April 2, 1946. P. B. STREICH 2,397,763

CONTINUOUS DEVELOPING MECHANISM

Filed July 29, 1943 4 Sheets-Sheet 1

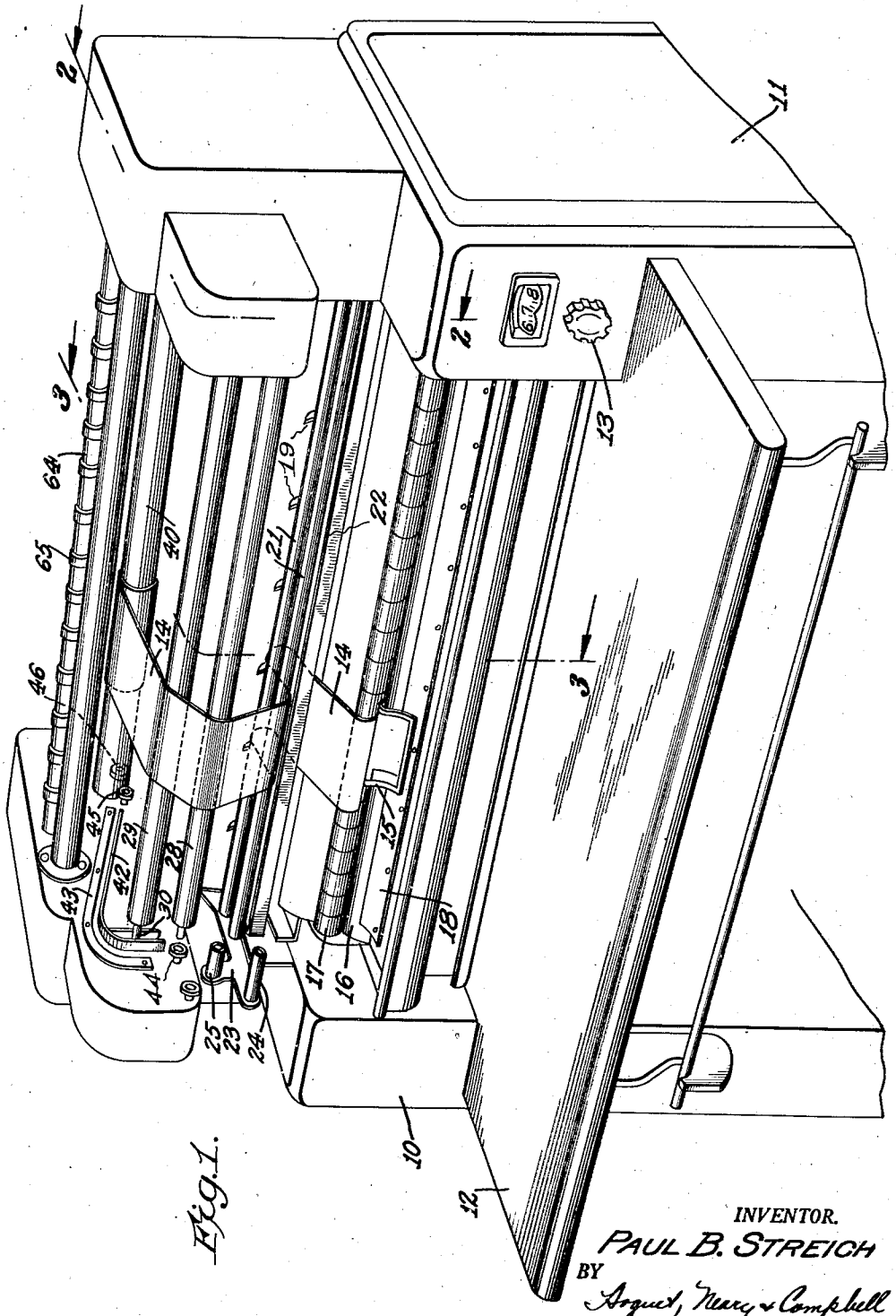


Fig. 1.

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CONTINUOUS DEVELOPING MECHANISM

Filed July 29, 1943 4 Sheets-Sheet 2

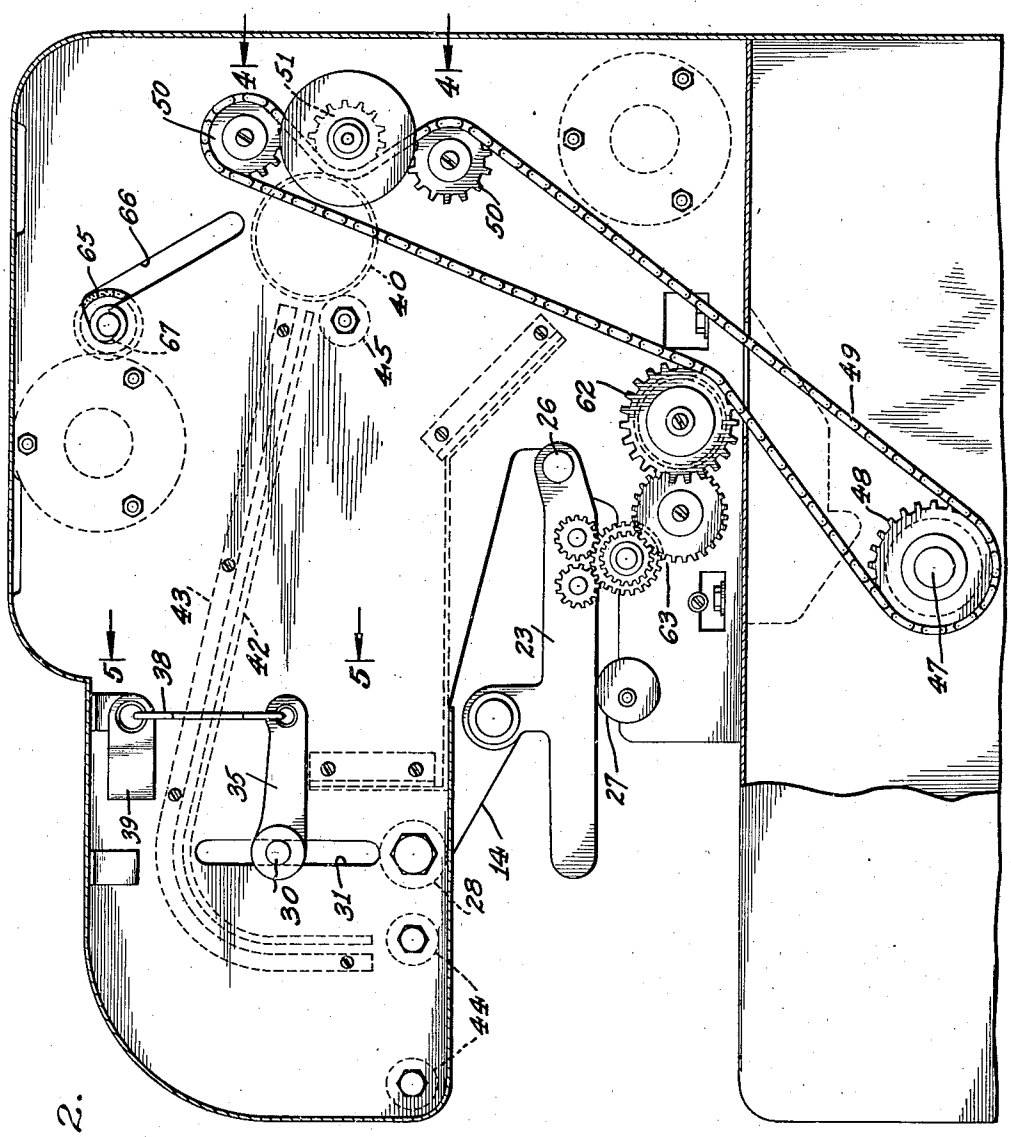


Fig. 2.

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April 2, 1946. P. B. STREICH 2,397,763

CONTINUOUS DEVELOPING MECHANISM

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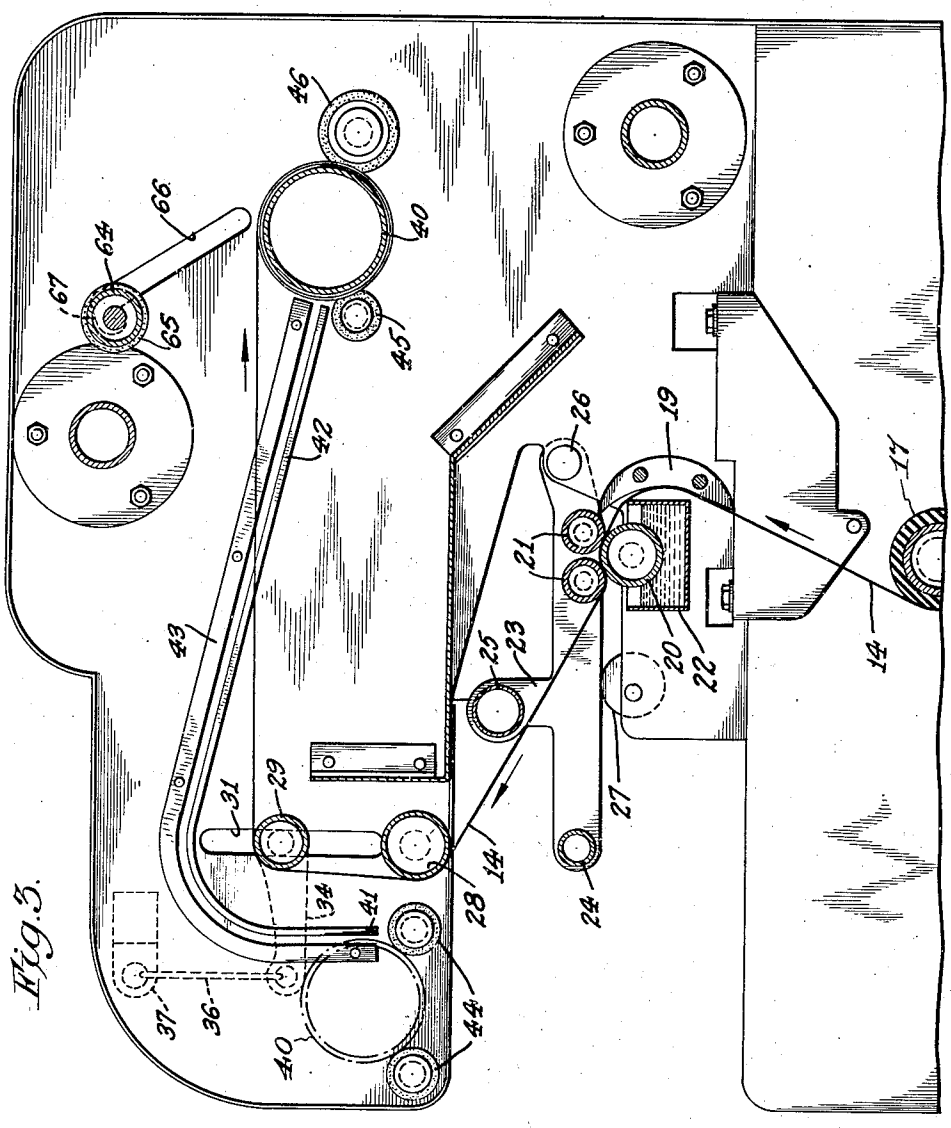


Fig. 3.

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April 2, 1946. P. B. STREICH 2,397,763

CONTINUOUS DEVELOPING MECHANISM

Filed July 29, 1943 4 Sheets-Sheet 4

Fig. 4.

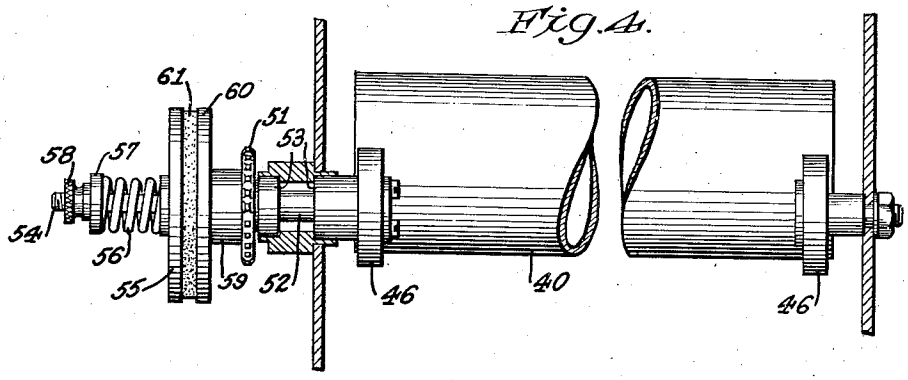
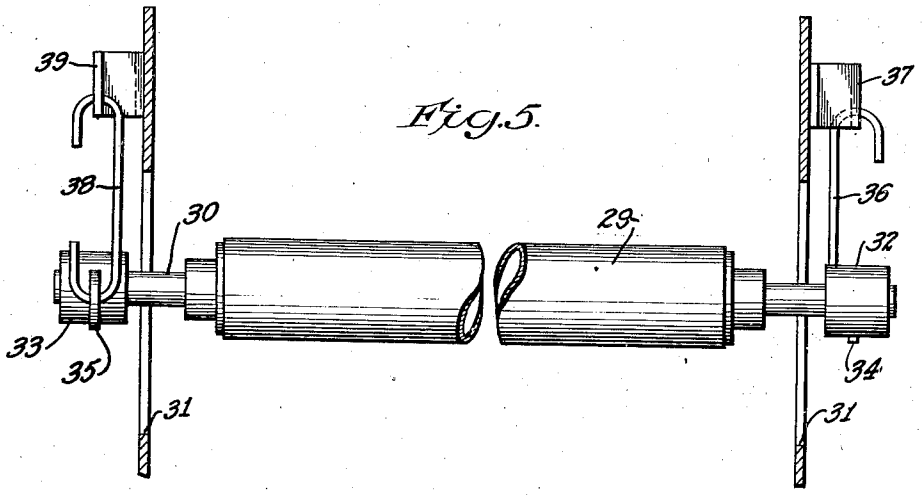


Fig. 5.



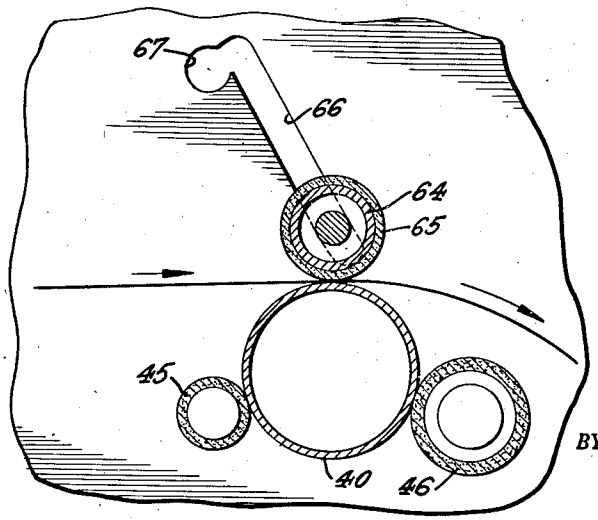


Fig. 6.

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Patented Apr. 2, 1946 2,397,763

UNITED STATES PATENT OFFICE

2,397,763

CONTINUOUS DEVELOPING MECHANISM

Paul B. Streich, Maywood, Ill., assignor to Charles Bruning Company, Inc., New York, N. Y., a corporation of New York

Application July 29, 1943, Serial No. 496,575

1 Claim. (Cl. 95—89)

The present invention relates to apparatus by means of which the development of photo-sensitive materials may be accomplished and embodies more specifically an improved developing mechanism by means of which, after the photographic printing of a sensitized emulsion, the emulsion and emulsion carrying base may be developed and handled in an improved fashion.

In the developing of sensitized papers that have been printed photographically, apparatus heretofore available has been difficult and unsatisfactory in operation in several respects, particularly where the paper being developed is generally continuous in nature rather than piecework where the paper that has been printed is fed through the machines piece-by-piece.

In continuous developing operations, the handling of the continuous web of paper that is directed through the developing machine has presented serious difficulties, and an object of the present invention is to provide a developing machine by means of which a continuous web of sensitized paper, after printing, may be developed in a fashion that enables the web to be handled with facility and in as convenient a manner as the development of single sheets.

A further object of the invention is to provide, in a machine of the above character, mechanism by means of which the exposed surface of the printed paper is continuously displayed to the operator in order that he may judge the character of the developing operation from time to time.

A further object of the invention is to provide a machine of such character that a single operator can conveniently supervise and control the developing operation carried out by the machine.

Yet another object of the invention is to provide, in a machine of the above character, an improved mechanism by means of which an equal tension is maintained transversely of the paper passing through the machine in order to eliminate crawling or creepage of the paper transversely of the machine due to irregularities in the tension transversely of the paper web.

Yet another object of the invention is to provide a mechanism of the above character wherein cut sheets may be developed as conveniently as a continuous paper stock.

A still further object of the invention is to provide a developing apparatus capable of developing single sheets or a continuous paper web, and wherein the continuous web may either be re-rolled for future trimming or discharged continuously for trimming as rapidly as it is developed.

Further objects of the invention will be apparent as it is described in greater detail in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a machine embodying the features of the present invention as above outlined;

Figure 2 is a view in transverse vertical section taken on the line 2—2 of Figure 1, and looking in the direction of the arrows;

Figure 3 is a view in transverse vertical section taken in the plane 3—3, as shown in Figure 1;

Figure 4 is a partial view in rear elevation in section showing the manner in which the wind-up roller is supported and driven;

Figure 5 is a partial view in rear elevation in section showing the manner in which the equalizing roller is mounted in order to equalize the tension transversely of the web; and

Figure 6 is a partial view in transverse vertical section showing the manner in which the continuous web is fed through the machine for cutting as it is developed.

Referring to the above drawings in greater detail, and particularly to Figure 1, the machine is shown as being provided with end frames 10 and 11 and a receiving table 12 which may be used in case single sheets are developed by the machine. Suitable control mechanism may be provided at 13, all in the accordance with established practice.

The sensitized paper 14 and tracing, or original, 15 are fed into the machine from the photographic printing apparatus by means of feed rollers 16 and 17, the tracing being removed, if necessary, by a scraper 18. The paper is then fed to curved guide fingers 19 (Figure 3) and over a developing roller 20. Feed and contact rollers 21 maintain the paper in contact with the developing roller 20 in order to develop the printed emulsion carried by the web. To this end, a pan 22 of developing solution is provided beneath the developing roller 20 in order that the devolping solution may be carried up to the web 14 by means of the roller 20. The foregoing developing mechanism is in accordance with standard practice.

The feed and contact rollers 21 are mounted upon a frame comprising end frames 23 between which bars 24 and 25 extend. The bar 24 serves as a convenient handle by means of which the rollers 21 may be lifted manually, the end frames 23 being pivoted at 26 to facilitate such operation. Cam elements 27 may be provided to oper-

ate and control the contact of the rollers 21 with the developing roller 20 in order to facilitate adjustment during operation of the machine.

From the rollers 21 the web 14 is directed over a guide roller 28, the axis of which is fixed, and then over a floating guide or tension roller 29.

The floating guide roller 29 is rotatably mounted on a shaft 30 (Figure 5), which is received within the vertical slots 31 in the end walls of the machine. The projecting ends of the shaft 30 are fixedly mounted in the hubs 32 and 33, hub 32 being provided with an arm 34 which projects forwardly of the machine, as viewed in Figure 1, while hub 33 is provided with an arm 35 that projects rearwardly of the machine, as viewed in Figure 1. Figures 2 and 3 illustrate the manner in which the arms 34 and 35 are related to the shaft 30 and roller 29. Link 36 connects the end of arm 34 to a bracket 37 carried by the stationary end wall of the machine, while a link 38 connects the end of arm 35 to a bracket 39 mounted on the opposite end wall of the machine. It will thus be seen that the roller 29 is free to rotate about its longitudinal axis and to rock in a vertical plane about its own center of gravity, a point on the longitudinal axis of the roller 29 about midway of its length. As a result, when a greater tension exists in one side of the web passing over the roller 29 than in the other side, the roller 29 is deflected downwardly on the side of the greater tension and deflected upwardly at the side of lesser tension, thus relieving the excess tension and equalizing the transverse tension along the entire width of the web. This equalizing or tension roller thus prevents sidewise travel of the web which would otherwise take place when unequal tension exists in the continuous web passing through the machine.

As the web continues to travel through the machine, it is directed to a take-up or feed tube 40. In order to facilitate operation of the machine, at the beginning of the developing of a continuous web and where the web is to be rewound after developing, the tube 40 is designed and operated in such fashion that it may be removed by the operator in order that the operator may roll the web upon the tube 40. In order to facilitate this operation, the inner side of each end frame is provided with a track formed with a vertical portion 41 and a rearwardly sloping or inclined portion 42. A buffer strip 43 is provided in order to give sufficient clearance between the tube 40 and the end walls of the machine. Supporting rollers 44 are provided immediately beneath and forwardly of the vertical track sections 41. At the start of the operation of developing a continuous web, the guide roller or feed tube 40 is removed from its rearward position and placed upon the supporting rollers 44. In such position, the web is rolled upon the tube 40 and, after the winding operation has been started, the tube 40 is rolled up the track 41 and permitted to rest upon the inclined track 42. As the developing operation continues, the tube 40 rolls down the track and falls upon the supporting and drive rollers 45 and 46, respectively.

Drive roller 46 receives power from a power shaft 47 (Figure 2) and drive sprocket 48 through a chain drive 49. The chain 49 passes over guide sprockets 50 and drive sprocket 51 (Figures 2 and 4). Drive roller 46 is secured to a drive shaft 52 which is journaled at 53 in the end wall of the machine and is provided with a threaded extension 54. A friction disc 55 is splined on the shaft 52 in order that it may be fixed against rotation with respect thereto but may travel longitudinally thereof. A spring 56, washer 57 and nut 58 serve to force the friction disc 55 to the right as viewed in Figure 4.

The drive sprocket 51 is mounted upon a sleeve 59 which is provided with a friction disc 60, suitable friction material 61 being mounted between the discs 55 and 60. Adjustment of the nut 58 thus serves to vary the tension on the spring 56 and the friction drive between the sprocket 51 and shaft 52. In this fashion, the driving forces applied to the take-up or feed tube 40 may be effectively controlled so that the proper tension is maintained in the exposed and developed paper.

The chain 49 also serves to drive the feed and contact rolls 21 through a sprocket 62 and gear train 63, as illustrated in Figure 2.

If it is desired to trim the sheets from the continuous web as the web comes from the developing machine, the tube 40 serves as a feed tube rather than a re-winding tube, and the web 14 is passed over the tube 40 and beneath a pressure roller 64 (Figures 1, 2, and 3). The pressure roller is preferably formed with flexible collars 65 and is received in inclined slots 66 formed in the end walls of the machine. The upper ends of the slots are formed with notches 67 in order that the contact roller 64 may be maintained in the position illustrated in Figures 1, 2, and 3 when the continuous web is to be wound upon the tube 40. When the web is to be fed continuously to be cut into sheets, the roller 64 is lowered into the position illustrated in Figure 6, and the web is fed through the machine in the manner indicated therein. The weight of the roller 64, together with its flexible collars or rings, causes sufficient friction on the paper to discharge it at the rear of the machine where it may be trimmed as rapidly as it is developed.

If, instead of developing a continuous roll, single sheets are to be developed, they are fed through the machine by introducing them between the developing pan and the guide fingers 19, and then removing them after they have passed over the developer roll and beneath the feed and contact rolls. Where the operation is a continuous one, the sensitized, exposed, and developed surface of the paper is always immediately before the operator's eyes as he stands in front of the machine, and he is thus afforded ample opportunity to examine the operation and make necessary adjustments in the machine from time to time.

From the foregoing, it will be seen that a developing apparatus has been provided by means of which continuous webs or single sheets may be conveniently developed and handled either for re-winding or subsequent cutting, or for continuous cutting. Moreover, the structure is such as to afford ample opportunity for inspection and control of the developing operation at all times. A further advantage of the apparatus is that sidewise creepage of the paper in the machine, due to unequal transverse tension in the web, is effectively prevented by the equalizing or tension roller.

The structure will be seen to be convenient in operation and to permit completely satisfactory operation and control by a single operator during all phases of the developing operation.

While the invention has been described to specific reference to the structure shown in the ac-

companying drawings, it is not to be limited save as defined in the appended claim.

I claim:

Developing apparatus comprising a pair of spaced apart frame members having front and rear ends, means mounted between said frame members for continuously applying a devoloping agent to a sheet of material, a roller adapted to be secured to the end of said sheet and upon which said sheet of material is to be wound, means extending between said frame members for delivering the sheet toward the front ends of said frame members, means at the rear ends of said frame members for rotating said roller to wind said sheet thereon, and substantially parallel tracks fixed to said frame members extending from the front of said frame members downwardly toward said roller rotating means, said tracks being inclined sufficiently to cause said roller to roll downwardly therealong by gravity to said roller rotating means and wind said sheet thereon.

PAUL B. STREICH.