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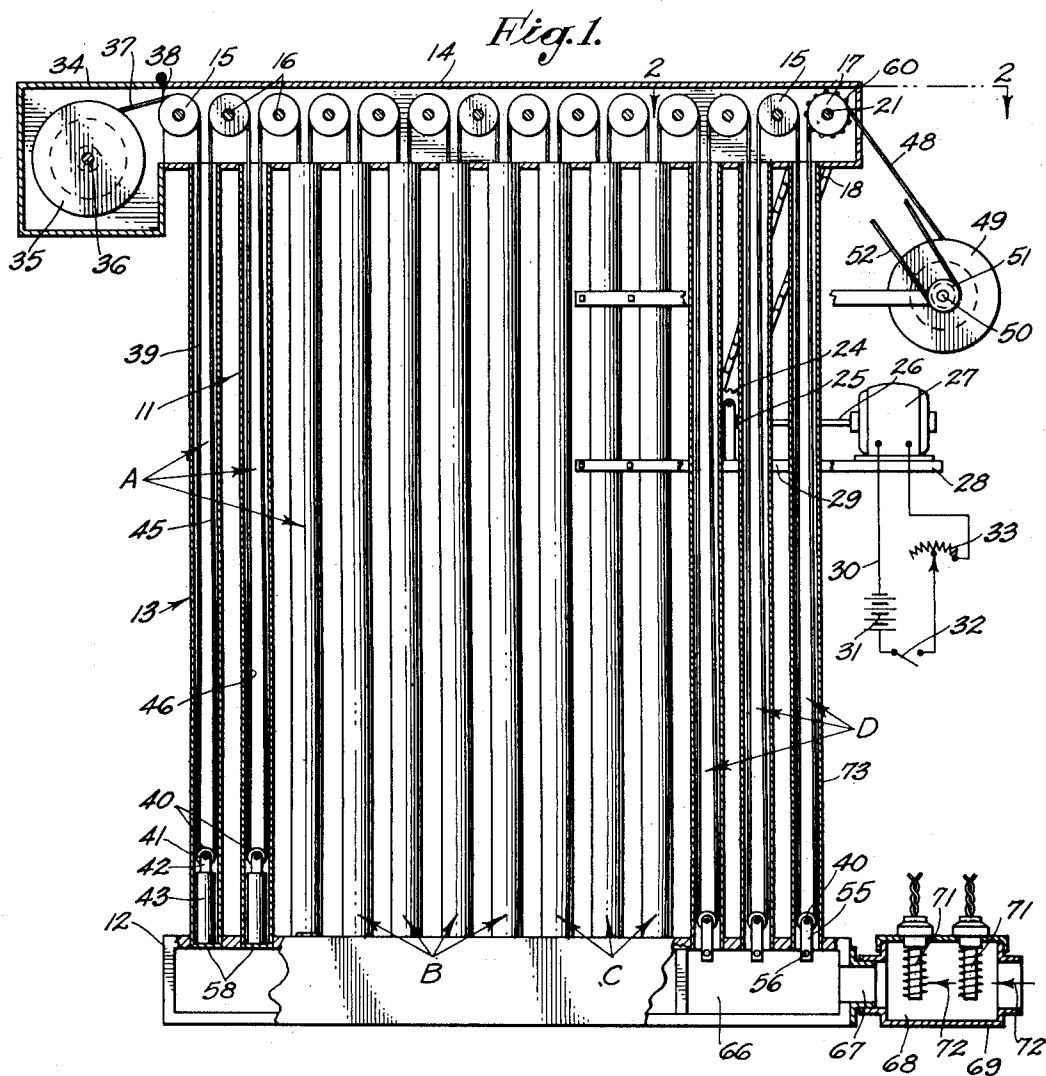
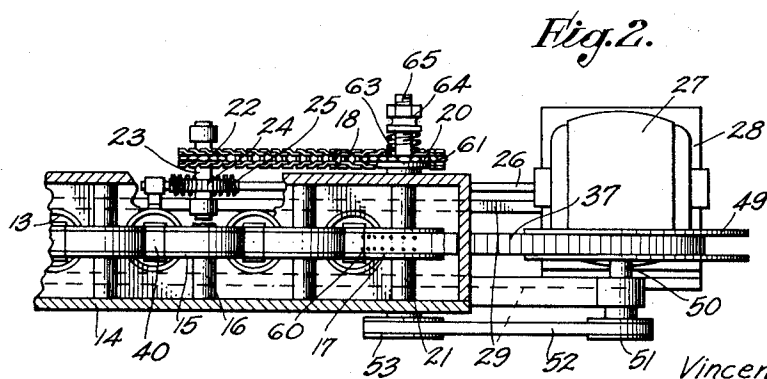
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1,946,841

TENSION OPERATED MOTION PICTURE FILM DEVELOPING MACHINE

Filed Oct. 27, 1930

2 Sheets-Sheet 1



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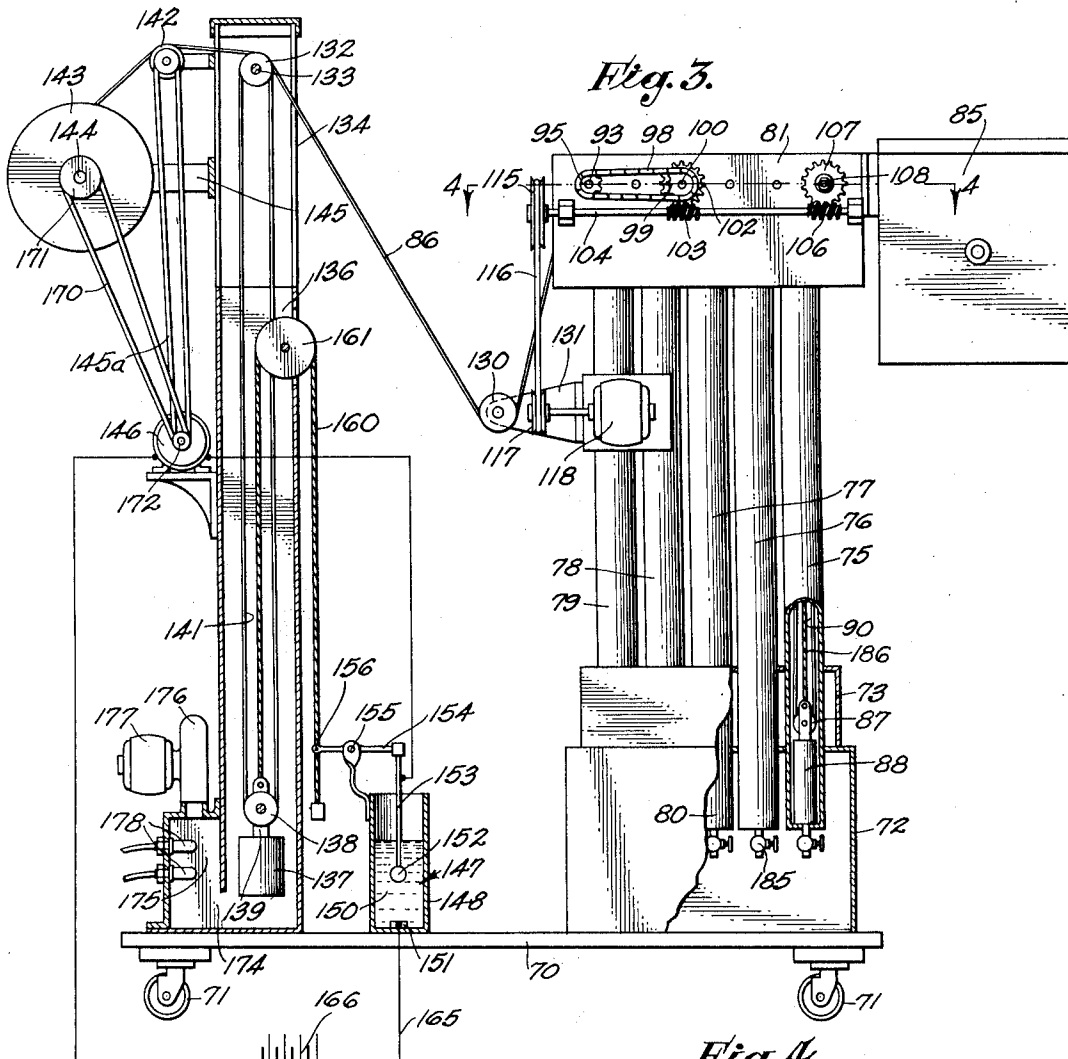
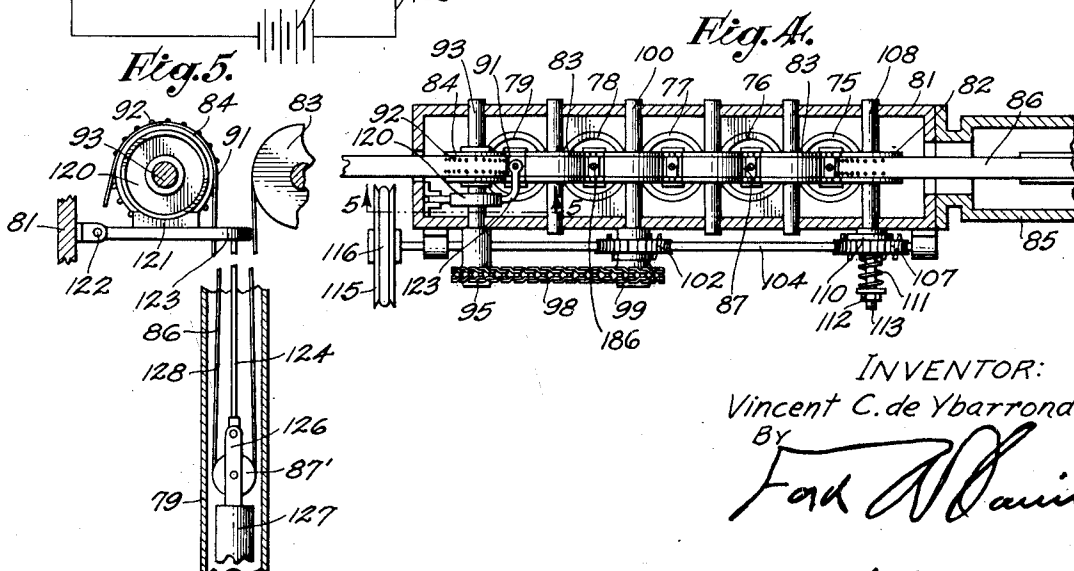
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TENSION OPERATED MOTION PICTURE FILM DEVELOPING MACHINE

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2 Sheets-Sheet 2



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TENSION-OPERATED MOTION-PICTURE
FILM DEVELOPING MACHINE

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17 Claims. (Cl. 95—94)

My invention relates to the art of treating motion-picture film, and relates particularly to a machine for developing motion-picture film.

It is an object of my invention to provide a machine having a minimum number of operating parts, which is simple and economical in construction, but which will give entirely satisfactory results.

It is a particular object of my invention to provide a film-treating machine in which film is moved through the various treating containers or treating chambers by means of a pull exerted on the end of the film leaving the machine. Within the machine the film is guided preferably by a plurality of free running rollers which do not in any way operate to move the film, but act merely as guides for keeping the film in proper position during the time it is pulled through the machine.

It is an object of my invention to provide a machine of this character in which a complete treatment of a motion-picture film may be accomplished, such a treatment being that of developing, fixing, washing, and drying a negative which has been exposed or a positive which has been printed from a negative.

The continuous motion-picture developing machines now in use have a series of treating chambers in which the treating solutions are placed, and the film is moved consecutively through the chambers by means of sprockets or drive rollers which are spaced throughout the length of the machine. As the result of investigation and experiment I have found that all intermediate drive sprockets and pulleys in a motion-picture machine may be eliminated, thereby accomplishing a marked simplification in motion-picture machine design and also an appreciable economy. I have found that the film may be continuously moved through all of the steps of a developing machine by pull or tension exerted on the end of the film leaving the machine. By such arrangement all effects and danger due to change in length of the film within the machine are overcome, and close regulation of driving speeds of different parts of the machine are avoided, thereby eliminating a great deal of supervision now necessary in the operation of such machines in keeping the various parts thereof properly adjusted, for it will be readily understood that in these previous forms of machines should the various drives become disadjusted, there is liability of the film being broken or tangled, and in either case ruined.

The film-treating machine may be used also for the various other treatments to which film is subjected, such as coloring or toning a print for a colored motion-picture.

A further object of the invention is to provide a film-treating machine having means for

limiting the tension which may be placed on the film during its travel through the machine so as to avoid the possibility of injury to the film, and it is also an object to provide a means for keeping a constant tension on the film so that it will be held taut in the guide rollers and therefore cannot scrape against the side walls of the containers in which the treating fluids are kept.

My invention is of such simple nature that in addition to having utility in standard laboratory equipment, it may be made up in portable form adapted for use on location and without the need of a specially equipped dark room.

Further objects and advantages of the invention will be made evident hereinafter.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is a partly sectioned elevational view of a film-developing machine embodying my invention.

Fig. 2 is an enlarged fragmentary section on a plane represented by the line 2—2 of Fig. 1.

Fig. 3 is a partly sectioned elevational view of a portable developing machine embodying my invention.

Fig. 4 is an enlarged section on a plane represented by the line 4—4 of Fig. 3.

Fig. 5 is an enlarged fragmentary sectional view on a plane represented by the line 5—5 of Fig. 4.

As shown in Figs. 1 and 2, my invention includes a structure 11 having a base 12 from which a plurality of tubular containers 13 project upwardly. Across the upper ends of the tubular containers 13 I place a housing 14 in which upper guide means in the form of rollers 15 are rotatively supported on shafts 16. At the rightward end of the housing 14 I mount a puller member consisting of a sprocket 17 adapted to be driven by a chain 18 which extends over a sprocket 20 frictionally mounted on the shaft 21 to which the sprocket 17 is fixed. The chain 18 extends over a drive sprocket 22 which is secured on a shaft 23 carrying a worm gear 24 adapted to be driven by a worm 25. The worm 25 is mounted on the leftward end of a shaft 26 which extends from a motor 27 mounted on a platform 28 which is supported by arms 29. The motor 27 is energized through a circuit 30 connected with a suitable source of electrical energy 31, this circuit 30 having a control switch 32 and a rheostat 33 therein.

The leftward end of the housing 14 is open and is adapted to have a magazine 34 attached thereto. In this magazine a reel or spool 35 for a film 37 to be treated or developed is held on a shaft 36. The film 37 to be treated is carried, as indicated at 38, over the first of the guide rollers 15. From this guide roller 15 the film then extends downward, as in-

5 indicated at 39, to a lower guide means 40 consisting of an idler pulley rotating on a shaft 41 secured by brackets 42 to the upper end of a weight 43. From the lower guide means 40 the film is carried upwardly through the first of the tubular containers 13, as indicated at 45, and is then conducted over the second of the upper guide rollers 15 into the second tubular containers 13 through which it extends in the form of a loop 46 similar to the loop formed in the first of the tubular containers 13, the bottom of the loop 46 being determined by a lower guide means 40 situated at the lower end of the second tubular container 13. In the lower end of each tubular container 13 a lower guide means 40 is situated. From the second of the tubular containers 13 the film is carried over upper and lower guide means 15 and 40 through the succeeding containers 13 until the sprocket 17 is reached, and the film is then carried, as indicated at 48, to a film receiver 49 which consists of a spool or reel mounted on a shaft 50 which carries a pulley 51 adapted to be driven by a belt 52 from a drive pulley 53 mounted on the shaft 21 which carries the puller sprocket 17. At the leftward end of the structure, I show weights 43 for holding the guide means 40 in operating positions at the lower ends of the containers 13, and at the right of the developing structure I show the guide means 40 held in lowered position by means of U-shaped bracket members 55, the lower ends of which extend below the lower ends of the containers 13 and receive cross-pins 56 which prevent upward movement of the bracket members 55 and the guide means 40 associated therewith.

In the developing machine shown in Fig. 1, I have employed thirteen tubular containers 13. Those indicated at A are filled to a desired level with a developing fluid. Those indicated at B are filled to a desired level with a fixative or hypo-solution. Those indicated at C are filled with a washing fluid, such as clean water, and those indicated at D are adapted for circulation of a drying fluid, such as warm air. As the containers A, B, and C are filled with liquid substances, the bottoms thereof are closed by bottom walls 58 on which the weights for holding the lower guide means 40 normally rest.

In the operation of the machine it is customary to first thread a leader strip through the machine which may be readily accomplished by raising the weights by means of cords attached thereto or by means of a rod having a hook formed on its lower end. The film 37 which is to be developed is then secured to the end of the leader projecting from the leftward end of the housing 14, the magazine 34 is secured in place, and by rotation of the puller sprocket 17 the leader is moved rightward so as to pull the film 37 through the guide means 15 and 40 over which the leader was originally threaded. The rotation of the sprocket 17 is adjusted to proper speed by the use of the rheostat 33 with the result that teeth 60 of the sprocket 17 exert a constant pull on the rightward end of the film 37, producing a continuous movement of the film through the consecutive containers 13 in which the various fluids or solutions for developing and treating the film are contained.

As shown in Fig. 2, the shaft 21 has a friction plate 61 against which the sprocket 20 is pressed by a spring 63 which is compressed by a nut 64 which screws onto the outer threaded end 65 of the shaft 21 so as to provide a means

for adjusting the friction operating between the sprocket 20 and the plate 61. By the use of this friction drive, the tension which may be exerted on the film by the puller sprocket 17 is limited to a safe value, in order to reduce to a minimum the possibility of the film being broken within the machine due to an excessive retarding effect by any of the guide means 15 or 40.

It will be noted that the base 12 has a chamber 66 at its rightward end which communicates with the lower open ends of the tubular containers indicated at D. At the rightward end of the chamber 66 is an inlet opening 67 to which an air heater 68 may be secured. This air heater 68 is in the form of a metal housing 69 having electric heating elements 71 mounted therein in such position that a flow of air from a blower will pass in proximity to the heating elements, as indicated by arrows 72. The heated air is forced into the chamber 66 and rises upwardly through the first two of the tubes D. The passage of air across the lower end of the last tube, indicated by the numeral 73, creates a suction which causes air to be drawn downwardly within the last tube. The circulation of air through the tubes D is sufficient to thoroughly dry the film so that there will be substantially no moisture thereon when the film is wound onto the film receiver 49. The belt 52 is sufficiently loose to allow slippage when the spool 49 is retarded by the enlargement of the diameter of the coil of film wound thereon. The developing machine previously described carries the film through a complete series of operations without the use of intermediate drive sprockets and thereby avoids the necessity of adjustably driving a plurality of drive sprockets. In my invention the pull exerted on the forward end of the film is carried successively through the various loops and holds the film in tension during the movement thereof through the various steps of the treatment.

The alternative form of my invention shown in Figs. 3, 4, and 5 is mounted on a truck 70 having wheels 71 so that it may be readily moved about. On this truck is a support consisting of a hollow frame structure 72 on which a base frame 73 is mounted. The base frame 73 supports in vertical position a series of tubes 75, 76, 77, 78, and 79, the lower ends 80 of which project downward into the supporting structure 72, and the upper ends of which receive a housing 81 carrying a controlling sprocket 82, idler pulleys 83, and a puller sprocket 84. The rightward end of the housing 81 is adapted to receive a magazine 85 from which a film 86, as shown in Fig. 4, is conducted into the housing and over the controlling sprocket 82, whence it extends downward through the tube 75 to a guide pulley 87 which is held in the lower end of the tube 75 by means of a weight 88. The film is then conducted upwardly from the guide pulley 87 so that a loop 90 is formed in the tube 75. The film is then conducted over consecutive idler pulleys 83 and through consecutive tubes 76, 77, 78, and 79 in the form of loops of the same character as the loop 90, each of which loops is maintained by a pulley 87 held in position of operation by a weight 88. As the film 86 leaves the last tube 79, as indicated at 91, it is carried over the puller sprocket 84 which has teeth 92 for engaging the sprocket holes of the film 86. The puller sprocket 84 is fixed to a shaft 93 having a sprocket 95 mounted thereon. From the sprocket 95 a chain 98 is carried to a drive sprocket 99 which rotates freely on the outer

end of a shaft 100 which also supports one of the pulleys 83, there being no driving connection between the sprocket 99 and the pulley 83. Secured to the sprocket 99 is a worm gear 102 adapted to be driven by a worm 103 carried by a shaft 104 which extends horizontally along the face of the housing 81. On the rightward end of the shaft 104 a worm 106 is placed in position to drive a worm gear 107 frictionally mounted on a shaft 108 to which the controlling sprocket 82 is secured. The shaft 108 has a friction plate 110 secured thereon against which the worm gear 107 is pressed by a compression spring 111 maintained in compression by an adjustment nut 112 which is threaded on the end 113 of the shaft 108. The leftward end of the shaft 104 is provided with a pulley 115 adapted to be driven by a belt 116 which extends over a pulley 117 of a drive motor 118. When the shaft 104 is rotated by the motor 118 the worm gears 102 and 107 was rotated in forward direction at equal speeds, thus causing the controlling sprocket 82 to rotate in unison with the worm gear 102 when no film or leader is threaded through the machine. Owing to the fact that the sprocket 95 is slightly smaller than the sprocket 99, as shown, the puller sprocket 84 will be driven at slightly greater speed than the controlling sprocket 82. Therefore during the operation of the machine with a film or leader in place therein, the sprocket 82 will not be driven by the worm gear 107 for the reason that the film or leader extending over the sprocket 82 causes it to rotate at substantially the same speed as the puller sprocket 84 or slightly faster than the gear 107. Therefore the sprocket 82 in combination with the frictionally applied gear 107 acts merely as a means for placing a specified or limited tension on the film at or near the point at which the film enters the developing machine. In addition to this, the sprocket 82 serves as a stabilizing means between the developing machine and the spool of film contained in the magazine 85. It will be recognized that the film is actually pulled from the magazine 85 by the puller sprocket 84.

To prevent an excess of tension being placed on the film by the puller sprocket 84 I provide an automatic control means as shown in Figs. 4 and 5, this control means consisting of a small brake drum 120 mounted within the housing 81, and a brake member 121 hinged at 122 and having an arm 123 which extends over the upper end of the tube 79. A rod 124 connects the arm 123 with a bracket 126 which extends upwardly from a weight member 127 and supports a guide roller or spool 87. Should the film 86 be retarded by any means so as to cause the loop 128 to swing and lift the weight 127, the movement of the weight 127 will be transmitted to the arm 123 and will force the brake member 121 upwardly into engagement with the brake drum 120, retarding the shaft and reducing the speed at which the puller sprocket 84 is moving the film 86. The operation of the brake member 121 in this manner will retard the puller sprocket 84 until the excess tension within the film 86 tending to raise the weight 127 is released. In this portable developing machine the tube 75 contains a developing solution, the tubes 76 and 77 contain the hypo or fixative, the tubes 78 and 79 contain water for washing the film; therefore in the group of tubes 75 to 79 a complete treatment of the film, exclusive of drying, is accomplished. In order that the film may be readily inspected as it leaves the washing step of the developing treatment I separate the dryer from the washing step of the treatment. Accordingly, as shown in Fig. 3, the film 86 is carried from an idler pulley 130 secured to a bracket 131, and thence to a pulley 132 mounted on a stationary shaft 133 in a frame 134 projecting above a drying chamber 136. In the lower end of the drying chamber I show a weight 137 having an idler pulley 138 held in the bracket 139 which projects upwardly from the weight 137. The film 86 is carried through a loop 141 extending over the pulleys 133 and 138 and is then carried over a drive sprocket 142 to a spool 143 mounted on the shaft 144 carried by a bracket 145. The sprocket 142 is driven through a belt 145a by means of a variable speed motor 146. This motor 146 is controlled by an electrolytic rheostat 147 which includes a container 148 of dielectric material in which an electrolyte 150 is contained so as to form a resistance between a stationary electrode 151 in the bottom of the container 148 and a movable electrode 152 suspended by a conductor 153 from a lever arm 154 which is pivoted at 155, and has an outer end 156 adapted to be moved in accordance with the movement of the weight 137 by means of a cord 160 which extends from the bracket 138 and over a pulley 161 secured at the upper end of the drying chamber 136. As the loop 141 is shortened and the weight 137 is raised the lever 154 is swung in anti-clockwise direction so as to raise the movable electrode 152 in the electrolyte 150. The flow of electric energy through the circuit 165 by which the motor is fed from a source of electric energy 166 causes a reduction in the speed of the motor 146 and a consequent reduction in the speed of the sprocket 142 so that the rate of speed at which the film is removed from the loop 141 will be reduced to substantially the speed at which the film enters the loop 141. By the use of this equipment the size of the loop 141 is automatically controlled so that the desired drying effect may be accomplished. The film spool 143 may be driven in the customary manner by means of a belt 170 which extends over a pulley 171 on the shaft 144 and over a pulley 172 on the shaft of the motor 146. Communicating with the drying chamber 136 through an opening 174 is an air-heating passage 175 through which air is forced by a blower 176 driven by a motor 177. Electric heater elements 178 project into the path of the air flow so as to heat the air before it is introduced into the drying chamber 136. It is to be understood that the housing 81 may be raised from the upper ends of the tubes 75 to 79 to permit access to the entry of the housing and to the upper ends of the tubes. Also access may be readily provided by making certain walls of the housing 81 removable. In order that the portable developing machine may be used in lighted surroundings, the housing is of light-proof construction and the magazine 85 is secured to the inlet of the housing in such a manner as to prevent exposure of the film to light. After the film has been developed, fixed, and washed, it is carried into the open atmosphere where the results obtained or the developing solution may be observed while the film is passing from the idler pulley 130 to the drying chamber. If the developing effects are not fully satisfactory, the developing action may be supplemented by adding additional developer to the tube 75 so as to raise the level of developing fluid through which

the film is passed, or the level of the developing fluid may be lowered within the tube 75 by drawing off fluid through a valve 185 in the lower end thereof. Also, one or more of the weights 88 by means of a cord 186 attached thereto may be raised to change the length of a loop or loops.

I claim as my invention:

1. In an apparatus for developing motion-picture film, which includes walls forming a plurality of treating chambers in consecutive arrangement, said treating chambers being adapted to contain fluids for accomplishing the complete development of a motion-picture film, the combination of: guide means for conducting a film into the first of said treating chambers; means for guiding a film through said chambers; a puller sprocket near the exit of the last of said treating chambers, having sprocket teeth positively engaging said film; and means for driving said sprocket so as to pull said film through said plurality of treating chambers.

2. In an apparatus for developing motion-picture film, which includes walls forming a plurality of treating chambers in consecutive arrangement, said treating chambers being adapted to contain fluids for accomplishing the complete development of a motion-picture film, the combination of: guide means for conducting a film into the first of said treating chambers; means for guiding a film through said chambers; a puller sprocket near the exit of the last of said treating chambers, having sprocket teeth positively engaging said film; means for driving said sprocket so as to pull said film through said plurality of treating chambers; and means for limiting the tension which may be exerted on said film.

3. In an apparatus for developing motion-picture film, which includes walls forming a plurality of treating chambers in consecutive arrangement, said treating chambers being adapted to contain fluids for accomplishing the complete development of a motion picture film, the combination of: guide means for conducting a film into the first of said treating chambers; means for guiding a film through said chambers; power driven sprocket means near the exit of the last of said treating chambers and having toothed engagement with said film, for pulling said film through said plurality of treating chambers; and means for limiting the tension which may be exerted on said film.

4. In an apparatus for developing motion-picture film, which includes walls forming a plurality of treating chambers in consecutive arrangement, said treating chambers being adapted to contain fluids for accomplishing the complete development of a motion-picture film, the combination of: guide means for conducting a film into the first of said treating chambers; means for guiding a film through said chambers; a puller near the exit of the last of said treating chambers for pulling said film through said plurality of treating chambers; and means for controlling the movement of film into said first of said treating chambers at a speed proportioned to give a desired degree of development of said film.

5. In an apparatus for developing motion-picture film, which includes walls forming a plurality of treating chambers in consecutive arrangement, the combination of: guide means for conducting a film into the first of said treating chambers; means for guiding a film through said chambers; a puller near the exit of the last of said treating chambers for pulling said film

through said plurality of treating chambers; means for controlling the movement of film into said first of said treating chambers at a speed proportioned to give a desired degree of development of said film; and means for limiting the tension which may be exerted on said film, said tension limiting means including a brake for said puller operated by the tension in said film.

6. In an apparatus for developing motion-picture film, which includes walls forming a plurality of containers for film-treating fluids adapted to perform the complete development of a motion-picture film carried therethrough, the combination of: sprocket means for controlling the movement of film into the first of said containers at a speed proportioned to give a desired degree of development of said film; guide means for guiding the film consecutively through the fluid contents of said containers, said guide means transmitting no power to said film; and means for moving said film through all of said containers by exerting tension on the film as it leaves the last of said containers.

7. In an apparatus for developing motion-picture film, which includes walls forming a plurality of containers for film-treating fluids adapted to perform the complete development of a motion-picture film carried therethrough, the combination of: sprocket means for controlling the movement of film into the first of said containers at a speed proportioned to give a desired degree of development of said film; guide means for guiding the film consecutively through the fluid contents of said containers, said guide means transmitting no power to said film; and means for moving said film through all of said containers by yieldably exerting a pull on the end of said film.

8. In an apparatus for developing motion-picture film, which includes a container for a developer, a container for a fixative, a container for a wash, said containers being placed in consecutive order, the combination of: sprocket means for controlling the movement of film into the first of said containers at a speed proportioned to give a desired degree of development of said film; guide means for guiding the film consecutively through the fluid contents of said containers, said guide means transmitting no power to said film; and means for moving said film through all of said containers by yieldably exerting a pull on the end of said film.

9. In an apparatus for developing motion-picture film, which includes a container for a developer, a container for a fixative, a container for a wash, and a container for a drying fluid, said containers being placed in consecutive order, the combination of: guide means for guiding the film consecutively through the fluid contents of said containers, said guide means transmitting no power to said film; sprocket means positively engaging said film for moving said film through all of said containers by exerting a pull on the end of said film; and a power device for driving said sprocket means at a substantially constant rate of speed.

10. In an apparatus for developing motion-picture film, which includes a structure having therein a plurality of containers for film-treating fluids adapted to perform the complete development of a motion-picture film carried therethrough, the combination of: means at the front of said structure for supporting a film; a control sprocket engaging said film so as to control its movement through the first of said containers;

means for driving said control sprocket at a substantially constant rate of speed to give a desired degree of development of said film; idle guide means for guiding a film from said support through the fluids in said containers; and a puller at the back of said structure for pulling said film through all of said guide means.

11. In an apparatus for developing motion-picture film, which includes a structure having therein a plurality of containers for film-treating fluids adapted to perform the complete development of a motion-picture film carried therethrough, the combination of: means at the front of said structure for supporting a film; a control sprocket engaging said film so as to control its movement through the first of said containers; means for driving said control sprocket at a substantially constant rate of speed to give a desired degree of development of said film; idle guide means for guiding a film from said support through the fluids in said containers; a puller at the back of said structure for pulling said film through all of said guide means; means for yieldably driving said puller so as to limit the tension which may be exerted on said film; and a film receiver for receiving said film from said puller.

12. In an apparatus for developing motion-picture film, which includes a structure having therein a plurality of elongated containers for film-treating fluids adapted to perform the complete development of a motion-picture film carried therethrough, the combination of: means at the front of said structure for supporting a film; a control sprocket engaging said film so as to control its movement through the first of said containers; means for driving said control sprocket at a substantially constant rate of speed to give a desired degree of development of said film, said driving means having cooperating parts adapted to yield under an excessive force to allow a change in the relative speed of said control sprocket; idle guide means at the ends of said containers for guiding a film from said support through the fluids in said containers from end to end thereof; a puller at the back of said structure for pulling said film through all of said guide means; and means for yieldably driving said puller so as to limit the tension which may be exerted on said film.

13. In an apparatus for developing motion-picture film, which includes a structure having therein in side-by-side order a plurality of vertical containers for film-treating fluids adapted to perform the complete development of a motion-picture film carried therethrough, the combination of: means at the front of said structure for supporting a film; a control sprocket engaging said film so as to control its movement through the first of said containers; means for driving said control sprocket at a substantially constant rate of speed to give a desired degree of development of said film; idle guide means at the upper and lower ends of said containers for guiding a film from said support through the fluids in said containers from end to end thereof; a puller at the back of said structure for pulling said film through all of said guide means; means for yieldably driving said puller so as to limit the tension which may be exerted on said film; and a brake actuated by said film and being operative to reduce the speed of said puller.

14. In an apparatus for developing motion-picture film, which includes a structure having therein in side-by-side order a plurality of vertical containers for film-treating fluids adapted to

perform the complete development of a motion-picture film carried therethrough, the combination of: means at the front of said structure for supporting a film; a control sprocket engaging said film so as to control its movement through the first of said containers; means for driving said control sprocket at a substantially constant rate of speed to give a desired degree of development of said film; idle guide means at the upper and lower ends of said containers for guiding a film from said support through the fluids in said containers from end to end thereof; one of said guide means at the lower end of one of said containers being vertically movable by said film; a puller at the back of said structure for pulling said film through all of said guide means; and means for limiting to a safe value the pull which said puller may exert on said film, said limiting means comprising a brake for said puller actuated by said vertically movable guide means.

15. In an apparatus for developing motion-picture film, which includes a container for a developer, a container for a fixative, a container for a wash, and a container for a drying fluid, said containers being placed in consecutive order, means for delivering drying fluid into said container for a drying fluid, and means for heating said drying fluid, the combination of: guide means for guiding the film consecutively through the fluid contents of said containers, said guide means transmitting no power to said film; a puller for moving said film through all of said containers by exerting a pull on the end of said film; means for yieldably driving said puller so as to limit the tension which may be exerted on said film; and means for controlling the speed of said puller, said means comprising a brake for said puller actuated in response to a change in tension of said film.

16. In an apparatus for developing motion-picture film, which includes a plurality of containers in which a treating fluid is placed, the combination of: means for controlling the speed at which said film enters the first of said containers; guide means for guiding said film through said containers, said guide means transmitting no power to said film; a puller for moving said film through all of said containers by exerting a tension on said film where it leaves the last of said containers; means for yieldably driving said puller so as to limit the tension which may be exerted on said film; and means for controlling the speed of said puller, said means comprising a brake for said puller actuated in response to a change in tension of said film.

17. In an apparatus for developing motion-picture film, the combination of: a plurality of film-treating units, each including a container and film guiding means for guiding said film through the container and not transmitting any power thereto, said containers being positioned so that said film extends through each of said containers and from one container to another; a sprocket for controlling the speed at which said film enters the first of said units; a film puller at the outlet end of said apparatus for pulling said film through all of said film-treating units, said puller being driven at a higher rate of speed than said controlling sprocket; and means for controlling the speed of said puller, said means comprising a brake for said puller actuated in response to a change in tension of said film in said units.

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