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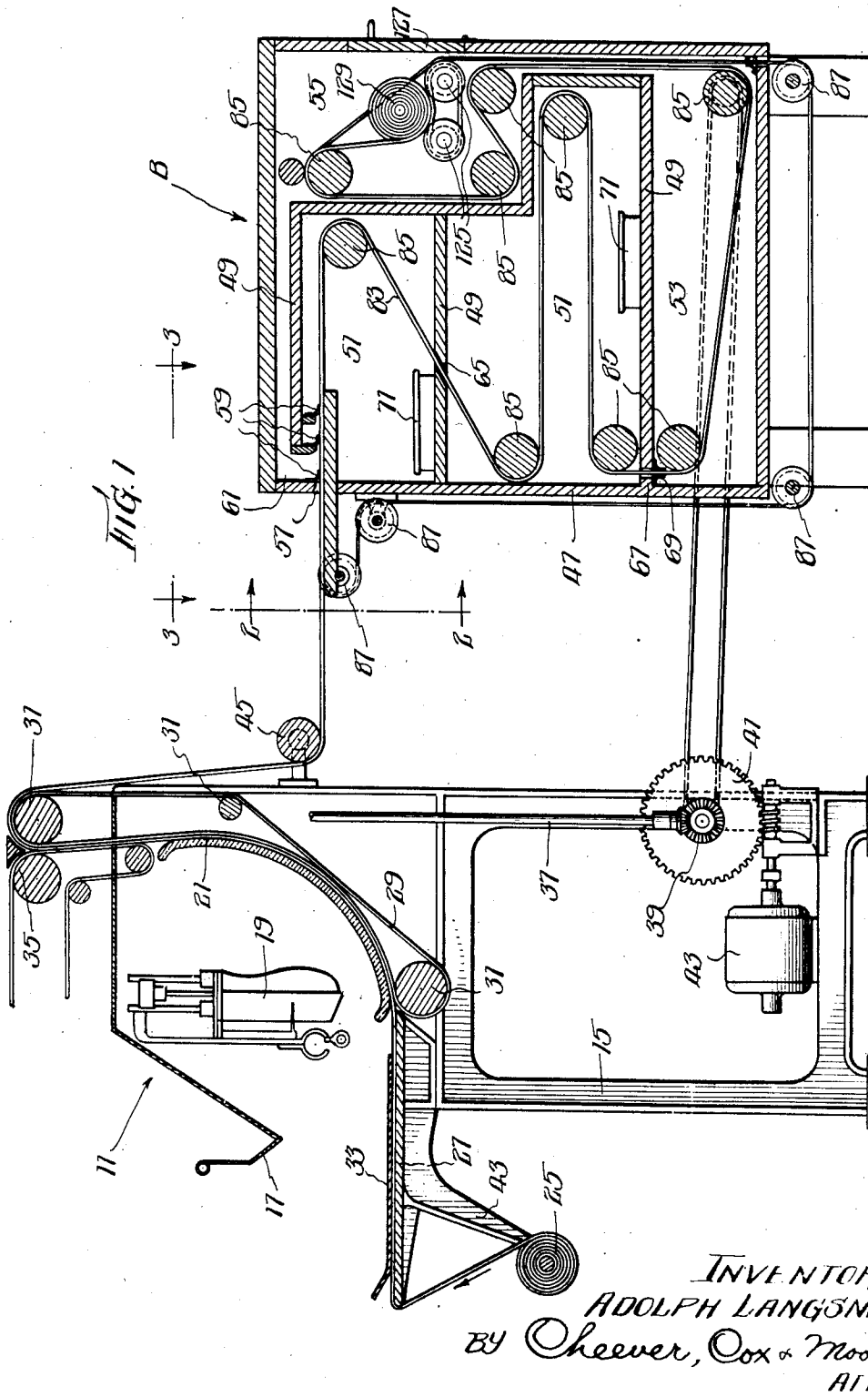
A. LANGSNER

1,845,296

CONTINUOUS DEVELOPING APPARATUS

Filed Jan. 30, 1929

3 Sheets-Sheet 1



Feb. 16, 1932.

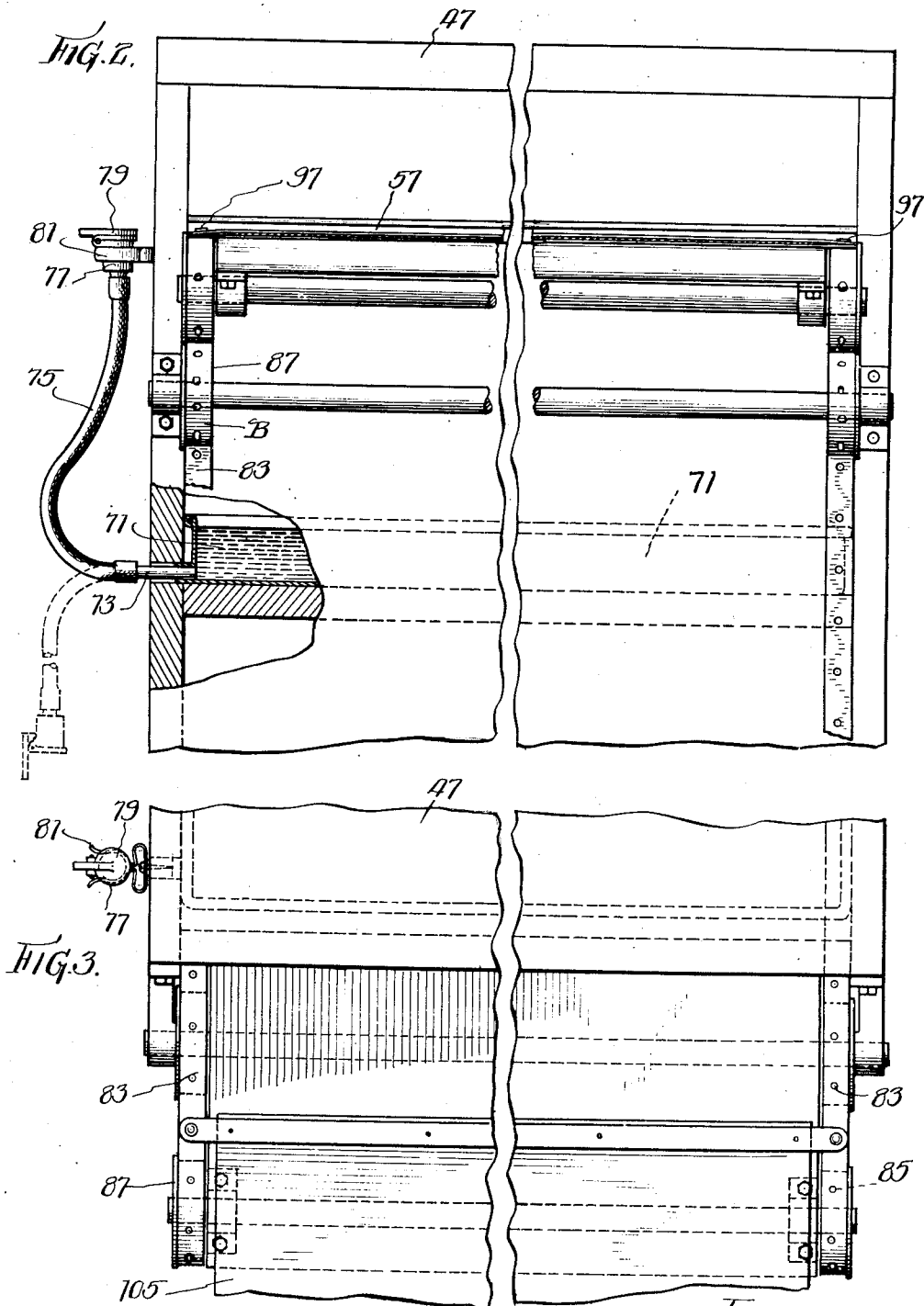
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CONTINUOUS DEVELOPING APPARATUS

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3 Sheets-Sheet 2



INVENTOR
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BY Cheever, Cox & Moore

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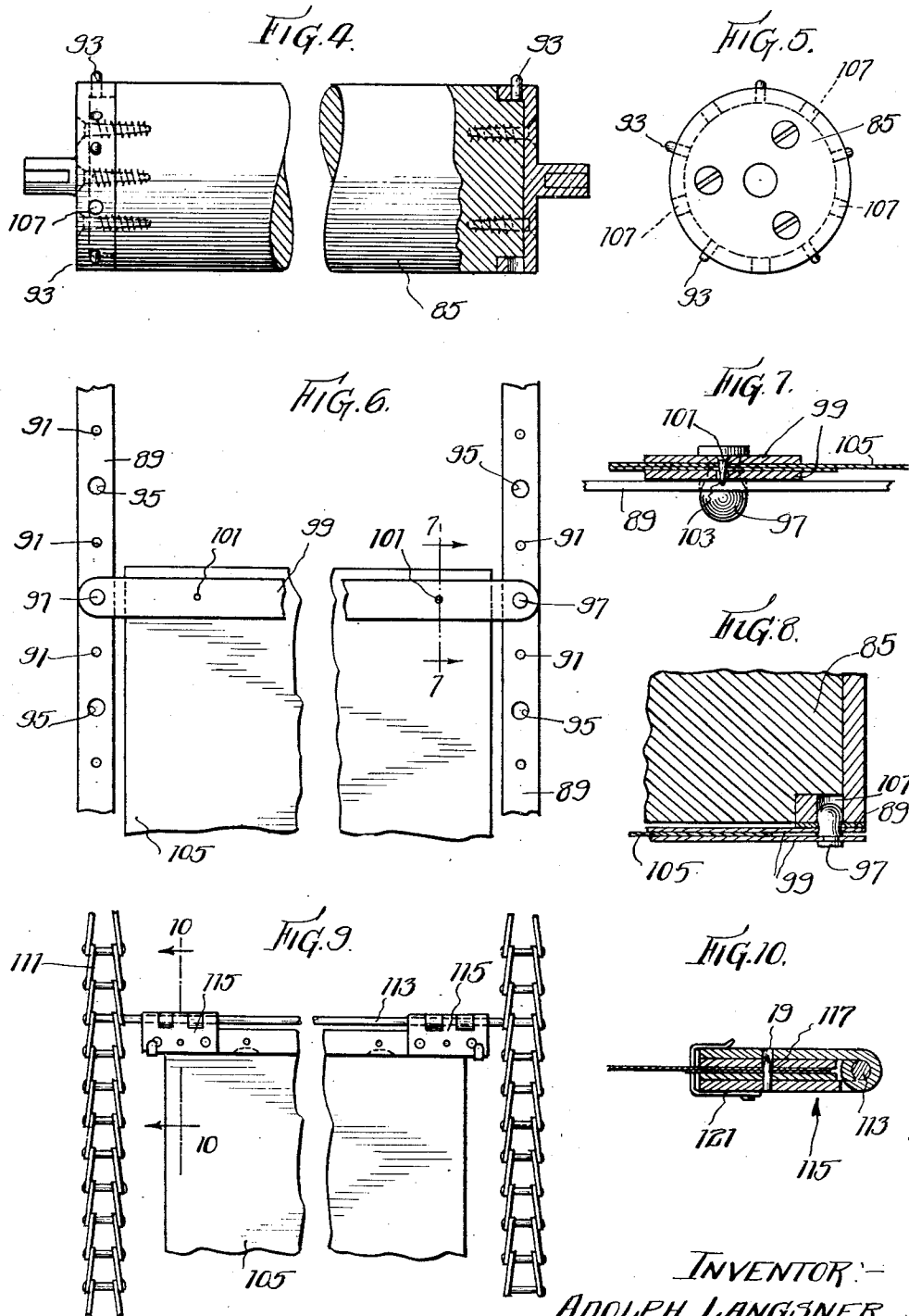
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CONTINUOUS DEVELOPING APPARATUS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

ADOLPH LANGSNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO EUGENE DIETZGEN COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

CONTINUOUS DEVELOPING APPARATUS

Application filed January 30, 1929. Serial No. 336,193.

My present invention relates in general to conveying mechanism and has particular reference to conveying mechanism particularly adapted for use in developing apparatus for light sensitive material, and more especially to an apparatus for continuously developing light sensitive sheets.

One of the important objects of my present invention is to provide a combination printing and developing machine whereby sheets or continuous strips of a light sensitive material, together with a negative, may be fed into the machine to be printed, whereby the printed strips and negative may then be separated, the printed sheets being fed into a developing chamber and finally discharged therefrom in a developed condition, while the negatives are discharged at an intermediate point.

Another important object of my invention is to provide a machine whereby light sensitive material may be continuously and consecutively exposed to a printing and a developing process by means of a novel conveying means.

Still another important object of my invention is to provide mechanism for conveying single sheets or continuous strips of material.

Yet another important object is to provide a conveying apparatus suitable for conveying sheet material through a treating medium whereby all the material carried may be uniformly subjected to the action of a medium.

Among other important objects of my invention is to provide a continuous developing apparatus adapted to be associated with a printing machine to thus eliminate the time and effort of transferring prints to the developing apparatus; to provide means for conducting long consecutively printed strips through a developer as printed; to provide a conveyor adapted to draw a strip of material along a circuitous path in a treating chamber; and to provide means for treating continuous strips of material in a continuous manner.

Numerous other objects and advantages of the invention will be apparent as it is more fully understood from the following description, which taken in connection with the ac-

companying drawings, discloses a preferred embodiment of the invention.

Referring to the drawings:

Figure 1 is a vertical section taken through a combination printing and developing apparatus to illustrate the conveying means forming the subject matter of the present invention;

Figure 2 is a vertical section taken substantially along line 2—2 in Figure 1;

Figure 3 is a horizontal section taken substantially along line 2—2 in Figure 1 and comprising a plan of the apparatus illustrated in Figure 2;

Figure 4 is a perspective view, partially in section, illustrating a roller forming a portion of my improved conveying apparatus;

Figure 5 is an end view of the roller shown in Figure 4;

Figure 6 is a plan view of a portion of the conveyor of my invention;

Figure 7 is a vertical section taken substantially along the line 7—7 in Figure 6;

Figure 8 is a section through a roller showing the cooperation of the roller and conveyor;

Figure 9 is a plan view of a portion of a preferred form of my improved conveyor; and

Figure 10 is a vertical section taken substantially along the line 10—10 in Figure 9.

To illustrate my invention, I have shown on the drawings a combination printing and developing apparatus comprising a printing machine shown generally at 11 and a developer for light sensitive material indicated generally at 13. The printer consists of a frame 15 supporting a housing 17 in which a printing lamp 19 is arranged. Adjacent the printing lamp 19, and within the housing 17, is mounted a member 21 which is transparent to the rays of the printing lamp. The frame 15 is provided with a bracket 23 in which is mounted a roll 25 of light sensitive material. This light sensitive material is drawn from the roll and passes over a feeding surface 27 formed in the upper surface of the bracket 23. Passing from the feeding surface 27, the light sensitive material passes between the printing member 21 and a con-

veyor comprising a plurality of endless strings or conveyors 29 which travel around guide rolls 31. During the operation of the printing machine these strings travel across the surface of the printing member and the light sensitive material is gripped between the printing member and the strings and drawn across the former at a uniform rate of speed by the movement of the strings. As the light sensitive material passes across the feeding surface 27, a negative or tracing may be laid upon the light sensitive material as indicated at 33. The negative and light sensitive material are thus carried across the printing member 21 so that the negative passes between the light sensitive material and the printing light 19 to form a reproduction in the light sensitive material. After passing from the printing member 21, the light sensitive material and the negative are carried by an extension of the conveyor to a station at which the negative may be stripped from the light sensitive material. The stripping of the negative may of course be accomplished by hand or may be carried out automatically by means, indicated at 35, which may be of a type shown and illustrated in United States Patent No. 1,758,612, issued to me the thirteenth day of May, 1930.

The conveying mechanism whereby the light sensitive material is carried across the printing member 21 may be driven in any convenient way such as by a drive shaft 37 journaled in the frame 15 and powered through bevel and reduction gears 39 and 41 from an electric motor 43 mounted in the frame 37 or at any other convenient point.

After passing from the printer, the light sensitive material is immediately conducted to the developer 13. This may be accomplished in any convenient manner, but I have shown the light sensitive material as passing around a roller 45 to the developer.

In the illustrated embodiment, the developer consists of a cabinet 47 having partitions 49 arranged therein to form a plurality of compartments including developing compartments 51, an airing compartment 53 and an aired discharge compartment 55. The partitions are arranged so that the airing compartment 53 and the discharge compartment 55 are in communication and communicate with that point in the compartment at which the light sensitive material is introduced thereinto. This construction is of advantage for the reason that the developing compartments 51 are entirely surrounded by airing compartments so that the possibility of the escape of developing gas from the developing compartments is reduced to a minimum. In connection with this feature, attention is directed to the fact that the discharge compartment 55 is arranged at a remote point in the cabinet from the point at which the light sensitive material is discharged from the devel-

oping chambers into the airing chamber 53. The light sensitive material is introduced into the cabinet through an inlet slot or aperture 57 which is normally closed by a flexible gasket 59. The light sensitive material is introduced first into an arm 61 which communicates with the discharge and airing chambers so that the atmosphere within the compartment immediately surrounding the inlet slot is relatively untainted with fumes from the developing compartment. The light sensitive material is then directed from the arm 61 into the first developing chamber 51, through openings 63 in the partition 49, each of which openings is normally closed by a flexible gasket similar to the gasket 59. From the first developing chamber the light sensitive material passes through an aperture 65 in a partition 49 into the second developing compartment, from which it is discharged through an opening 67 in the partition 49 and into the airing compartment 53, the opening 67 being normally closed by flexible gaskets 69.

In order to create an atmosphere of suitable developing gases in the developing chambers 51, I arrange therein pans 71 which are adapted to be filled with a suitable liquid from which developing gases may be evolved. I provide means for filling these pans from outside of the cabinet, which means consists in a nozzle or spout 72 extending from the bottom of the pans 71 through a side wall of the cabinet as illustrated in Figure 2. The outer end of the spout 73 is provided with a flexible tube 75 which may conveniently be formed of rubber, and the other end of which is fitted with an inlet funnel 77 provided with a hinged cap 79. The cabinet also is provided with a clip 81 in which the funnel 77 may be normally supported. When so supported, the cap 79 closes the opening in the funnel and prevents the escape of any fumes from the pans 71. When it is desired to empty the pans, the funnel 77 may be detached from the clip 81 and allowed to assume the position illustrated in dotted lines in Figure 2. When in such position the fluid will drain by gravity from the pan 71 into a suitable receptacle which may be placed beneath the outlet.

In order to convey the light sensitive material through the developer 13, I have provided a conveyor consisting of a pair of spaced continuous flexible members 83 which travel around rollers 85 conveniently placed within the cabinet so that the conveyors travel over a predetermined tortuous or serpentine path through the various developing, airing and discharge chambers of the apparatus, and additional rollers 87 mounted in brackets outside of the cabinet so that the flexible members 83 may be returned upon themselves. At intervals, the flexible members 83 carry means for gripping a forward edge of the light sensitive material, which means is carried between

the flexible members. I have illustrated in Figures 6 through 10, preferred forms of mechanism for conveying light sensitive material. In each case the rollers 85 present a solid cylindrical surface throughout their intermediate portions so that the light sensitive material may be guided along the tortuous path defined by the flexible members 83. In Figures 6, 7 and 8, I have illustrated a conveyor in which the flexible members 83 consist of a pair of tapes 89 which may be formed of any suitable or convenient material and which are provided with a spaced series of perforations 91. The rollers 85, for use in connection with the tapes 89, are provided with a plurality of pins 93 arranged in their opposite ends and spaced circumferentially in the roller to cooperate with the apertures 91 of the tapes in order to provide a positive engagement between the tapes and the rollers as the former travel around the rollers. At intervals in the tapes 89, relatively large perforations 95 are formed. These perforations are adapted to receive a snap fastener 97 which is adapted to be detachably inserted into the registering apertures 95 of the spaced tapes. This fastener 97 carries a pair of strips 99 and is adapted to secure the same detachably together. One of the strips 99 is provided with a plurality of pins 101 and the other is provided with cooperating sockets 103 into which the pins 101 are adapted to fit when the strips are arranged in side by side relationship. The strips may be assembled on opposite sides of a strip of light sensitive material illustrated at 105 in Figures 6 and 7 of the drawings so that the pins 101 perforate the light sensitive material and enter the apertures 103. The strips may then be secured between registering portions of the flexible tapes 89 by means of the snap fastener 97. The rollers 85 also are provided with sockets 107 as shown in Figure 8 of the drawings so that the protruding head of the snap fastener 97 may be received when the tapes travel over the rollers.

In the conveying mechanism illustrated in Figures 9 and 10 of the drawings, the spaced flexible conveying members comprise chains 111 and the rollers 85 are provided at their ends with cooperating sprockets adapted to carry the chains. At intervals the spaced chains carry a rod 113 which provides a pivot point for spaced hinges 115. The hinges each consist of relatively pivoted plates, one of which carries a plurality of pins 117 and the other of which is provided with apertures 119 arranged to receive the pins when the hinge plates are relatively closed. Each hinge also carries a pivoted fastener 121 whereby the hinged plates may be locked in relatively closed position. It will be apparent that the hinges may be opened, the edge of a strip 105 of light sensitive material inserted therebetween, and the hinges closed and locked

upon the edge of the light sensitive material, as shown in Figures 9 and 10. When the hinge plates are closed upon the light sensitive material, the pins 117 will penetrate the light sensitive material and provide a firm grip thereon so as to draw the forward edge of the light sensitive strip through the developing apparatus along the serpentine path defined by the flexible members 83. In order to draw the light sensitive material through the developer, means is provided for moving the members 83. This may be accomplished in any convenient manner. In the illustrated embodiment I have shown how this may be accomplished by providing a driving connection between one of the rollers 85 and the driving mechanism of the printer. It will be apparent, of course, that where the printer and developer are driven from the same source of power, that the speed of travel of the light sensitive material through the printer and the developing apparatus may be maintained constant so that there will be no stretching or slacking of the light sensitive material as it passes continuously through the combination printing and developing apparatus.

As the conveyor travels in its path in the developing cabinet, the gripping devices come at intervals to the inlet slot 57. When this occurs the printed strip may be attached to the conveyor and thus is drawn through the developer.

When the developed sheet is finally discharged into the chamber 55, I provide means for rolling it up. This not only provides that the printed strip may be removed from the apparatus as a neat, easily handled roll, but also permits the strip to be retained in the airing chamber for a greater length of time. The rolling mechanism consists of a pair of spaced rollers 125 mounted for rotation in the chamber 55 and belted together for rotation. As the strip comes from the last roller 85, it may be detached from the conveyor by manually loosening the gripping mechanism by which the strip of light sensitive material is secured to the conveyor, access to the compartment 55 for this purpose being had through a door 127, and rolled upon a mandrel 129 which rests upon the rollers 125 and is thereby driven. One of the rollers 125 also serves to guide the flexible conveyor members 83 and is in turn driven thereby.

It will be apparent that the apparatus which I have described will handle continuous strips of material as well as short pieces and convey the same through a tortuous path.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing description; and it is apparent that numerous changes may be made in the form, construction and arrangement of the various parts without departing from the spirit and scope of the invention or sacrificing any of its attendant advantages,

the form hereinbefore described being of a preferred embodiment for purposes of illustration.

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

1. In combination, a developer comprising a compartment forming a gas chamber, a plurality of guide and support rollers mounted in the chamber, conveying means for engaging the end of light sensitive material to be developed for the purpose of drawing it through the chamber, said conveying means comprising a pair of continuous, spaced apart bands having each a spaced series of perforations therein and supported by and arranged to travel around said rollers, said rollers having spaced apart fingers arranged circumferentially therein to enter the perforations of said strips for the purpose of driving same along, gripping means carried detachably by and between the spaced conveying members, said members having registering snap sockets formed therein intermediate the perforations and said gripping means comprising a strip having snap means spaced therein to detachably engage the sockets in said members, a second strip having spaced perforations therein for detachably receiving the snap means of the other strip, whereby said strips may be detachably snapped together, one of said strips having a projecting pin and the other a depression whereby when the strips are snapped together upon either side of the light sensitive material, the pin may pierce the material to provide a firm grip.

2. A device as set forth in claim 1 wherein the rollers, around which the bands are carried, are relieved at points opposite the position occupied by the snapped socketed portion of the bands when traveling around the rollers whereby the gripping means attached to the conveyors may be accommodated in traveling around the rollers.

3. A device as set forth in claim 1 wherein the rollers have a spaced pair of formations formed circumferentially therein, said formations comprising a spaced circumferential series of alternate fingers and intermediate depressions, the fingers for entering the perforations of the continuous conveying bands and the intermediate depressions for the fastening means whereby the gripping means are attached to the bands.

In witness whereof, I have hereunto subscribed my name.

ADOLPH LANGSNER.