Sept. 8, 1931. J. S. GREENE 1,822,345

PHOTOGRAPHIC APPARATUS

Filed July 2, 1928 4 Sheets-Sheet 1

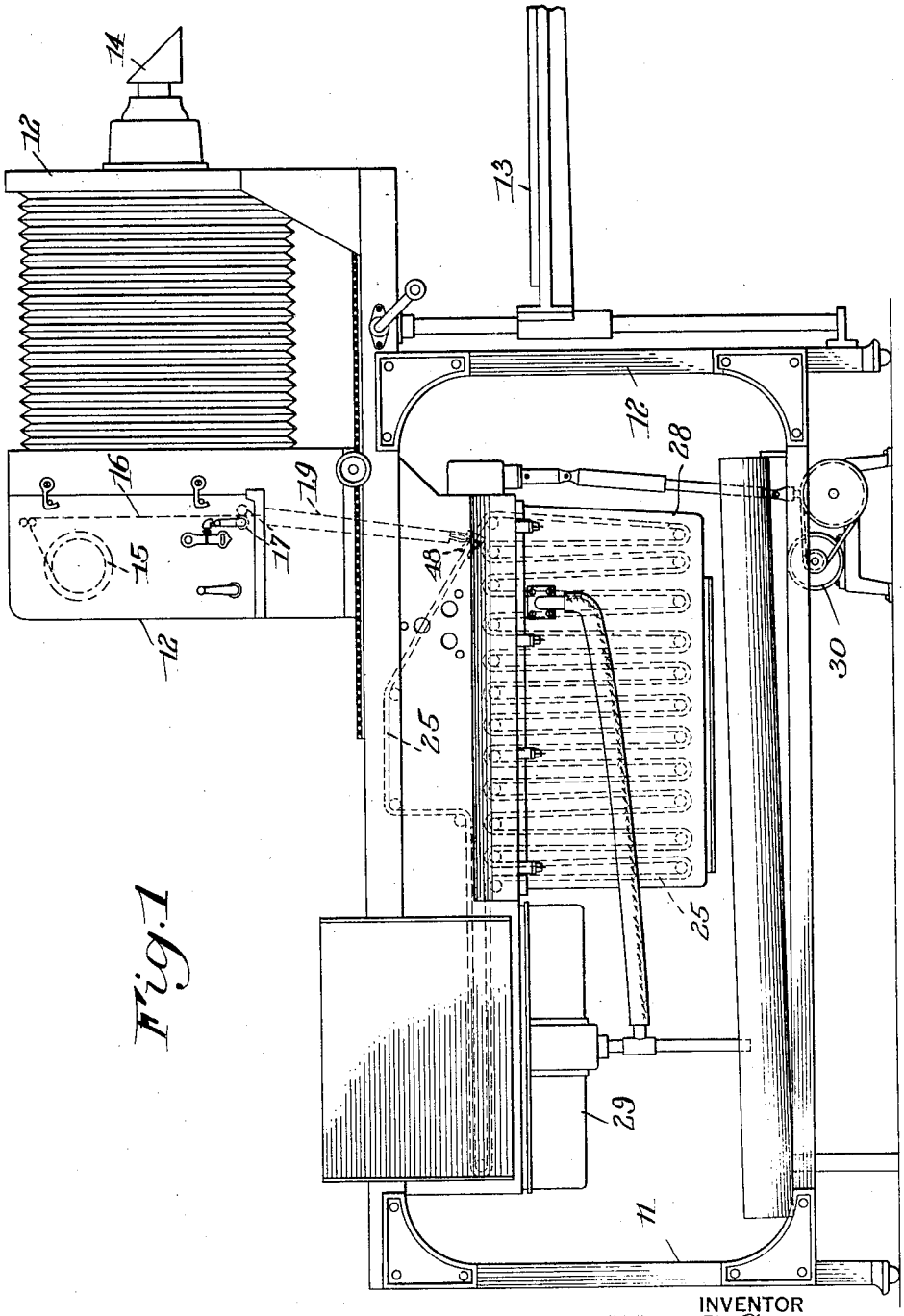


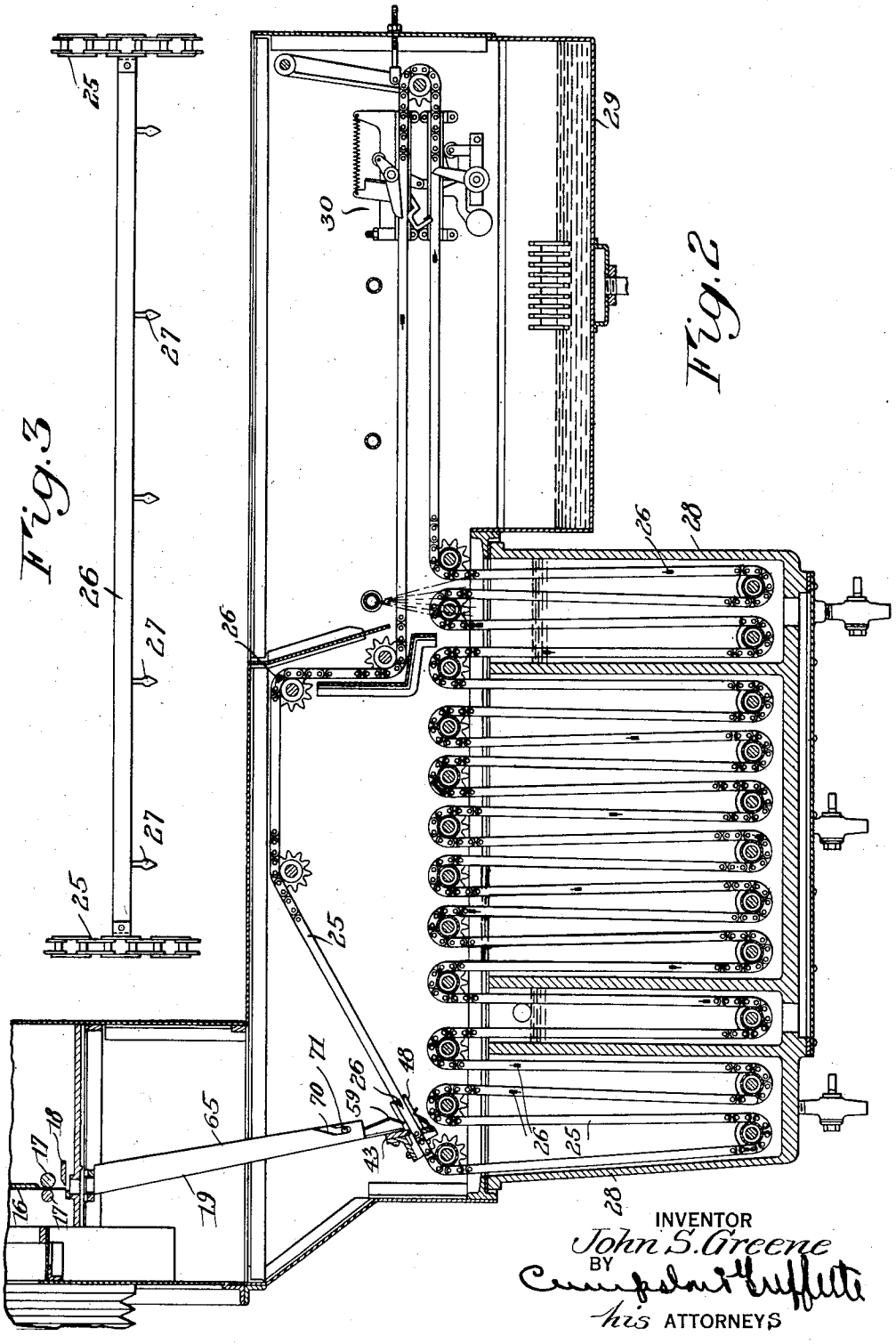
Fig. 1

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PHOTOGRAPHIC APPARATUS

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PHOTOGRAPHIC APPARATUS

Filed July 2, 1928 4 Sheets-Sheet 3

Fig. 4

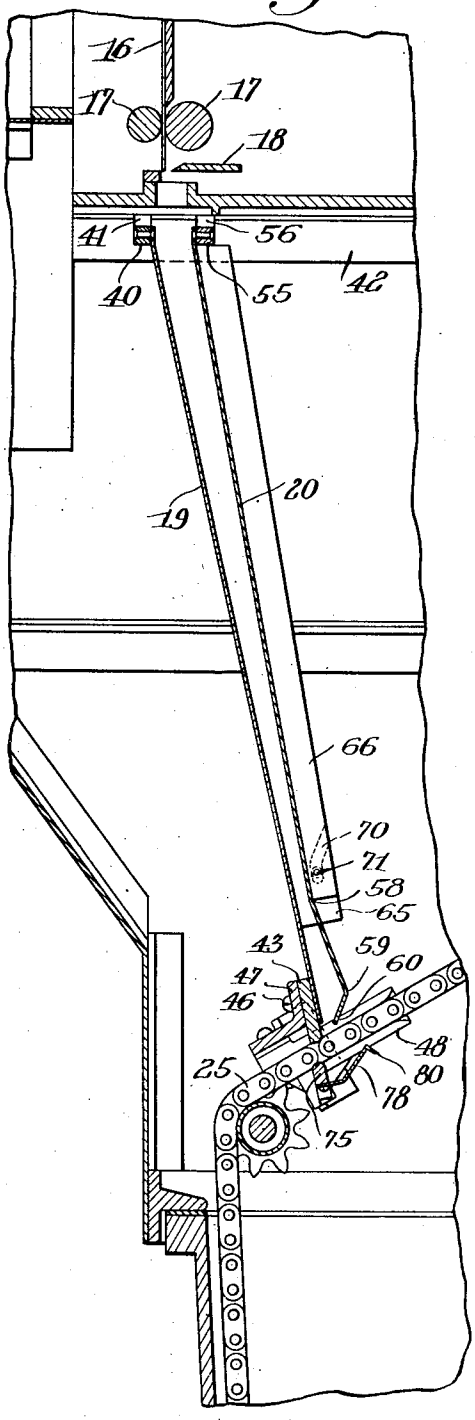


Fig. 5

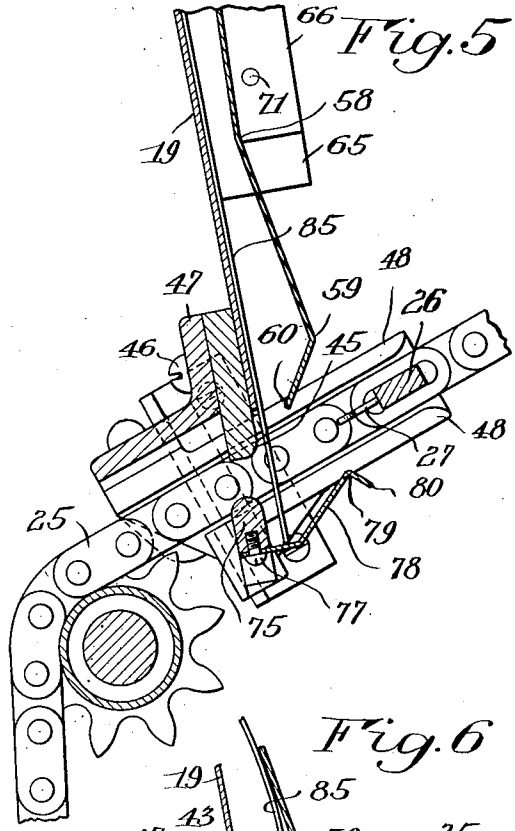
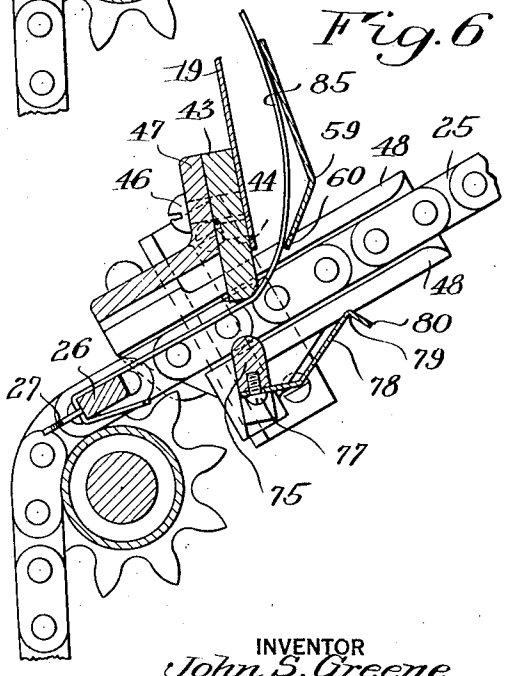


Fig. 6



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PHOTOGRAPHIC APPARATUS

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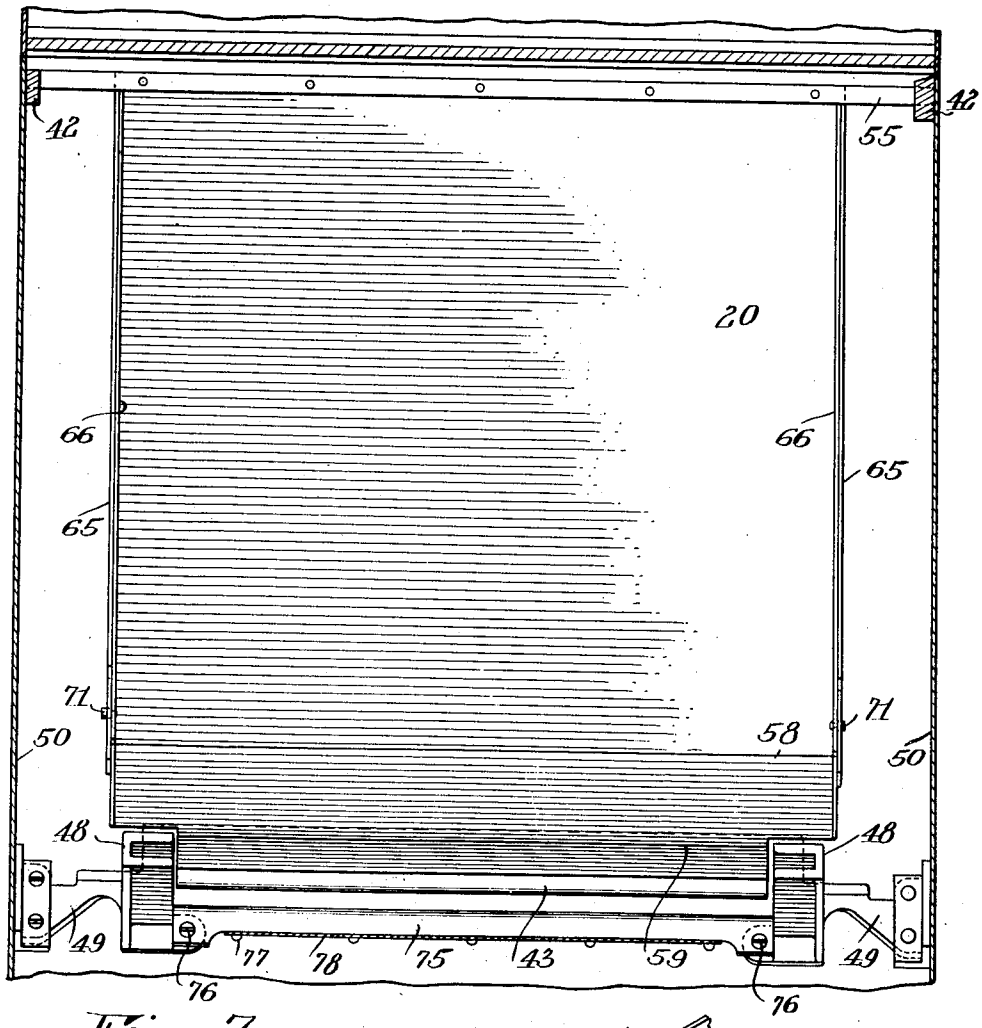


Fig. 7

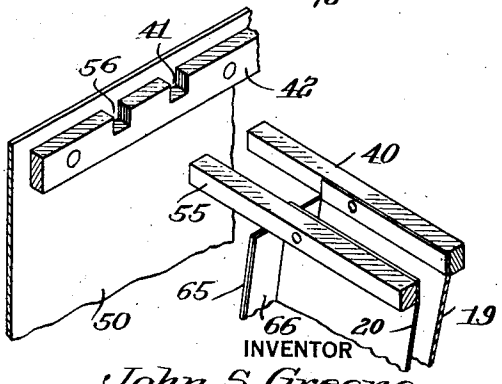


Fig. 8

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UNITED STATES PATENT OFFICE

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PHOTOGRAPHIC APPARATUS

Application filed July 2, 1928. Serial No. 289,731.

This invention relates to photographic apparatus, and has for its principal object the provision in such an apparatus of an improved passageway or conduit which may be used for transferring sheet material from one part of the apparatus to another, or for holding the sheet material in position to be picked up by sheet conveying means, or for both of these purposes together.

Another object of the invention is the provision, in photographic apparatus, of means for holding a sheet in position to be picked up by conveying means, the holding means being so designed and constructed as to allow the sheet to bend on a comparatively large radius of curvature as it is withdrawn from the holding means by the conveying means.

It is a further object of the invention to provide, in combination with photographic apparatus, a passageway or conduit having one side thereof readily removable to obtain access to the space within the conduit.

A still further object is the provision of improved apparatus for one or all of the purposes above mentioned, which is easy to manufacture, satisfactory in operation, and not liable to get out of order.

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 one form of photographic apparatus with which the invention may be used;

Fig. 2 is a vertical section taken longitudinally through a part of the apparatus illustrated in Fig. 1;

Fig. 3 is a plan of certain portions of the sheet conveying mechanism, illustrating details thereof;

Fig. 4 is a fragmentary vertical section through parts of the apparatus, showing details of the conduit or chute for sheet material;

Fig. 5 is an enlarged view of a part of the mechanism shown in Fig. 4, illustrating a sheet held in the chute and about to be picked up by the conveying means;

Fig. 6 is a view similar to Fig. 5 showing the sheet in the act of being withdrawn by the conveying means;

Fig. 7 is a rear elevation of the chute or sheet holding means, and

Fig. 8 is a fragmentary perspective view illustrating details thereof.

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

This invention is here disclosed, by way of example, with reference to photographic apparatus of the type in which a roll of sensitized sheet material is employed, successive portions of the roll being unwound and fed into the focal plane of a camera, where they are exposed. The exposed portions of the sheet are then fed forwardly to bring fresh or unexposed portions into the focal plane, and the exposed portions are severed so that they drop one by one into a conduit or chute which holds them in position to be picked up and withdrawn from the chute by suitable conveying means.

The conveying means may transport the sheets to any desired point, but preferably carries them through developing, washing, and fixing baths so that the sheets are transformed into prints. After being fixed, the prints may be removed from the conveying means at any desired point and stored in a suitable receptacle or container from which they may be taken as desired by the operator of the apparatus.

The present invention is concerned especially with the conduit or chute for transferring the sheets from the feeding and severing means to the conveying means, and for holding them in position to be picked up by this conveying means. It is obvious, however, that many features of the invention are not limited to use in this connection, but are applicable equally well to other uses, and may be employed in photographic apparatus of other types.

In the embodiment of the invention herein disclosed for purposes of illustration, there is shown in Fig. 1 a frame 11 which serves as a support for the various parts of

a camera 12. The articles to be photographed may be supported upon a copyholder 13, a prism 14 being provided on the camera for bending the light rays coming from the copyholder so that they will fall upon the focal plane of the camera.

Within the camera there may be provided a roll 15 of suitable sensitized sheet material, successive portions of this roll being unwound and held in the focal plane 16 of the camera. After being exposed, the sheet material may be moved forwardly by feeding means such as the rolls 17, shown in Figs. 2 and 4, and the exposed portion, after being fed forwardly, may be severed by the knife 18 so that it drops downwardly into a chute including a front wall 19 and a rear wall 20. This chute extends in a general downward direction from a point near the feeding and severing means, and acts as a conduit to transfer the sheet from the feeding and severing means to a point adjacent the sheet conveying means, the chute also holding the sheet in a position intersecting the path of travel of the conveying means so that it will be picked up thereby.

The conveying means may include a pair of continuous members such as the chains 25 spaced transversely from each other, each chain traveling in a vertical plane adjacent one side wall of the apparatus. Cross bars 26, best shown in Fig. 3, may be placed at intervals along the chain, each end of each bar being secured to one of the chains so that the bars extend transversely across the apparatus and travel with the chains. Each of these bars 26 may carry a plurality of pins or darts 27 extending forwardly from the bar, these pins being arranged to pierce a sheet held in the chute as a pin bar travels past the sheet. Thus the sheets are picked up by the conveying means and withdrawn from the chute, after which they may be conveyed through a tank 28 provided with various compartments supplied with developing, fixing, and washing solutions. After the treatment of the sheet by these solutions has been completed, the sheet may be carried to a point over the tank 29, where it may be removed from the conveying means by automatic removing means indicated generally by the numeral 30 in Fig. 2. The details of this removing means form no part of the present invention and need not be further described herein. The sheets or prints when removed may drop into the tank 29, from which they are collected at intervals by the operator of the apparatus.

The conveying means may be driven by any suitable mechanism such as the motor 30, and may be arranged to move forwardly either continuously or intermittently, as desired. The details of this drive form no part of the present invention and therefore are not illustrated herein.

Referring now particularly to Figs. 4 to 8 inclusive, in which the details of the sheet conduit or chute are illustrated, it will be observed that the front plate 19 of the chute is substantially flat throughout its length and is supported at its upper edge by a bar 40 which extends transversely across the dark chamber and has its ends removably supported in notches 41 formed in members 42 extending longitudinally along the side walls of the chamber. This construction is illustrated most clearly in Fig. 8.

The lower edge of the plate 19 terminates a short distance above the path of travel of the conveying means, and a transverse bar 43 is fixed to the plate by means such as the rivets 44 shown in Fig. 6. This cross bar projects somewhat below the lower edge of the plate 19 and thus forms substantially a continuation or prolongation of the plate. The lower edge of the bar extends somewhat down into the space between the side members 25 of the conveying means and this edge is so positioned that it is just above the path of travel of the cross bars or pin bars 26 of the conveying means, a slight clearance being allowed between the lower edge of the bar 43 and the upper surfaces of the pin bar 26 as the latter travels past the former. The lower rear edge of this cross bar 43 is rounded as at 45 to form a smooth surface for contact with the sheet as it is drawn out of the chute by the conveying means in the manner to be described below.

The cross bar 43 to which the lower end of the plate 19 is attached, may be removably secured by means such as the screws 46 to an angular cross piece 47, the ends of which may be fastened to channel shaped guide members 48 which receive the chains 25 of the conveying means and guide them during their travel so that they move always in a predetermined path relative to the lower end of the chute. These channel guiding members 48 may be supported by brackets 49, as shown in Fig. 7, which are attached to the side walls 50 of the dark chamber.

The plate 20 which forms the rear side of the sheet conduit or chute is supported at its upper end by a cross bar 55 having its ends received in notches 56 formed in the members 42. This plate 20 extends downwardly in a direction nearly but not quite parallel to the plate 19. As will be observed from Fig. 4, the space between these plates is tapered downwardly so that it is wider at the top, near the sheet feeding and severing means, than it is farther down, such as at the intermediate point 58. The plate 20 is flat throughout the greater portion of its length, but at an intermediate point 58, somewhat above the path of travel of the conveying means, the plate is bent rearwardly as shown in Figs. 4 and 5, so that the space between the two plates increases in a downward di-

rection to a second intermediate point 59. At this point, the plate 20 is again bent forwardly and extends obliquely in a direction so as to be substantially tangent to the curve of a sheet as it is withdrawn from the chute by the conveying means. The lower end of the plate 20 terminates at an edge 60 slightly above the path of travel of the conveying means.

The terminal portion of the plate 20, that is, the portion extending from the angle 59 to the lower edge 60, makes a much smaller angle with the path of travel of the conveying means than does the plate 19 constituting the front wall of the chute. Preferably the angle between the path of the conveying means and the terminal portion of the plate 20 is approximately half as great as that between the path of the conveying means and the plate 19, so that this latter angle is approximately bisected by the terminal portion of the plate 20. Thus, when the sheet is withdrawn from the chute by the conveying means and is bent from the direction of the chute to the direction of the conveying means, the sheet may lie substantially tangent to the terminal portion of the plate 20 at the point 60, and approximately half of the bending of the sheet may take place within the chute, above the edge 60, while the rest of the bending occurs in that portion of the sheet which extends below the edge 60 and over the corner 45 of the bar 43.

For holding the lower end of the plate 20 in predetermined position relative to the plate 19, so that the space between these plates will be of the desired dimensions, various means may be provided. In the present instance, the plate 19 has rearwardly extending flanges 65 formed on its lateral edges or margins, while the plate 20 has similar marginal flanges 66. The flanges 66 are arranged to fit within the flanges 65, as shown in Figs. 4, 7 and 8, and thus they prevent relative lateral motion of the two plates 19 and 20, while the flanges 65 also form closures for the lateral edges of the chute.

The flanges 65 have notches 70 formed therein, as shown in dotted outline in Fig. 4, while the flanges 66 on the plate 20 are provided with pins 71 adapted to be removably engaged with these notches. When the pins are in the notches and when the cross bars 40 and 55 at the tops of the plates 19 and 20 are in their respective notches 41 and 56, it is obvious that the two plates 19 and 20 are held in predetermined relationship relative to each other.

Furthermore, it is apparent that the plate 20 may be readily removed when it is desired to obtain access to the space between the plates. The dark chamber of the photographic apparatus is provided with a suitable removable section or door (not shown). The operator may reach into the chamber through the door and remove the plate 20 of the chute, the plate being readily detachable simply by a slight upward movement. Such a movement will lift the ends of the cross bar 55 out of the notches 56 and will likewise lift the pins 71 from the notches 70, thus freeing the plate 20 entirely from its supports and allowing it to be removed completely from the dark chamber or to be shifted within the chamber to any position desired. Since a simple upward movement is all that is necessary to free the plate, and since no screws, nuts or similar fastenings need be removed, it may be said that the plate 20 has interlocking portions held in place by gravity.

The movability of one part of the chute relative to another in order to obtain access to the space within the chute is an important feature of the present invention. In photographic apparatus of this type, it is sometimes necessary to clean the chute or to remove a piece of sheet material which may have clogged the chute by becoming curled up therein. Great difficulty in cleaning out the chute is often experienced with chutes of prior constructions, but according to the present invention the chute may be cleaned when necessary exceedingly quickly and with a minimum of interruption to the use of the apparatus.

Below the cross piece 43 and in a position slightly forward of the plane thereof, there is a cross bar 75, the ends of which may be attached by screws 76 (Fig. 7) to ears formed on the guiding channels 48. Supported from the lower edge of this bar 75 by means such as the screws 77 is a plate 78, which extends rearwardly for a short distance in a direction substantially perpendicular to the axis of the chute, and thence extends obliquely upwardly to a point 79 somewhat below the path of travel of the conveying means, where it is bent downwardly and terminates at an edge 80. This plate 78 forms a support for the lower edge of a piece of sheet material 85 held within the chute, as shown in Fig. 5, and thus the plate may be described as the lower end of the chute. When a sheet 85 is within the chute and rests upon the bottom plate 78 as shown in Fig. 5, it is then in position to be picked up and removed from the chute by the next pin bar 26 which travels past the chute, as will be described in greater detail below.

From Fig. 4, it will be observed that the conduit or chute is straight throughout its length, and extends from the sheet feeding and severing means to the conveying means. The chutes heretofore known and used in photographic apparatus of this type have ordinarily been more or less curved, in some instances the extent of curvature being as much as fifty or sixty degrees. In curved chutes of the previous types, it has been found

that frequently a piece of sheet material would not pass through the chute satisfactorily if moved simply by gravity, and it has been necessary in these curved chutes to provide feeding means for passing the sheets through the chutes.

Since the sheet material ordinarily used in photographic apparatus of this type is paper, it is apparent that a sheet of comparatively small size is quite light, and it may be readily understood that the action of gravity alone on such a sheet is insufficient to overcome the friction encountered during its passage through a chute having any substantial amount of curvature. When a chute which is entirely straight is used, according to the present invention, no such difficulty is encountered. Even the smallest sheet will drop readily by gravity through the chute into position to be picked up by the conveying means, since there is no curve or bend to create excessive friction during the travel of the sheets. Hence it is unnecessary to provide means for feeding the sheets positively through the chute, nor is it necessary to make the chute adjustable for use with different sized sheets, as has sometimes been done in prior chutes.

In operation, the sheet material from the roll 15 is fed forward after exposure by the feeding means 17, and is then severed by the knife 18. If a large sized sheet is severed, the lower edge of the sheet may extend entirely or nearly to the path of travel of the conveying means after it has been fed forward and before the sheet is severed, but if only a small piece of material is severed, it is obvious that the lower edge thereof will be at some intermediate point in the chute when the knife 18 is operated. As soon as the cut is completed, the sheet will drop by gravity through the conduit or chute to the position shown in Fig. 5, in which the lower edge of the sheet is supported by the plate 78, so that the sheet extends across and intersects the path of travel of the conveying means. Since the cross bar 75 is placed somewhat forwardly of the plane of the bar 43, there is little likelihood of the sheet striking this bar 75 during it descent, and the upper edge of the bar is rounded off as shown so that the sheet would be deflected therefrom and slide down the side of the bar to the plate 78, even if the lower edge of the sheet should, by any chance, strike the top of the bar 75 during its descent.

With the sheet held in this position described above and illustrated in Fig. 5, it is apparent that the next succeeding pick-up means or pin bar 26 on the conveyor will pick up the sheet 85 and withdraw it from the chute. As the pin bar 26 travels forwardly, the pins 27 will come into contact with the rear edge of the sheet 85 and push forwardly on this sheet. Since the sheet is then supported by the cross bars 43 and 75, which have only a comparatively narrow space between them, the sheet will offer sufficient resistance to the pins so that they will have no difficulty in piercing it. After the pins have pierced the sheet, the sheet thus becomes connected to the conveying means, and continued movement of the pin bar draws the sheet out of the chute and through the slot between the bars 43 and 75, in the manner illustrated by Fig. 6.

The front edge of the sheet rides easily over the rounded corner 45 of the bar 43, and the novel construction of the lower end of the chute allows the sheet to bend on a curve of comparatitvely large radius, so that it is not creased or cracked while being withdrawn. Prior chutes have usually had substantially parallel walls near the pick-up end of the chute, these walls being spaced comparatively close together. In such constructions, the sheets as they are withdrawn from the chutes and bent into the direction of travel of the conveying means, have been forced to bend on curves of comparatively short radius, so that considerable friction has been produced and the sheets have often been marred by the sharp bending.

In the present construction, however, the angular portions near the lower end of the plate 20 provide an enlarged chamber which furnishes room so that the sheet may bend on a curve of large radius, as shown in Fig. 6. It will be noted further that the terminal portion of the plate 20, which extends from the intermediate portion 59 obliquely toward the opposite side wall of the chute, is substantially tangent to the curve of the sheet, and the sheet slips easily over this portion and is guided thereby during its withdrawal from the chute. The chute widens out upwardly from the lower edge 60 of the plate 20 to the intermediate point 59, at which point the chute is of considerable width and provides ample space for the sheet 85 to assume a favorable position therein. Thus the sheet is not confined within a comparatively narrow space from which it must emerge with a sharp bend, but a space is provided of increasing width in a direction away from the path of travel of the conveying means (that is, from the point 60 to the point 59) and the sheet may thus form a curve of comparatively large radius as it is drawn from the chute.

Should it be necessary for any reason to obtain access to the space within the chute, this may be done easily and quickly by lifting the plate 20 a slight distance to free it from its supports, in the manner which has been described in detail above.

It will thus be seen that a sheet conduit or chute has been provided which is superior in many respects to the chutes heretofore used in apparatus of this kind. It is so shaped that comparatively small sheets may travel

through it easily solely by gravity, without the necessity of using feeding means to force the sheets through the chute. The shape of the lower end of the chute, adjacent the conveying means, is so designed and constructed as to reduce the friction of the sheet as it is withdrawn from the chute by the conveying means, and to avoid the sharp bends and creases which have occurred in the chutes heretofore used and which frequently mar the sheets. Furthermore, the chute is so constructed that access to the space within it may be obtained rapidly and with comparatively little trouble, without the necessity of removing any screws or other fastenings. The chute of the present invention is therefore far more satisfactory and efficient in use than other chutes heretofore commonly employed in apparatus of this type.

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 sheet conveying means having a path of travel, of means for holding a sheet in a position at an angle to said path of travel to be picked up by said conveying means, said holding means comprising a conduit having one wall deflected near said path of travel to provide an enlargement of said conduit permitting a sheet to bend on a comparatively large radius of curvature as it is withdrawn from the conduit by the conveying means.

2. In a photographic apparatus, the combination with means for feeding a sheet, of a chute extending downwardly from a point near said feeding means for receiving and holding a sheet fed thereby, and sheet conveying means movable in a path at an angle to said chute near the lower end thereof, said chute being longitudinally tapered and having the taper interrupted near said lower end to form a wider portion providing room for a sheet to bend on a comparatively large radius of curvature as it is withdrawn from said chute by the conveying means.

3. In a photographic apparatus, the combination with sheet conveying means having a path of travel, of means for holding a sheet in a position at an angle to said path of travel to be picked up by said conveying means, said sheet holding means comprising a pair of spaced plates arranged to receive a sheet between them, one of said plates being substantially flat, and the other plate having an angular portion to provide an enlarged space between said plates at a point near the path of travel of said conveying means, to allow a sheet to bend on a comparatively large radius of curvature as it is withdrawn from said holding means by said conveying means.

4. In a photographic apparatus, the combination with sheet conveying means having a path of travel, of means for holding a sheet in a position at an angle to said path of travel to be picked up by said conveying means, said sheet holding means comprising a wall having an aperture therein through which said conveying means is adapted to travel, and a second wall spaced from said first-named wall, said second wall having an edge adjacent said path of travel and having a portion extending from said edge in a direction obliquely away from said first-named wall, so that the space between the two walls increases in a direction away from said path of travel, to provide space so that a sheet held between said two walls may bend on a comparatively large radius of curvature as it is withdrawn by said conveying means from a position between said two walls.

5. In a photographic apparatus, the combination with sheet conveying means having a path of travel, of means for holding a sheet in a position to be picked up by said conveying means, said holding means comprising a pair of spaced walls arranged to hold a sheet between them, the forward wall with reference to the direction of travel of said conveying means being arranged at an angle to said path of travel, and the rear wall having a portion arranged at a substantially smaller angle to said path of travel than the forward wall, to allow a sheet to bend on a comparatively large radius of curvature as it is withdrawn from said holding means by said conveying means.

6. In a photographic apparatus, the combination with sheet conveying means having a path of travel, of means for holding a sheet in a position intersecting said path of travel to be picked up by said conveying means, said sheet holding means comprising a wall having an edge adjacent said path of travel and a second wall having an edge also adjacent said path of travel and spaced rearwardly along said path of travel from the edge of said first-named wall, a portion of said second wall extending from its said edge in a direction substantially tangent to a curve formed by a sheet as it is withdrawn from between said two walls by said conveying means.

7. In a photographic apparatus, the combination with means for feeding a sheet and for severing successive portions thereof, of sheet conveying means movable in a path below and spaced from said feeding and severing means, and a chute extending downwardly from said feeding and severing means for receiving a sheet therefrom and for holding it in a position intersecting the path of travel of said conveying means

so as to be picked up thereby, said chute including a substatially flat wall extending from a point near said feeding and severing means to a point adjacent the path of travel of said conveying means, and a second wall spaced from said flat wall and likewise extending from a point near said feeding and severing means to a point adjacent said path of travel, the space between said flat wall and said second wall being relatively wide at the upper ends of said walls and tapering downwardly to a narrower space at an intermediate point, said space widening in a downward direction from said intermediate point to a second intermediate point, and said second wall extending obliquely toward said flat wall from said second intermediate point downwardly to the lower edge of said second wall.

8. In a photographic apparatus, the combination with sheet conveying means, of means for holding a sheet in position to be picked up by said conveying means, said holding means comprising two spaced plates adapted to receive a sheet between them, one of said plates being readily movable relative to the other for obtaining access to the space between said plates, said movable plate being normally held in position by interlocking portions retained in place by gravity and being removable by an upward motion to disengage said interlocking portions.

9. In a photographic apparatus, the combination with sheet conveying means, of means for holding a sheet in position to be picked up by said conveying means, said holding means comprising two spaced plates adapted to receive a sheet between them, one of said plates being held in place by a pin and slot connection and being readily removable by disengaging said pin and slot connection, to obtain access to the space between said plates.

10. In a photographic apparatus, the combination with sheet conveying means, of means for holding a sheet in position to be picked up by said conveying means, said holding means comprising two spaced plates adapted to receive a sheet between them, each of said plates having marginal flanges, the flanges of one plate being arranged to fit within the flanges of the other plate when said plates are in normal operating position.

11. In a photographic apparatus, the combination with sheet conveying means, of means for holding a sheet in position to be picked up by said conveying means, said holding means comprising two spaced plates adapted to receive a sheet between them, each of said plates having marginal flanges, the flanges of one plate being arranged to fit within the flanges of the other plate when said plates are in normal operating position, a slot in a flange of one plate, and a pin on a flange of the other plate in position to project into said slot to hold said plates in predetermined position relative to each other, said pin being removable from said slot to allow said plates to be separated to obtain access to the space between them.

12. In a photographic apparatus, the combination with a dark chamber, of a conduit therein for sheet material, said conduit comprising a pair of members extending across said dark chamber substantially parallel to each other, and a plate attached to each of said cross members and extending downwardly therefrom, said plates being spaced from each other to form a passageway through which a sheet may pass, one of said cross members being detachably supported relative to the other so that the detachable cross member and its associated plate may be moved to obtain access to the space between said plates.

13. In a photographic apparatus, the combination with sheet conveying means having a path of travel, of means for holding a sheet in a position to be picked up by said conveying means, said holding means comprising a pair of spaced walls arranged to hold a sheet between them, one of said walls having a relatively narrow slit through which a part of said conveying means passes, and guiding means for said conveying means adjacent said sheet holding means, said guiding means comprising members for alining said conveying means accurately with said slit.

14. In a photographic apparatus, the combination with a dark chamber, of a conduit therein for sheet material, said conduit comprising a pair of members extending across said dark chamber substantially parallel to each other, and a plate attached to each of said cross members and extending downwardly therefrom, each of said plates having marginal flanges extending at an angle to the body of the plate, the flanges of one plate being arranged to fit within the flanges of the other plate when said plates are in normal operating position, the flanges on one plate having slots and the flanges on the other plate having pins removably engageable with said slots to hold said plates in predetermined position relative to each other, and one of said cross members having its ends removably supported in notches, so that the removable cross member and its associated plate may be moved to obtain access to the space between said plates.

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