vertical position, an upwardly extending portion on said casing, a prism mounted on said upwardly extending portion for receiving light rays from an object held by said copyholder and for transmitting said rays downwardly through said upwardly extending portion, means for holding sentsitized material substantially horizontal within said casing beneath said upwardly extending portion in position to receive an image of objects held by said copyholder, and mechanism for delivering exposed sheet material to said photographic print treating mechanism.

7. In a photographic apparatus, the combination with a casing, of a container within said casing for holding a photographic print treating bath, a cover for said casing, and means including an endless member and a pick-up device carried thereby for conveying a photographic print through said container, said endless member being mounted upon said cover and movable as a unit therewith.

8. In a photographic apparatus, the combination with a container for holding a photographic print treating bath, of a cover for said container, members depending from said cover and arranged to extend into said container when said cover is in normal position, and means including an endless member mounted on said depending members and movable as a unit with said cover and a pick-up device carried by said endless member for conveying a photographic print through said container.

9. In a photographic apparatus, the combination with a container for holding a photographic print treating bath, of a cover for said container, and means including an endless member movable along a predetermined path and a pick-up device carried by said member along said path for conveying a photographic print through said container, said endless member being mounted on said cover and movable as a unit therewith.

10. In a photographic apparatus, the combination with a plurality of containers for holding photographic print treating baths, of a cover for said containers, a pair of flanges depending from said cover and arranged to extend downwardly into said container when the cover is in normal position, and means including an endless member mounted on said flanges and a pick-up device carried by said member for conveying a photographic print through said containers in succession.

11. In a photographic apparatus, the combination with a casing, of a container within said casing for holding a photographic print treating bath, means within said casing for holding sensitized material, a cover for said casing, a copyholder mounted on said cover, and optical means for transmitting an image of an object held by said copyholder to the sensitized material held by said holding means.

12. In a photographic apparatus, the combination with a casing, of a container within said casing for holding a photographic print treating bath, means within said casing for holding sensitized material, a cover for said casing, a copyholder mounted on said cover,

optical means for transmitting an image of an object held by said copyholder to the sensitized material held by said holding means, and means carried by said cover for conveying exposed sensitized material through said photographic print treating bath.

13. In a photographic apparatus, the combination with a container for holding a photographic print treating bath, if means for conveying a photographic print through said bath, mechanism for delivering a photographic print to said conveying means, and a light guard having a portion for supporting a photographic print in position to be picked up by said conveying means.

14. In a photographic apparatus, the combination with a container for holding a photographic print treating bath, of means for conveying a photographic print through said bath, mechanism for delivering a photographic print to said conveying means, and a member for excluding light from said bath, said member including a portion serving as a support for a photographic print to hold it in position to be picked up by said conveying means.

15. In a photographic apparatus, the combination with a container for holding a photographic print developing bath, of a container for holding a photographic print fixing bath, conveying means for moving a photographic print successively through said baths, mechanism for removing a print from said conveying means, and a container for holding a bath for washing said conveying means subsequent to the removal of a print therefrom.

16. In a photographic apparatus, the combination with a container for holding a photographic print developing bath, of a container for holding a photographic print fixing bath conveying means movable in an endless path repeatedly through said developing bath and said fixing bath in succession, mechanism for removing a print from said conveying means, and a container for holding a bath for washing said conveying means subsequent to the removal of a print therefrom and prior to the next succeeding passage of the conveying means through the developing bath.

17. In a photographic apparatus, the combination with a camera including a substantially horizontal focal plane, of means for holding sensitized sheet material in said focal plane in position to be exposed, a substantially horizontal guide to receive an exposed print from said focal plane, and photographic print conveying means movable in a direction transversely of a print held by said guide to pick up said print and remove it from said guide.

18. In a photographic apparatus, the combination with a camera including a substantially horizontal focal plane, of means for holding sensitized sheet material in said focal plane in position to be exposed, a substantially horizontal guide arranged to receive exposed sheet material from said focal plane and to hold the sheet material substantially horizontal, mechanism for delivering sheet material from said focal plane to said guide, a container for holding a photographic print treating bath, and print conveying means movable along a path of travel adjacent said guide and transversely of sheet material held in the guide, to pick up such sheet material and to convey the same to said print treating bath.

19. A compact photographic exposing and developing apparatus requiring relatively little floor space, comprising means for developing a photographic print, a copyholder mounted on top of said developing means, means for holding sensitized material, an optical system for directing an image of an article held by said copyholder onto said sensitized material, and means for transferring the exposed sensitized material to said developing means.

20. A compact photographic exposing and developing apparatus requiring relatively little floor space, comprising a casing adapted to contain sensitized material and photographic developing apparatus, a removable cover for said casing, a copyholder mounted on said cover, an extension projecting inwardly from said cover at a point spaced from said copyholder, and an optical system carried by said extension for directing an image of an article held by said copyholder through said extension to fall upon sensitized material.

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