

PATENT SPECIFICATION



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211,918

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COMPLETE SPECIFICATION.

Improvements in or relating to Liquid Treatment of Cinematograph Films.

We, TECHNICAL MOTION PICTURE CORPORATION, a corporation organized under the laws of the State of Maine, United States of America, of 110, Brookline Avenue, Boston, Massachusetts, United States of America, LEONARD THOMPSON TROLAND, JOSEPH ARTHUR BALL and JARVIS MELVIN ANDREWS, all citizens of the United States of America, and all of the above address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the liquid treatment of photographic films, particularly cinematographic films, and specifically to that mode of treatment in which only one side of the film is treated at a time. In making color-picture films, for example, in which a series of pictures representing one color aspect are carried on one side of the film and a complementary series representing another color aspect is carried on the other side of the film, it is frequently desirable to treat the opposite sides of the film separately and differently as, for example, by staining one side a reddish color and the other side a greenish color.

The object of the invention is to provide a method and apparatus for treating one side of a film independently of the other side with rapidity and uniformity, without injury to the film, and without affecting the other side of the film. Another object is to provide a method and means for automatically restoring a film to normal position in the event that the film tends to submerge on one side as the result of a wavy edge such as films frequently have.

According to the present invention the film is passed along the surface of a body of liquid in such manner that it is sup-

ported solely by the liquid without the aid of any auxiliary supports, thereby avoiding the difficulty of maintaining the liquid at a definite predetermined level relatively to the supports and also avoiding friction and scratching of the film by the supports. While this has heretofore been considered impossible in the case of the thin and tenuous liquids such as are used in treating cinematographic and other photographic films, and where the liquid has a relatively low surface tension, we have discovered that it is not only possible but highly practicable.

In one aspect the invention involves maintaining the film substantially flat and thereby restraining it from contacting with the liquid on its upper side and, where the film is supported by floating, preventing it from sinking, by making the film multi-ply. For example, if two films are properly secured together back-to-back with the coatings on the outer sides, the resulting double film will have less tendency to curl and buckle, even when only one side is wet, presumably for the same reason that a multi-ply board or cardboard has less tendency to warp and curl than a single ply piece.

In another aspect the invention consists in aiding the flotation of the film by making the film water-repellent at the sides, preferably from the extreme edges inwardly to lines extending longitudinally of the film slightly inside the sprocket holes. One way of rendering the marginal portions of the film water-repellent is to make the celluloid support bare and clean throughout such portions. This is preferably accomplished by dissolving off the unexposed gelatine emulsion and thoroughly washing the film, thus leaving the celluloid perfectly bare and clean outside the lateral edges of the images which are slightly inside

[Price 1/-]

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the rows of sprocket holes. The unexposed portions may be dissolved off without affecting the images between the rows of sprocket holes by first hardening the gelatine throughout the exposed image spaces in known manner. The marginal portions of the film may be rendered even more liquid-repellent by a coating which is not readily wet by aqueous solutions, such as stearic acid wax.

In order to illustrate the invention, one concrete embodiment is shown in the accompanying drawings, in which,

Fig. 1 is a side elevation of a complete machine;

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged plan, viewed from line 3—3 of Fig. 1 of a portion of the drying chamber showing the drying-air feed-pipe in cross section;

Fig. 4 is an enlarged sectional view of the liquid trough, showing a film floating upon the surface of the liquid within the trough;

Fig. 5 is a view similar to Fig. 4 showing the action of the film and the liquid when the former becomes displaced;

Fig. 6 is a longitudinal sectional view of the liquid trough and general assembly of the lower portion of the apparatus, the central portion of the trough being cut away;

Fig. 7 is a detail section of line 7—7 of Fig. 6, showing surface liquid removing means;

Fig. 8 is a sectional view on the line 8—8 of Fig. 1, showing in elevation the means for drawing the film through the machine;

Fig. 9 is a sectional view on the line 9—9 of Fig. 6 showing in elevation the devices for applying the liquid repelling substance to the edges of the film;

Fig. 10 is a detail vertical sectional view through one of the devices shown in Fig. 9; and

Fig. 11 is an enlarged cross section of a film such as above described (in which S and S¹ are the two celluloid strips cemented together and R and R¹ are the images carried by the respective strips).

The specific embodiment of the invention chosen for purpose of illustration comprises a base 11 to which are fastened U-shaped supporting uprights 12 connected by cross members 13. These upright and cross members are preferably made in one piece. Upon the cross members 13 is supported an elongated drying chamber 14 enclosed on the top, bottom and sides and open at the ends. Within the drying chamber and mounted in U-shaped supports 15 are rollers 16 consisting of a central drum 17 with

shoulders 18 of greater diameter than the drum and beyond these guide flanges 19 of still greater diameter. When the film is fed through the drying chamber after the liquid treatment the edges of the film rest upon the shoulders 18 so that the moist face of the film cannot contact with the drum 17. At one end of the drying chamber is a pipe 20 through which warm air is forced into the drying chamber through the side openings 21.

Supported upon the base 11 by blocks 22 is a broad U-shaped trough 23 shown in cross-section in Fig. 2. Within the trough 23 is mounted the elongated shallow trough 24 for the liquid treatment of the film (Fig. 4). The trough 23 serves as a means for taking care of accidental overflow from trough 24, pipe 23¹ (Fig. 6) being arranged to carry away this overflow. The trough 24 has upwardly flaring or diverging sides 25 which extend above the level at which the liquid is constantly maintained. The distance between the sides 25 at the level of the liquid is slightly greater than the width of the film A to be treated. The trough 24 may be supported at intervals upon legs, or as shown in Fig. 4 it may be stamped from a single sheet of metal.

At one end of the troughs 23 and 24 are the triangular supports 26, one being located upon each side of the troughs as shown in enlarged scale in Fig. 6. These triangular supports are connected together by a rod 27 upon which is mounted guide roller 28 similar in construction to guide rollers 16. At the apex of the triangular support are registering holes 29 serving as bearings for a shaft 30 forming a portion of the carriage 31 which comprises side arms 32 connected by rods 33 upon which are rollers 34 and 35. In order to hold the carriage 31 in adjusted position the triangular supports are provided with binding screws acting upon the shaft 30.

At the opposite end of the treatment tank are brackets 36 extending upwardly from the base 11. These brackets are connected by rods 37 and 38 upon which are mounted respectively plain roller 39 and guide roller 40. Supported between rods 37 and 38 by means of attachment members 41 is a block 42 shown in detail in Figs. 6 and 7. This block acts as a means for removing the excess liquid from the film as the latter issues from the treatment trough. The means for removing the excess liquid comprises a transverse nozzle 43 fast at the lower portion of the block and allowing space through a recess in the block for the passage of the treated film above the nozzle. The nozzle has an elongated slot

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44 directed at an angle of approximately 45° toward the film as it issues from the treatment trough. A pipe 45 connects the nozzle with any suitable source of compressed air. The portion of the block 42 directly above the film has a hollow chamber 46 shown in Fig. 7 with openings into the recess in which the film travels directly above the sprocket holes in the film. Threaded into the chamber 46 is a pipe 47 to which there is a connection from a suction pump. The blast of air from the slot in the nozzle below the block cooperates with the suction means above the film to completely remove all liquid from the sprocket holes of the film, and also sweep the lower portion of the film which has been treated clear of surface liquid.

Suitable means for applying a liquid repelling substance to the edges of the film are shown in detail in Figs. 9 and 10. The substance applied by this device is stearic acid wax, although other substances, *e.g.* paraffin, may be used. Removably clamped to the side arms 32 of the carriage 31 by means of set screws 48 are bracket arms 49 extending inwardly and over the edges of the film in proximity to roll 34. The outer ends of bracket arms 49 support tubes 50 containing pistons 51 urged downwardly by springs 52, the tension of the latter being regulated by hand screws 53. A stick of wax 54 is placed in the lower end of the tube 50 and held in frictional contact with the edges of the film by the spring-pressed piston 51. The application of wax or the like is particularly desirable prior to treating the second side of a film as the tendency for the liquid to flow over the top is sometimes greater if the upper surface has already been treated.

At the right-hand end of the device as seen in Fig. 1, and supported above the base 11 by members 55 similar to supports 12, is a table 56 upon which is mounted the means for drawing the film through the machine. This means is shown in detail in Fig. 8, and comprises a main shaft 57 supported in bearings 59 and provided with sprocket wheels 58 which cooperate with the sprocket holes on the sides of the film. The shaft 57 has keyed upon its central portion a worm gear 60 meshing with a worm 61 upon a shaft 62 mounted transversely of shaft 57 and below the same. Shaft 62 is driven through pulley wheel 63 from any suitable source of power. Upon the end of shaft 57 opposite to the end of the sprocket wheels is the driving member 64 comprising a large pulley wheel 65 and a smaller pulley wheel 66. Suspended below table 56 is a bracket sup-

port 67 having an elongated bearing 68 for a shaft 69 arranged in parallel relation to shaft 57. Shaft 69 has a projecting end directly below sprocket wheels 58 over which a film reel is adapted to be placed, upon which the film, after being treated and dried, is adapted to be wound. In order to turn the drum at a proper speed to take up the film, the opposite end of shaft 69 is provided with driven member 70 comprising smaller pulley wheel 71 directly below pulley wheel 65 and pulley 72 directly below pulley 66. Driven member 70 is loose upon shaft 69 but is held by springs 74 in frictional contact with disc 73 keyed to shaft 69. The tension of spring 74 is regulated by collar 75 held in adjusted position on shaft 69 by screw 76.

The operation of the device is as follows: A reel of film is placed upon the bracket support 77 which is suspended from the base 11. The film in this reel is threaded upwardly through an opening in the base 11 over the guide roller 27, then upwardly over roller 34 under the wax ends 54, over roller 35 and then downward the length of the treatment trough 24, the film resting upon the surface of the liquid and being supported thereby. The film is drawn along the surface of the liquid, threaded upwardly under roller 39 through the recess in the surface liquid removing block 42 under guide roller 40, up through a slot in the drying chamber 14 over the guide rollers 16, throughout the length of the drying chamber over the sprocket wheels 57, the sprocket teeth being registered in the sprocket holes of the film, and down around an empty film reel upon the extremity of shaft 69, the take-up reel being driven by a belt (not shown) over pulleys 65—71 or 66—72. Since it is impossible to arrange for the slight variation in proportion between the speeds of shafts 57 and 69 in reeling up the film, a provision is made for slip between the driven member 70 and shaft 69, comprising arranging the driven member 70 loosely upon shaft 69 but in spring-pressed frictional engagement with the collar 73.

A feature of the invention consists in the upwardly flaring sides of the liquid trough and the slight clearance between the edges of the film and the sides of the trough when the film is floating normally. If the liquid creeps over the edge of the film, as a result of curling or buckling, thereby submerging one side of the film, the submerged edge engages the inclined side and by virtue of the inclination the other side is caused to ride up the opposite inclined side, the

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film assuming a position such as shown in Fig. 5. Owing to the surface tension acting on the tipped-up side the film is either restored to normal position or restrained from being submerged except in the immediate region of the curl or buckle.

In forming the relief images the marginal portions of the gelatine or other colloid material are completely removed in the hot-water etching bath, the marginal portions being unexposed. Thus the gelatine or other colloid material in which the images are formed terminates short of the marginal edges of the film and indeed is confined to the space between the series of marginal registering openings (Fig. 11). This is important in coloring the relief images inasmuch as pigment solution can be applied to one side with little or no tendency to creep around the edges of the film to the opposite side by virtue of bare celluloid margins.

We are aware that it has been proposed to pass a film over the surface of a liquid by mechanically supporting the

film at recurrent intervals. It has also been proposed to wax the margins of a film for protective and lubricative purposes but so far as we are aware no one has used this expedient in floating film.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

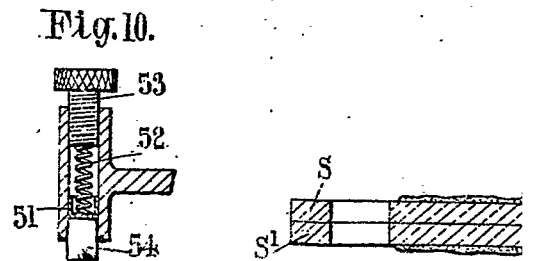
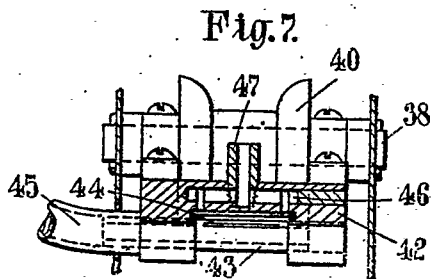
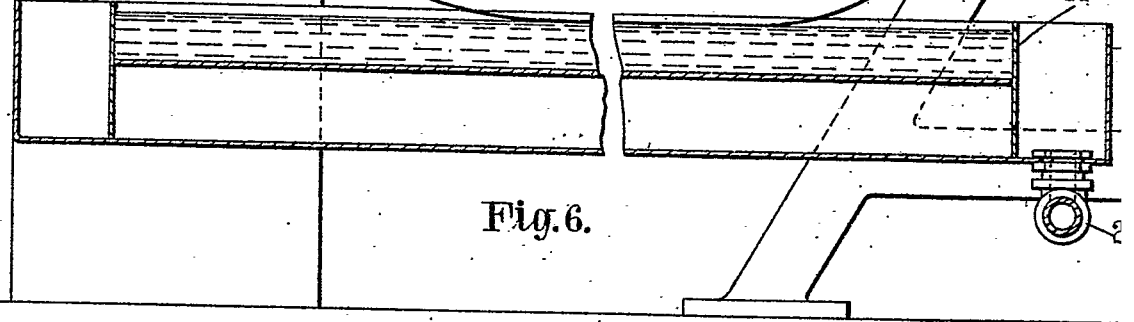
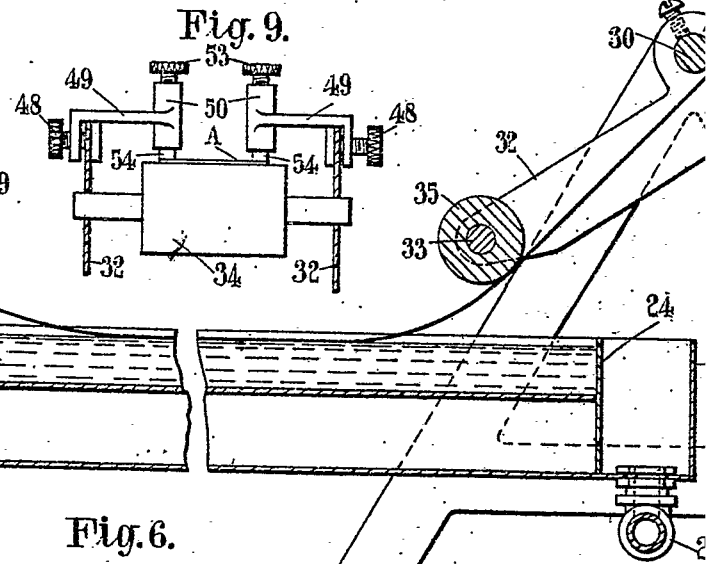
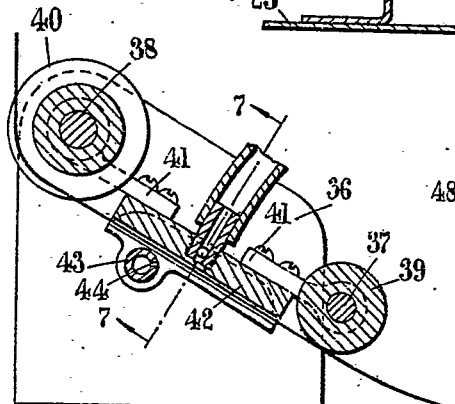
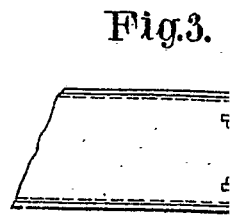
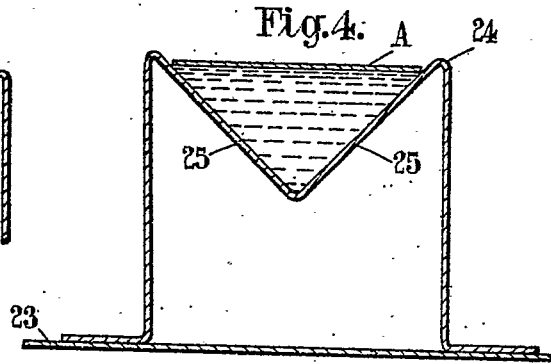
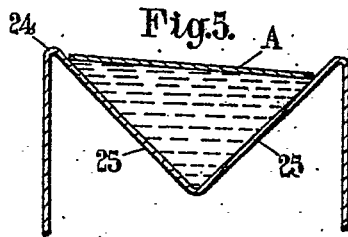
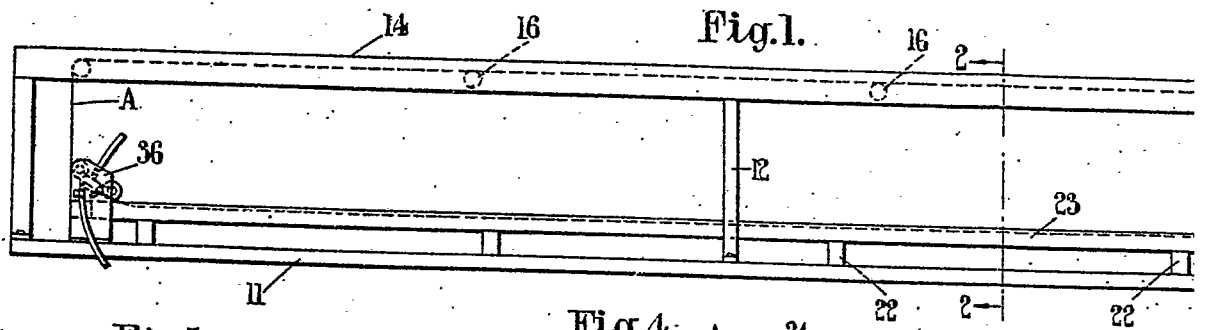
1. The method of preparing a roll of photographic film which comprises moving the film over a body of liquid in surface contact therewith to treat one side of the film without submerging the film, the film being normally supported solely by the liquid, substantially as described.

2. The method of preparing a roll of photographic film according to Claim 1 characterized by rendering the margins of the film liquid-repellent before passing the film over the surface of the liquid.

Dated this 31st day of October, 1922.

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[This Drawing is a reproduction of the Original on a reduced scale]



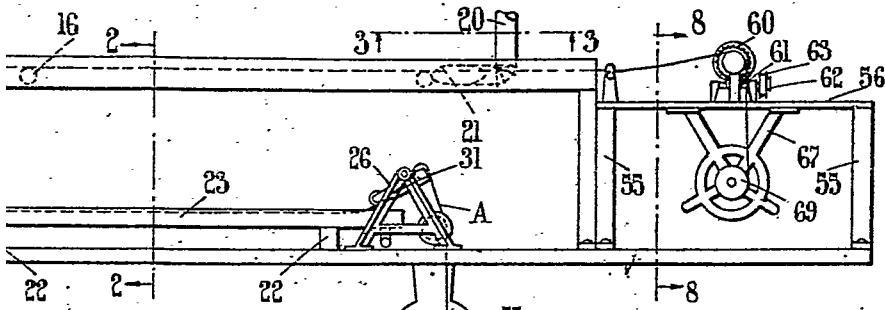


Fig. 3.

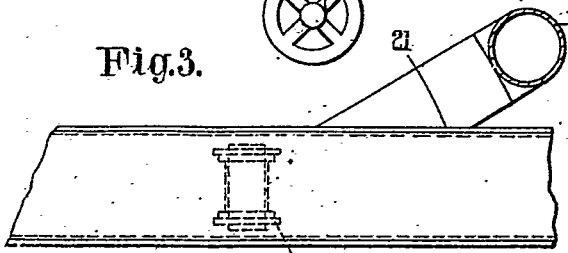


Fig. 2.

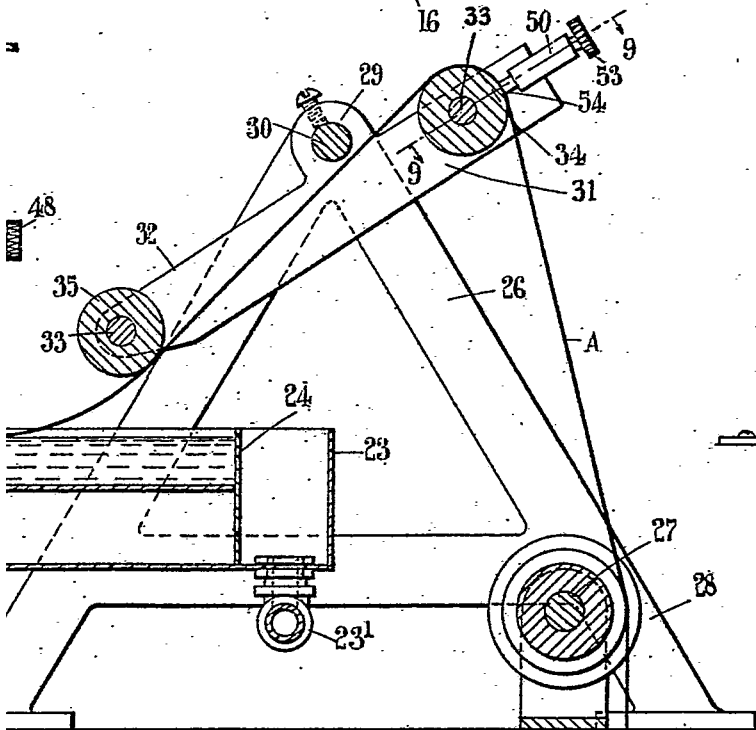
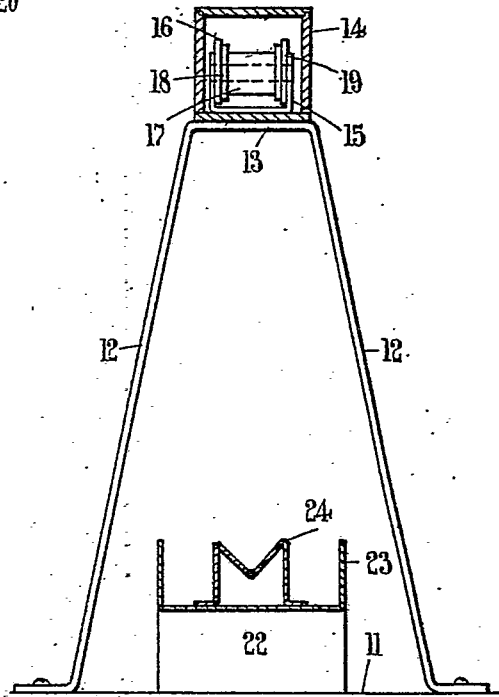


Fig. 11.

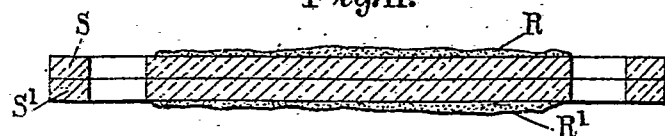
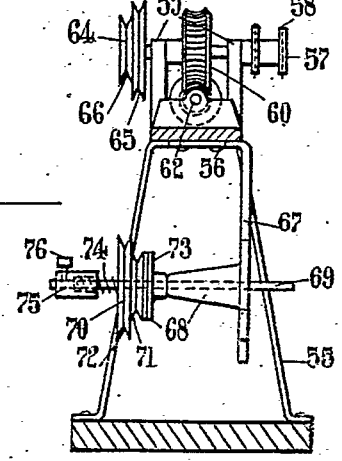
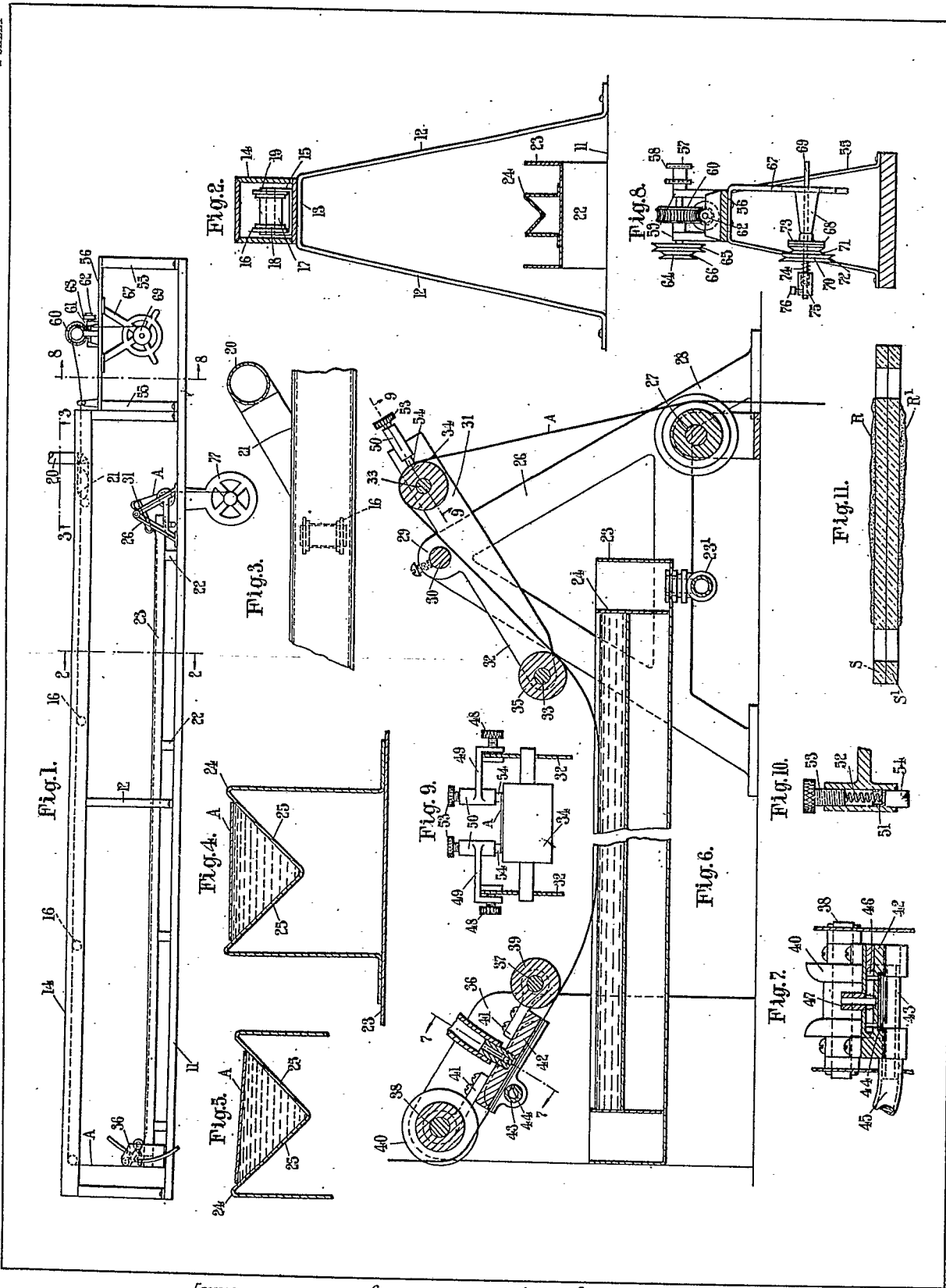


Fig. 8.





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