Jan. 2, 1923.

1,441,163.

F. C. MARTIN ET AL.

FILM TREATING APPARATUS.

FILED MAY 17, 1920.

2 SHEETS—SHEET 1.

FIG. 1.

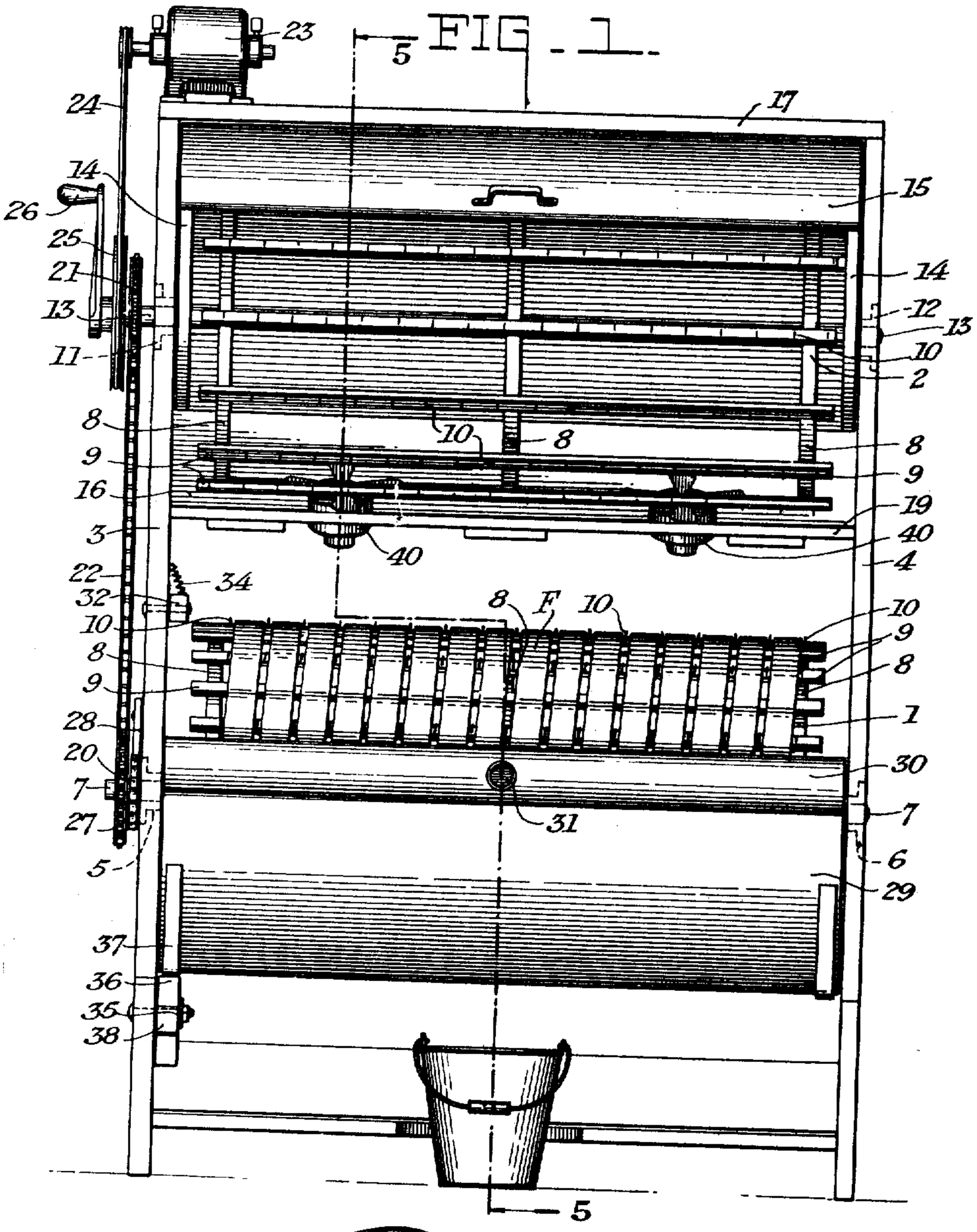

FIG. 2.

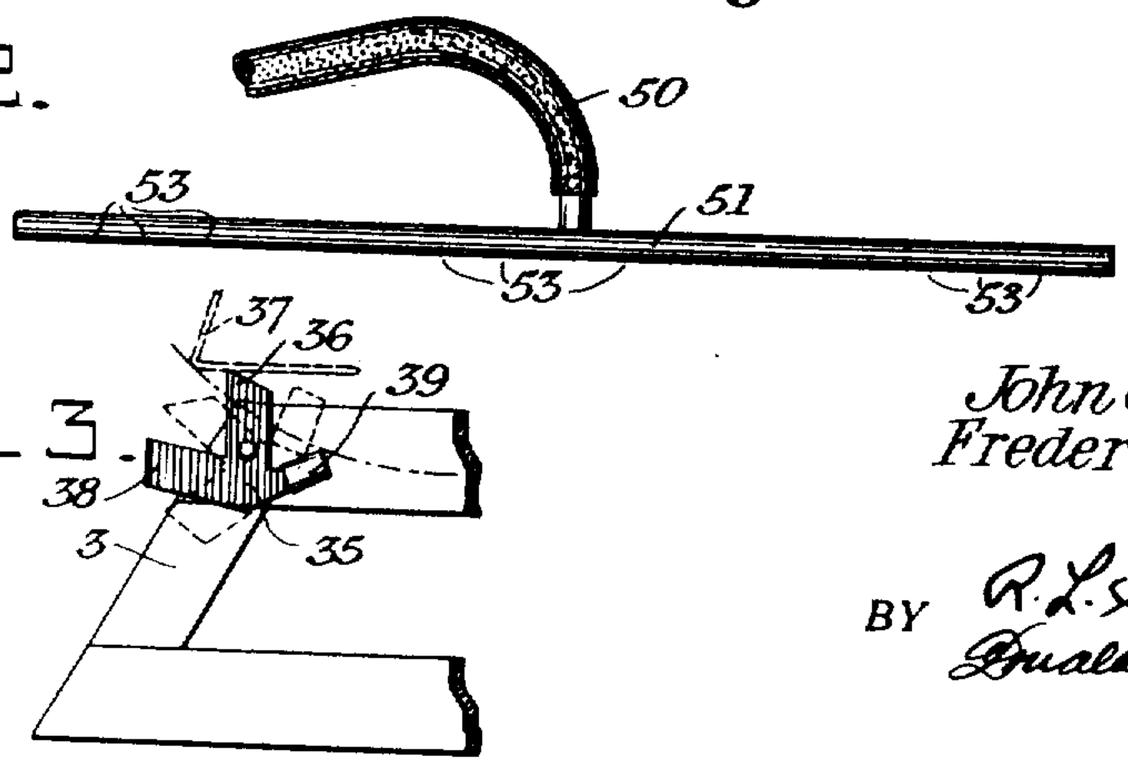

FIG. 3.

WITNESSES

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2 SHEETS—SHEET 2.

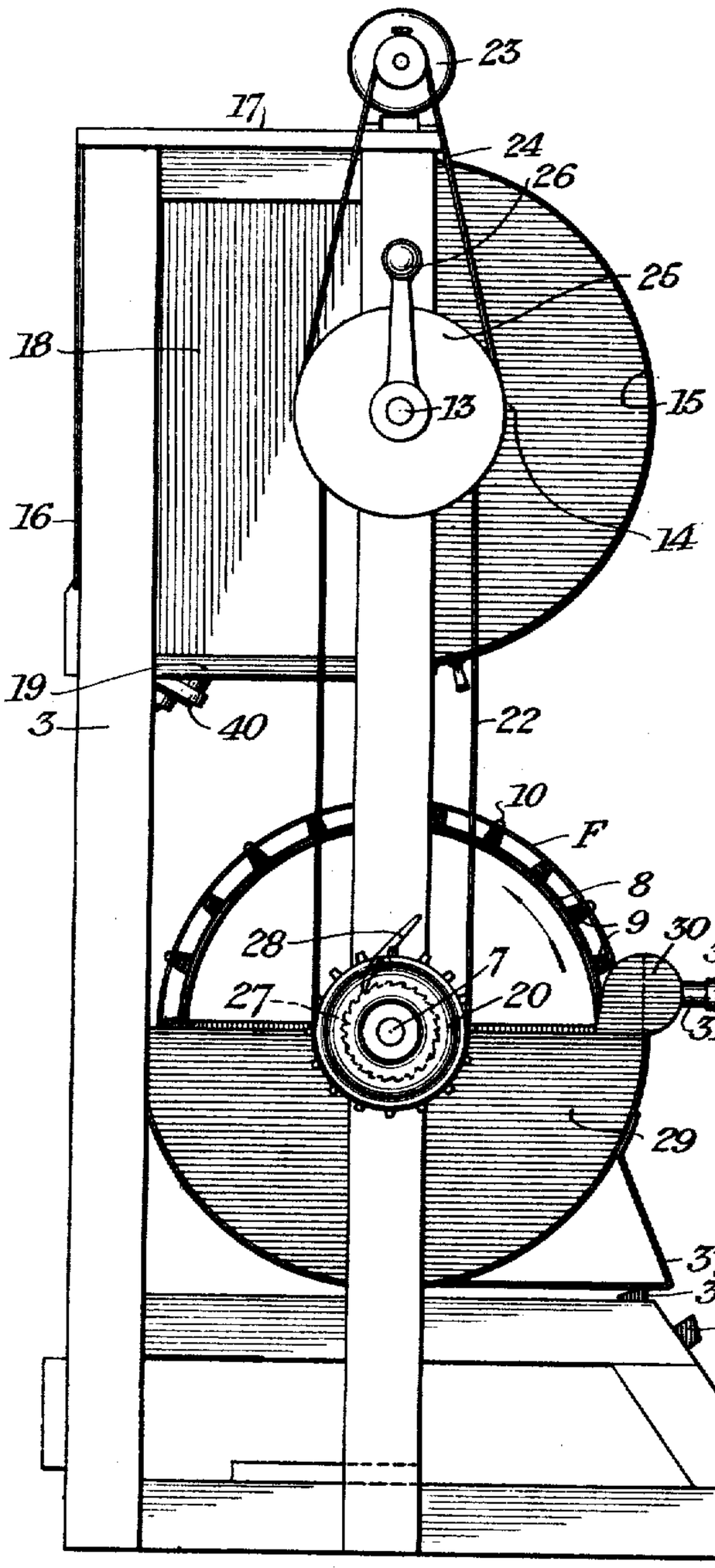

FIG. 4.

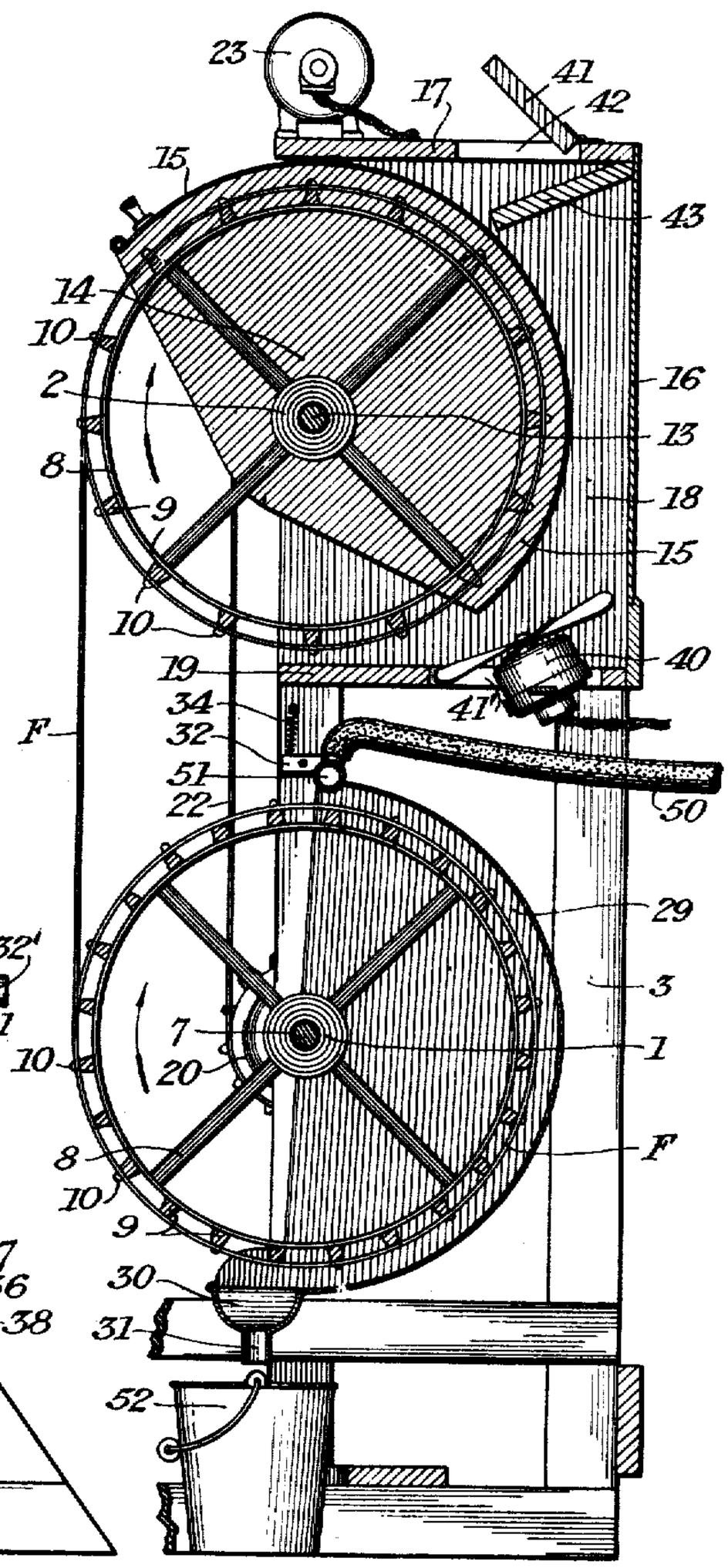

FIG. 5.

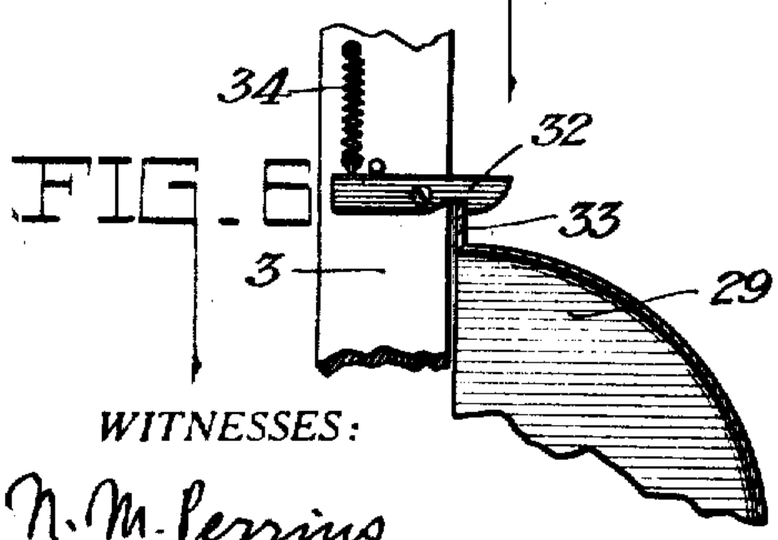

FIG. 6.

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Patented Jan. 2, 1923. 1,441,163

UNITED STATES PATENT OFFICE.

JOHN G. CAPSTAFF AND FREDERICK C. MARTIN, OF ROCHESTER, NEW YORK, ASSIGNORS TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

FILM-TREATING APPARATUS.

Application filed May 17, 1920. Serial No. 382,169.

To all whom it may concern:

Be it known that we, JOHN G. CAPSTAFF, a subject of the King of Great Britain and FREDERICK C. MARTIN, a citizen of the United States of America, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Film-Treating Apparatus, of which the following is a full, clear, and exact specification.

Our present invention relates to photography, and more particularly to machines in which a strip of photographically light sensitive material may be developed, fixed, washed, and dried.

One object of our invention is to provide a device in which a photographic film may be developed, fixed, washed, and dried without being removed from the machine, or a machine in which any one of the above mentioned treatments may be separately given to the photographically sensitive film; a further object is to provide a machine which will eliminate handling the photographic material during treatment; a still further object is to devise a tank for treatment which will use a very small quantity of solution, and one which is adapted to sweep the solution rapidly and evenly over the strip material; another object of the invention is to produce a solution measuring device which forms a part of one of the treatment tanks; and another object is to provide means for rapidly and thoroughly washing a strip of material. To these and other ends the invention resides in certain improvements and combinations of parts all as will be hereinafter more fully described, the features being pointed out in the claims at the end of the specification.

In the drawings, wherein like reference characters designate the same parts throughout,

Fig. 1 is a front elevation of a machine constructed in accordance with and illustrating one embodiment of our invention, a roll of motion picture film being shown wound on the lower reel in position for developing.

Fig. 2 is an elevation of the spraying head for washing the film.

Fig. 3 is a fragmentary elevation of the inside of the base of the machine showing the latch for holding the tank in one position.

Fig. 4 is an end elevation of the machine shown in Fig. 1.

Fig. 5 is a section on line 5—5 of Fig. 1, portions being shown in elevation for convenience, and the tank being in another position.

Fig. 6 is a detail of a latch for holding the treatment tank in one position.

This machine is particularly adapted for use in developing, fixing, washing, and drying a long strip of photographic film such as motion picture film or the long strip film used in some of the aviation cameras. The film F is first wound upon the lower reel or drum 1, in which position it is developed, fixed, and washed, and then is rewound upon the upper drum 2 where it is dried.

The machine consists in end frames 3 and 4, which have bearings 5 and 6 for a shaft 7, upon which the lower reel or developing drum 1 is mounted. This drum consists of, in the embodiment shown in the drawings, a series of wheels 8 which support slats 9 on their peripheries, the slats preferably being provided with guide pins 10. In the drawings these guiding pins are shown on every other slat, as this was found sufficient in practice to properly guide the film. This drum may also be made as shown in patent to J. I. Crabtree No. 1,225,929, May 15, 1917, if desired. On the upper part of the side frames 3 and 4 there are bearings 11 and 12 for the upper reel or drum, which in this instance is shown made of wheels 8 and slats 9 similar to the lower reel 1, except that the slats are placed farther apart. This reel is carried by a shaft 13, which also supports the ends 14 of a hood 15 which is movable into two positions. In Fig. 1 the hood is shown open and in Fig. 4 closed. A chamber is formed at the top of this machine by a rear wall 16, a top wall 17, side walls 18 and a bottom 19 which encloses the upper reel when the hood 15 is lowered, as shown in Fig. 4.

In order to revolve reels 1 and 2 the shafts 7 and 13 are provided with sprocket wheels 20 and 21 connected by a chain 22. A motor 23 on top of the developing machine provides power through a belt 24 and pulley wheel 25 affixed to shaft 13 so that the reels may be automatically rotated. If desired, the drums may be revolved by a handle 26. In the embodiment shown in the drawings

no means is shown for rotating the reels separately, but it is obvious that any skilled mechanic could provide a suitable connection for this purpose, if desired. On the shaft 7 there is affixed a ratchet wheel 27 with which a pawl 28 cooperates so that the drums can only be operated in the direction shown by the arrows in Fig. 5.

The treatment tank 29 which is mounted so as to revolve about shaft 7 has a trough 30 affixed to its outer edge, there being an outlet 31 to the trough, which is provided with a cap 32′ for controlling the flow of liquid therefrom. A tap or spigot may be used in place of the cap. This trough is made so as to contain when in the position shown in Fig. 5 the proper quantity of fluid for developing one reel of film. A latch 32, see Fig. 6, is adapted to engage a flange 33 of the tank 29 so as to hold it in the position shown in Fig. 5. There is a spring 34 for actuating this latch. A second latch 35, best shown in Fig. 3, is provided for holding the tank in the position shown in Fig. 1, the arm of the latch 36 contacting with the bracket 37 attached to the tank 29. This latch is provided with an operating end 38 and a second arm 39, which operates in the following manner: When the latch 32 is released tank 29 swings about its shaft 7 until the bracket 37 passes the end of arm 36, which will swing back to the position shown in Fig. 3 so as to hold the tank in position for developing. The operating end 38 can be depressed, thereby releasing the bracket 37 from arm 36. As bracket 37 swings it will strike arm 39 which will move the latch from the position shown in dotted lines to the position shown in full lines in Fig. 3, so that it will be in position to hold the tank when it is again swung forwardly.

The film is washed while still on reel 1 by means of water entering through the tube 50 into the pipe 51, which is perforated at 53, forming a spraying head. Pipe 51 is fastened along one edge of tank 29, so that water sprayed from the openings 53 will come in contact with the film F as reel 1, upon which the film is wound, is revolved. When used for washing, tank 29 is in the position shown in Fig. 5, the water being sprayed on the film and being thrown off by the centrifugal force of the rapidly revolving drum against the bottom of tank 29, from which it drains through trough 30, and out of the tap 31 into a bucket 52 or other convenient receptacle.

In order to dry the film, electric fans 40 are provided in the bottom wall 19 of the top chamber. A door 41 is hinged to the top wall 17 of this chamber, so that the air is carried in past the fan opening 41′ against the revolving film on reel 2 and out of the opening 42 in the top. There is a baffle plate 43 inside of the top of this chamber to cause the air circuit to pass between the spiral wound film and to also catch dust or dirt which may drop through door 42.

The operation of the machine is as follows: The end of a reel of film to be developed is attached by a convenient clip to one end of the drum 1, which is then slowly revolved as the film is guided between the pins 10. The end of the film strip may be fastened by a clip to one of the slats. Having the tank 29 in the position shown in Fig. 5 with the cap 32′ closing the outlet 31, the developing fluid is poured into the trough 30, which measures the necessary amount of fluid. The motor is then started, so that the drum will be rapidly revolved as the catch 32 is released. This causes tank 29 to swing about shaft 7, giving an even sweep of the developing fluid from trough 30 across the face of the rapidly revolving film. This action evenly saturates all of the film in a very short time, so that no preliminary dampening is necessary to avoid uneven development. The tank is held in a developing position, as shown in Fig. 1, by the latch 36. The cap 32′ is then removed so that as soon as the development is completed the operator by pressing down on the arm 38 of latch 35 will allow the tank 29 to swing back into the position shown in Fig. 5, so that the developing fluid will be discharged through the tube 31. If desired, the film may be washed a short time, although this step is not essential, and then the tank swung back to the position shown in Fig. 1 for fixing. After this step, the tank is again swung to its initial position and the film is washed by spraying water on the rapidly revolving film through tube 50 and the spraying head 51, as best shown in Fig. 5. After the washing is completed one end of the film F is attached by any convenient means to the reel 2. As the reels are revolved together the film F will be unwound from reel 1 and wound upon reel 2 in an even spiral, there being preferably guide pins 10 on the upper reel similar to those on the lower. The hood 15 is then closed, as shown in Fig. 4 and the fans put in motion, the film being at the same time revolved by the drum 2.

It will be seen by the foregoing description that with our machine a long strip of film can be conveniently put through the various fluid treating steps and then dried without the necessity of the operator touching the sensitive surface of the film. By using concentrated solutions the steps of developing and fixing can be very quickly completed and after rapidly washing the film it can be dried upon the upper reel in a short time by means of the forced air circulation.

By drying one reel of film while another is being treated by the various solutions, many rolls of film can be developed, fixed, washed and dried in a short time.

It will be obvious to those skilled in the art that many changes can be made in the mechanical details of construction of our machine without departing from the principle which we have invented.

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

1. In a photographic film treating machine, the combination with a stand, and a tank mounted to swing on the stand, of a film support carried by the stand and extending into the tank, and means carried by the tank for flowing a solution over the film as the tank is moved.

2. In a photographic film treating apparatus, the combination with a supporting stand, of a tank mounted to swing on the stand into two positions, a film support carried by the stand and extending into the tank, and means carried by the tank for measuring the necessary quantity of a treatment bath when the tank is in one position, said means automatically emptying the bath into the tank when the tank swings from that position.

3. In a photographic film treating apparatus, the combination with a supporting stand, of a tank mounted to swing on the stand to and from a solution holding position, a film support carried by the stand, and extending into the tank and means carried by the tank for measuring the necessary quantity of a treatment bath, said means automatically flowing the bath across the film as the bath is passed from the measuring means into the tank, as said tank approaches the solution holding position.

4. In a film treating apparatus, the combination with a frame, of a film support carried by the frame, a tank partially surrounding the film support, said tank being also supported by the frame, there being a trough fastened along one edge of the film tank, and means for spraying water upon the film from the opposite edge of the tank, the wash water draining from the film through the trough.

5. In a photographic film machine, the combination with a frame, of a film reel carried by the frame, and a tank mounted to swing upon the frame and about the film reel into solution holding and solution discharging positions, a solution trough affixed to the tank at an angle thereto, the solution trough receiving solution from the tank when the tank is in a solution discharging position and discharging solution into the tank as the tank is swung into a solution receiving position.

6. In a photographic film treating apparatus, the combination with a stand, of a tank mounted to swing on the stand into two positions, a measuring trough affixed to the tank at substantially right angles thereto, and means on the stand for holding the tank in one position wherein the measuring trough will hold a solution, and means on the stand for holding the tank in the other position in which the tank will hold the solution.

7. In a photographic film developing apparatus, the combination with a stand, of a tank mounted to swing on the stand, the tank swinging into two positions, a measuring device carried by the tank, and two latches on the stand, one for holding the tank in a position in which the measuring device will hold fluid, the other holding the tank in a position in which the tank will hold fluid, the fluid in the measuring device being transferred to the tank as the tank is swung between the two latches.

8. In a machine for developing, fixing, and washing films, the combination with a supporting frame, of a film drum carried by the frame, a tank mounted to swing about the drum into a solution carrying and into a solution discharging position.

9. In a machine for developing, fixing, and washing films, the combination with a supporting frame, of a film drum carried by the frame, a tank mounted to swing about the drum into a solution carrying and into a solution discharging position, a solution trough carried by the tank, and a vent in the solution trough, said vent being adapted to discharge the solution from the tank when the tank is in the second mentioned position.

10. In a machine for treating photographic strip material, the combination with a frame, of a solution tank mounted to swing on the frame, a film drum mounted to revolve in the tank, a sprinkling head, the tank being adapted to be swung into one position for holding fluid for treating the film and into another position for collecting the wash water sprayed through the sprinkling head upon the film.

11. In a photographic film treating device, the combination with a stand, of a shaft supported by the stand, a film reel mounted on the shaft and a tank mounted to swing on the film reel supporting shaft.

12. In a film treating apparatus, the combination with a stand, of two shafts revolubly mounted upon the stand, means for connecting the shafts together, and means for imparting motion to the shafts, film supporting drums mounted on the shafts, one drum for holding the film for liquid treatment and the other for holding the film for drying, the film being automatically wound from one drum to the other by the shaft rotating mechanism.

13. In a film treating apparatus for developing, fixing, washing and drying strips of film in rapid succession, the combination with a stand, of two shafts mounted revolubly upon the stand, a motor operably connected to the shafts, and film drums sup-

ported upon the shafts, one drum being suspended in a solution treating tank, the other drum being enclosed in a drying chamber, means including the motor for changing the film from the drum suspended in the treatment tank to the drum mounted in the drying chamber, said means also operating the drums to simultaneously treat one film with solutions, while another film is being dried.

Signed at Rochester, New York, this 12th day of May, 1920.

FREDK. C. MARTIN.
JOHN G. CAPSTAFF.