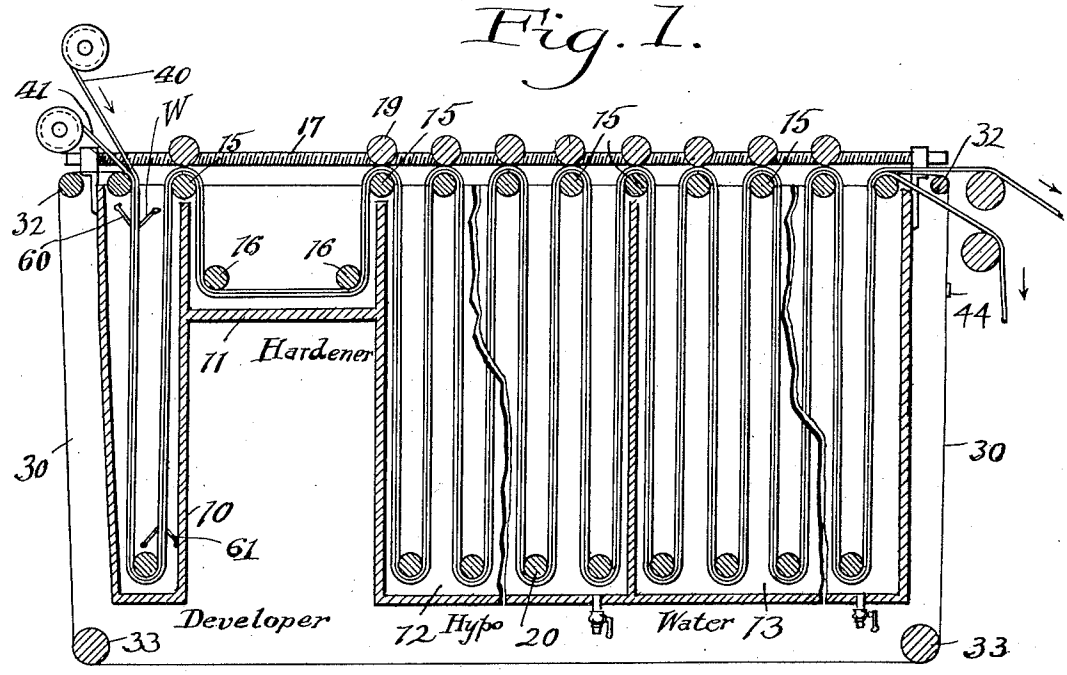
H. SHAPIRO.

PHOTOGRAPH DEVELOPMENT APPARATUS.

APPLICATION FILED APR. 17, 1918.

1,366,748. **Patented Jan. 25, 1921.**

Fig. 1.



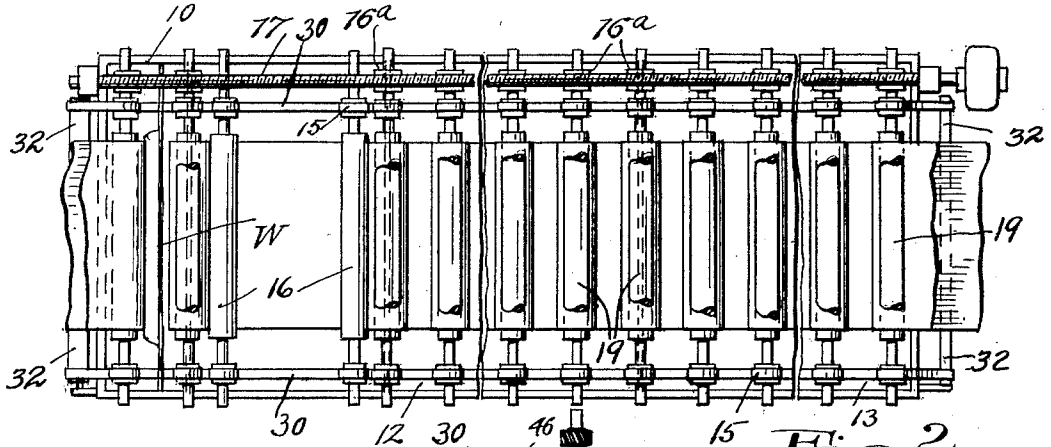
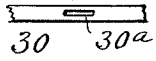


Fig. 2.

Fig. 4.



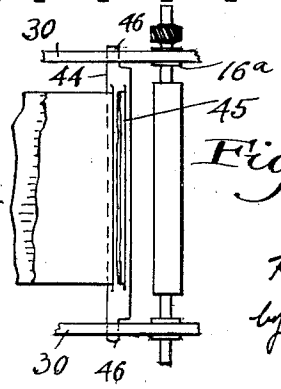
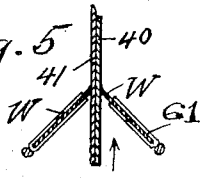


Fig. 3.

Fig. 5



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UNITED STATES PATENT OFFICE.

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PHOTOGRAPH-DEVELOPMENT APPARATUS.

1,366,748. Specification of Letters Patent. Patented Jan. 25, 1921.

Application filed April 17, 1918. Serial No. 229,186.

To all whom it may concern:

Be it known that I, HERMAN SHAPIRO, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Photograph-Development Apparatus, of which the following is a full, clear, and exact description.

The apparatus in which the present invention is embodied is one of a group of apparatuses which are especially useful for producing cheaply and on a commercial scale a multiplicity of prints of photographic enlargements.

The object of this invention is to cheaply and rapidly develop and fix the photographic prints which have been repeatedly printed by another apparatus, on long strips of sensitized paper.

More specifically, the present invention is designed so that it will continuously move two (or one) strips of photographic prints through tanks severally containing the various solutions required to develop, fix and finish the prints, and subject said prints to the action of these solutions for such actual and relative times as are required to enable them to produce the desired results on the prints.

The invention consists in the construction and combination of parts shown in the drawing as hereinafter described, and pointed out definitely in the appended claims.

In the drawings, Figure 1 is a sectional side elevation of the apparatus, Fig. 2 is a plan view thereof. In both of these views a portion of the two tanks 12 and 13 are broken away. Fig. 3 is a plan view showing the drag bar for connecting the paper strips with the belts, and Fig. 4 is a side view enlarged of one of the belts showing one of the slots therein for receiving one end of the drag bar. Fig. 5 is a sectional view of the wiper W.

Referring to the parts by reference characters, 10, 11, 12 and 13 represent a row of tanks for respectively containing the developing solution, the hardening solution, the fixing solution, and the wash water.

Arranged over the tops of these tanks are a plurality of parallel rotatable guide rollers 15. In the tanks near the bottoms thereof a like series of parallel guide rollers 20 are rotatively mounted.

The upper series of rollers are driven at the same rate. To effect this result, a worm wheel 16^a is fixed to each roller, and all of these worm wheels are engaged by a single worm 17 that may be driven at the required rate by a suitable motor.

Associated with these two series of rollers and tanks are two endless belts 30, located respectively inside of but near the front and rear walls of the tanks. Each of these runs over pulleys 18 of which two are fixed to each of the upper rollers, and under pulleys 19 of which two are fixed to each of the lower rollers. At the ends of the row of tanks, are the rollers 32 over which these belts run; and below them and in a plane below the bottoms of the tanks are other rollers 33; and said belts run under these last named rollers and under the row of tanks.

In using this apparatus for its intended purpose the end of one, or preferably the ends of two printed paper strips 40, 41, placed back to back, are made fast to a drag bar 44, which extends between and is connected to the two belts. The two rolls 33, 32, of these strips are suitably mounted adjacent that end of the row of tanks at which is the tank 10 which contains the developing solution. When after this has been done, the worm is driven the two belts will pull this drag bar, and the strips attached to it successively through the various tanks, through the same path in which the belts run. That is to say, in the particular apparatus shown the strips will go once to the bottom of a deep tank 10 containing the developer, then up and over the roller 15 above the wall which separates tank 10 from tank 11; then down into and across near the bottom of the shallow tank 11, passing under the two rolls 16 thereon; then over the roller 15 above the division wall between tanks 11 and 12, and thence down into deep tank 12. The strips will be led up and down in said tank a suitable number of times and then over the roller 15 above the division wall between tanks 12 and 13, and thence down into the deep tank 13, when it will be carried up and down a suitable number of times, being finally carried out over the roller 15 above the end wall of the tank 13.

As indicated by the broken lines on Figs. 1 and 2, the drawing does not pretend to show all of tanks 12 and 13, nor all of the

rollers 15 and 16 associated with each. What is omitted however, is a mere duplication of what is shown. In a practical apparatus the print strips should be led up and down in tank 12 about twelve times, and in tank 13 about fifteen times, more or less. This is because the print strips should be subject to the action of the fixing solution about twelve times as long as to the action of the developing solution, and about fifteen times as long to the action of the wash water. It is to be understood, however, that the relative sizes of the tanks and the number of rollers 15 and 16 associated with each may be changed as circumstances require.

When the drag bar 44 finally emerges from tank 13 the paper strips are disconnected from it, and are severally connected with any suitable take up apparatus, on which said paper strips may be severally wound.

The drag bar 44 may be merely a strip of celluloid having slits 45 through which the ends of the paper strips may be threaded, whereby the strips will be anchored to the drag bar in a satisfactory way. Each end of the drag bar is reduced in width to form tongues 46 that fit in slots 30^a in the belts.

The size of the various tanks and the number of guide rollers 15 and 20 associated with each determines the relative lengths of the periods of time during which the photographic prints will be subjected to the action of the various solutions in the several tanks while the printed slips are being drawn along as stated. The actual time during which these prints will be subjected to these solutions will be regulated by regulating the speed of the driving worm 17.

Associated with each of the rollers 15 which is at the top of the division wall between tanks is a squeezing roller 19 between which and the associated roller 15 the paper strips will be passed. These paper strips will be slightly squeezed between these rollers 19 and the associated rollers 15, and thereby the solution from which the paper strips have just emerged will be largely squeezed out of the paper strips and caused to run back into the tank in which said solution is contained.

In practice it will probably be necessary and desirable to provide a supply tank (not shown) of developing solution adjacent the developing tank 10, from which the developing solution will be slowly fed into the developing tank 10.

In order to insure that there may be no air bubbles between the two paper strips placed back to back, and remove dust and the like from the surfaces of the print strips, a pair of wipers 60 may be placed near the top of tank 10, to engage both faces of the print strips as they are about to enter the developing solution in tank 10. Another pair of wipers 61 are preferably fixed in tank 10 near the bottom thereof. These wipers may be two strips of vulcanized rubber secured to suitable frames.

Having described my invention, I claim:—

1. In a photographic developing machine, the combination of a row of tanks of different sizes, a plurality of parallel guide rollers mounted over said tanks, a plurality of guide rollers mounted in the tanks near the bottoms thereof, means to cause a strip of photographic prints to travel continuously over the upper rollers and under the lower rollers, pressure rollers above each of those rollers in the upper set over which the photographic strip passes as it emerges from the several tanks,—which pressure rollers exert downward pressure on said strip as it passes between it and the associated roller whereby to squeeze out of the paper strip and discharge back into the tank from which it came the excess solution carried by said paper strip.

2. In a photographic developing machine, the combination of a row of tanks, a plurality of parallel guide rollers mounted over said tanks, a plurality of guide rollers mounted in the tanks near the bottoms thereof, two pulleys fixed to each roller adjacent the inside of the side walls of said tanks, and other guide pulleys, and two endless belts which run over the upper pulleys and under the under pulleys and outside of the other pulleys mentioned, means to cause the continuous travel of said endless belts, a drag bar, means for attaching the end of a strip of photographic prints thereto, and means for detachably connecting said drag bar to both of said belts.

In testimony whereof, I hereunto affix my signature.

HERMAN SHAPIRO.