

April 3, 1928.

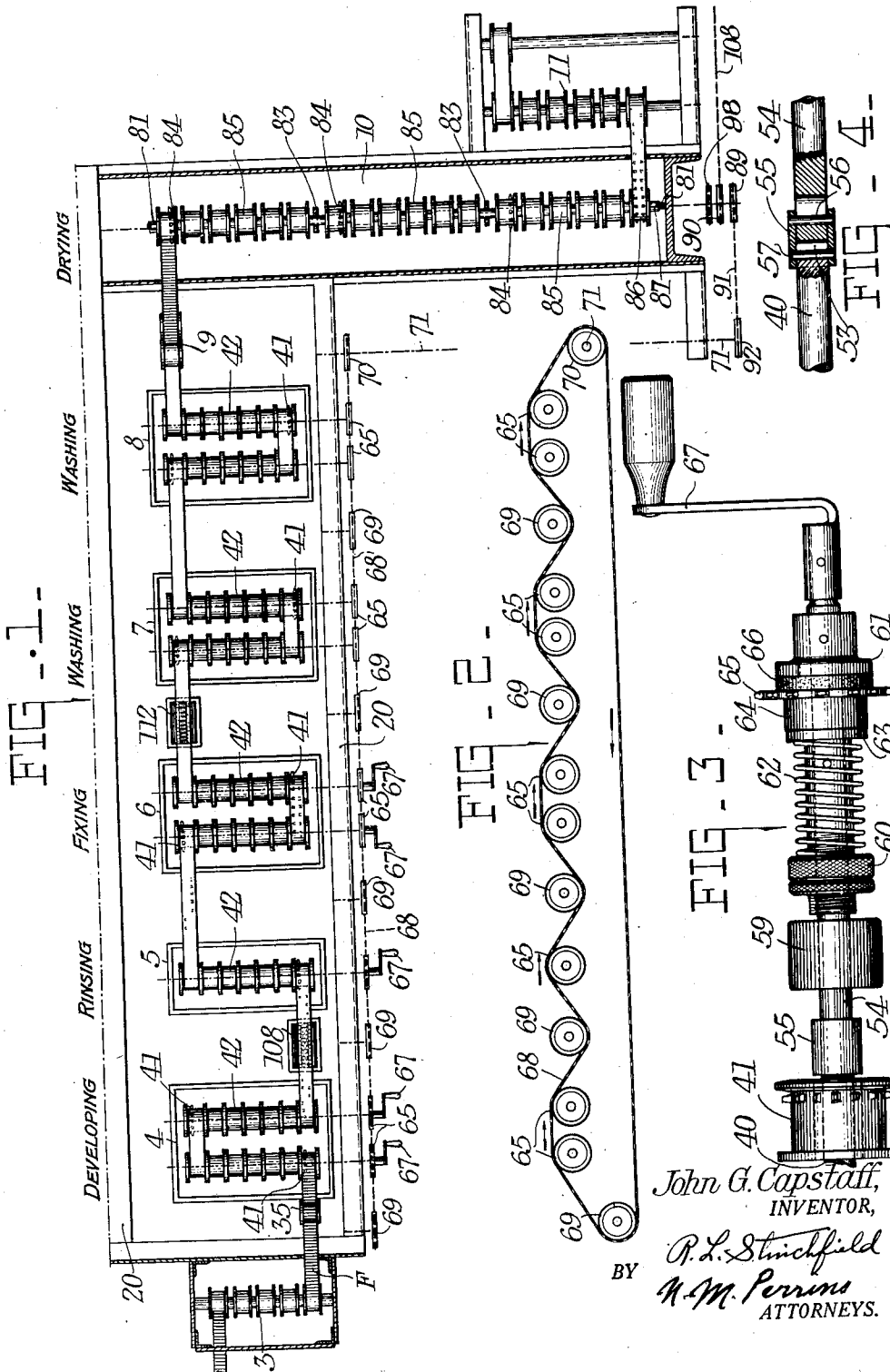
1,664,735

J. G. CAPSTAFF

FILM TREATING APPARATUS

Original Filed May 18, 1925

4 Sheets-Sheet 1



John G. Capstaff,
INVENTOR,
P. L. Strickfield
H. M. Perrins
ATTORNEYS.

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J. G. CAPSTAFF

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FIG. 5.

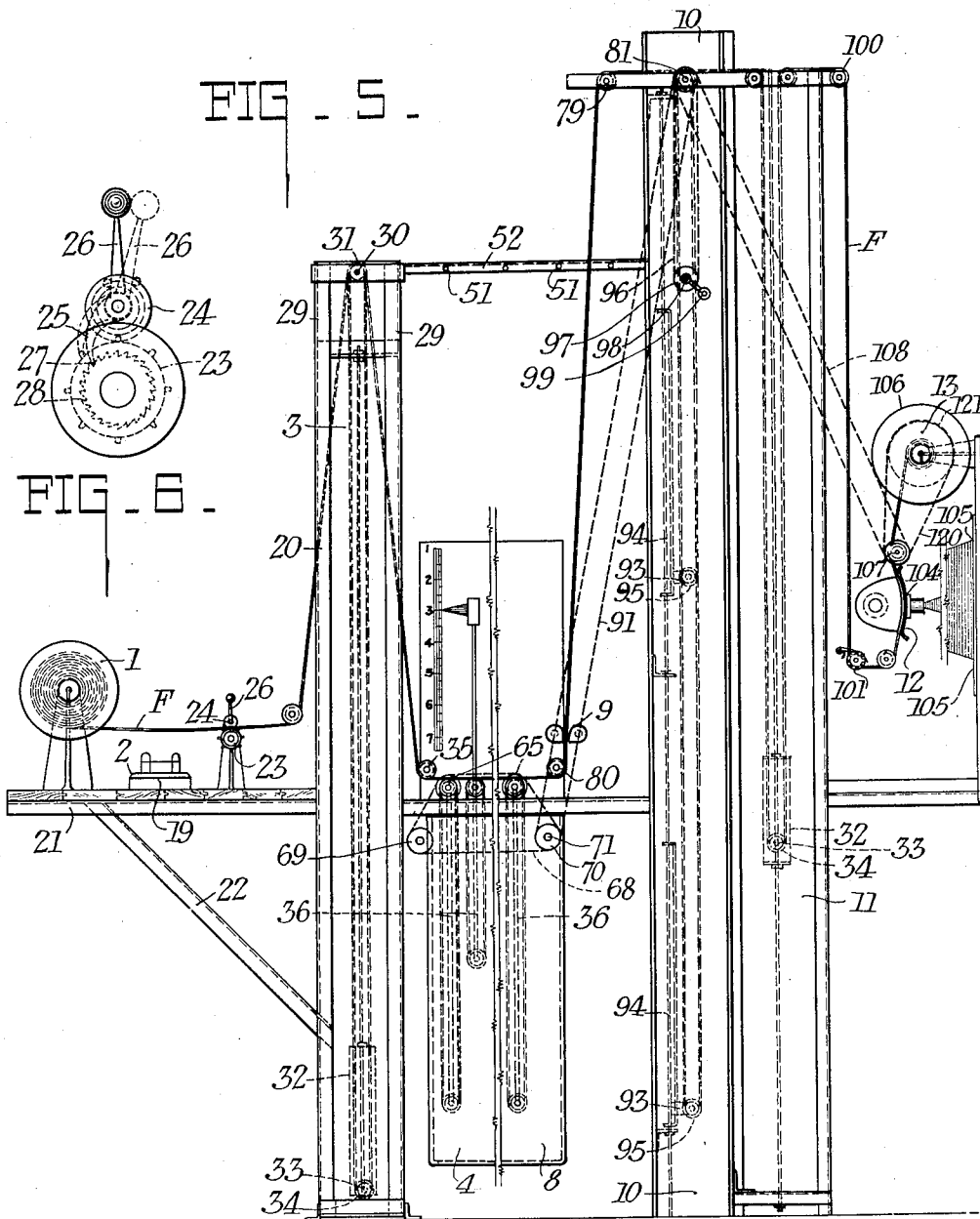


FIG. 6.

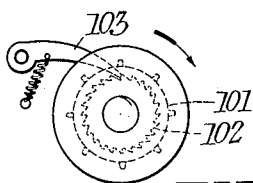


FIG. 7.

John G. Capstaff
INVENTOR,
BY *R. L. Stinchfield*
N. M. Parnes
ATTORNEYS.

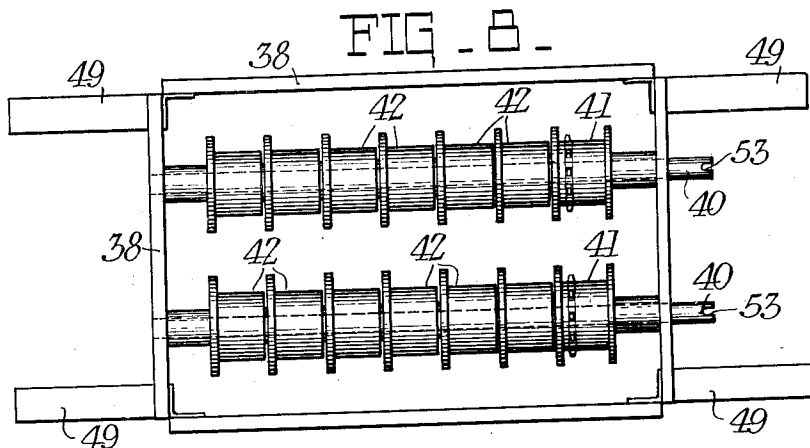
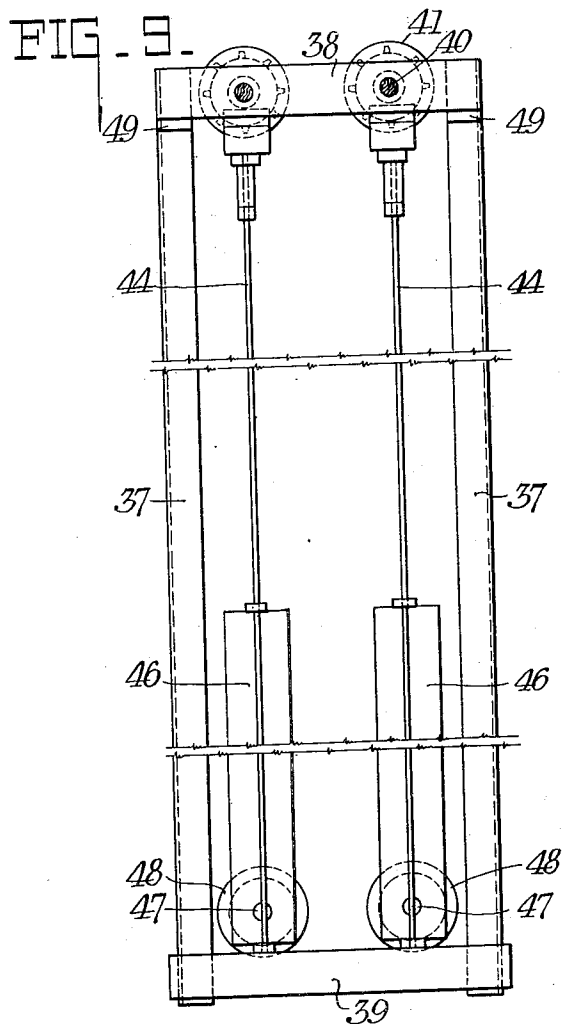
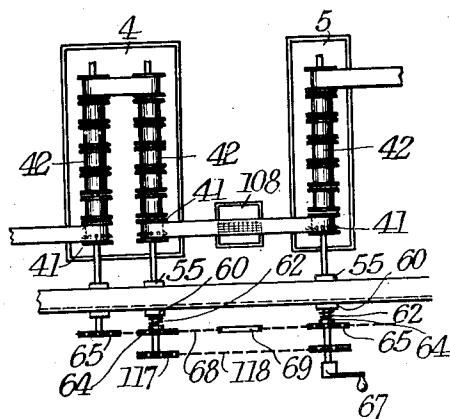
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John G. Capstaff,
INVENTOR,
BY P. L. Stinchfield
N. M. Perrins
ATTORNEYS.

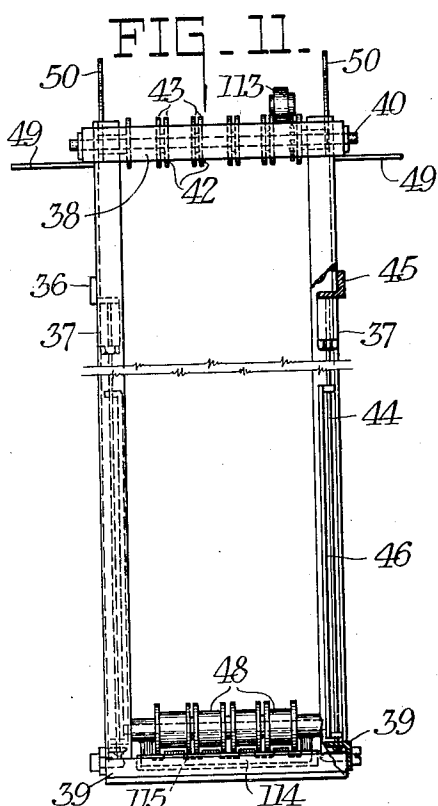
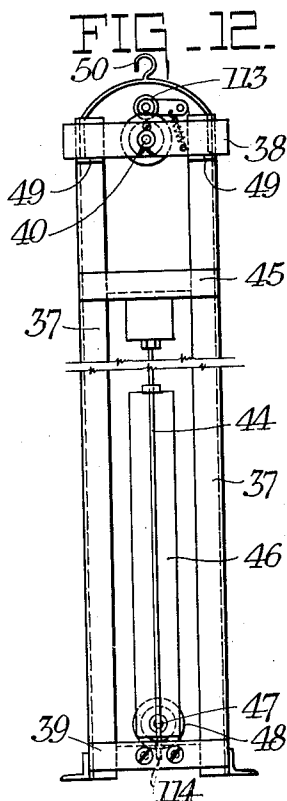
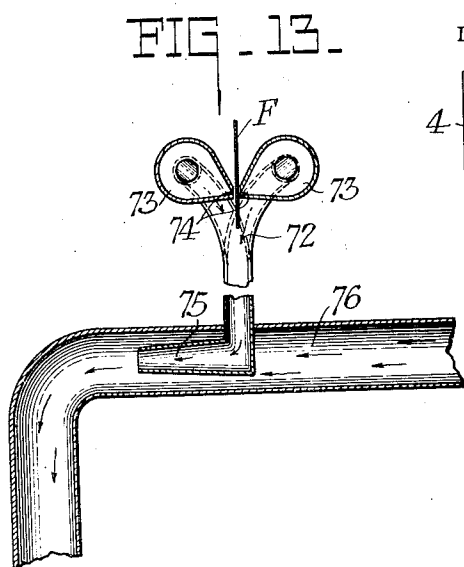
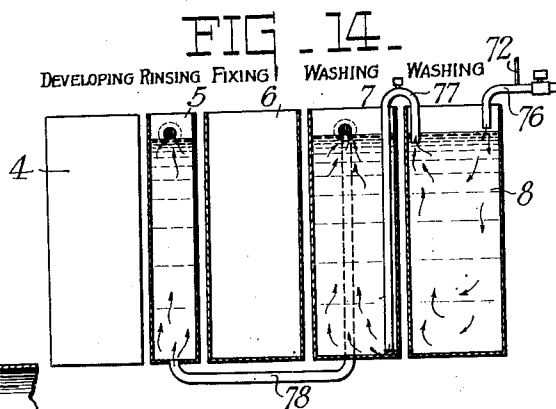
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J. G. CAPSTAFF

FILM TREATING APPARATUS

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John G. Capstaff,
INVENTOR,

BY *P. L. Stinchfield*
N. M. Perkins
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN G. CAPSTAFF, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

FILM-TREATING APPARATUS.

Application filed May 18, 1925, Serial No. 31,096. Renewed September 7, 1927.

My invention relates to apparatus for the treatment of motion picture film, and particularly to structures of the type in which long lengths of film are run continuously over appropriate guides through a series of tanks containing successively the appropriate baths to carry out a complete photographic process.

Among the objects of my invention are the provision of such guides which will be readily adjustable to permit variation in the time that the film is submitted to a particular bath, of means for readily lifting any one of such guides out of the tank for repair, examination or drying, of means for disconnecting the driving means for such a unit, and of improved and automatic control of the slack caused by adjustment of the film.

Other objects will appear from a reading of the following specification and claims.

The apparatus will now be described, reference being made to the accompanying drawings, in all the figures of which the same reference character designate the same parts.

Fig. 1 is a diagrammatic plan of my improved apparatus.

Fig. 2 shows diagrammatically the relation of the common driving chain to the several sprockets.

Fig. 3 is a detail showing of a pulley-carrying shaft and the driving connection thereto.

Fig. 4 is a fragmentary view showing a detail of the connection.

Fig. 5 is a side view of the apparatus, omitting some of the central parts.

Figs. 6 and 7 are views of the terminal sprockets with their ratchet controls.

Fig. 8 is a top view of a double film guide unit.

Fig. 9 is an end view of such a unit.

Fig. 10 is a diagrammatic fragmentary plan of a modification of the sprocket arrangement.

Fig. 11 is a side view of a unit.

Fig. 12 is an end view of a single unit.

Fig. 13 shows a detail of a suction squeegee used in the apparatus.

Fig. 14 shows the course of the washing water through the tanks.

The apparatus consists of a series of tanks through which a long tape band or strip,

here shown as ordinary motion picture film, is successively passed, being guided through the several tanks by improved adjustable, compact, pulley guide units. The tanks contain the necessary baths for a complete photographic process and may vary in size and number according to the requirements of the process or operations used.

In Figs. 1 and 4, the structure and arrangement as a whole are indicated.

The strip of film F is here shown as passing from a supply reel 1, past a splicing station 2, these being shown only in Fig. 4, through a reserve supply unit 3 and the various tanks 4, 5, 6, 7 and 8, not completely shown in Fig. 4, past a wiper or squeegee 9, through a drying cabinet 10, to a second reserve supply unit 11, and then to a testing projector 12 and final wind-up reel 13, these last two elements being shown only in Fig. 4.

The various elements will now be consecutively described in greater detail. It is to be understood, however, that the drawings disclose most fully those features which are deemed necessary to the complete understanding of the invention, and that some of the ordinary mechanical details have been omitted and parts indicated diagrammatically only, where such a showing is sufficient to enable others to make and use the invention.

A fabricated metal framework 20 suited to the apparatus as a whole is provided. At one end there is a platform 21, supported by braces 22 and carrying the supply reel 1, constructed and supported in a standard manner. Adjacent this is the splicing station 2 with a splicing block 19 of familiar design. At this station and beyond the block is an idle sprocket 23 over which the film passes, being held against it by an idle roller 24. Coaxial with the roller is pivoted a pawl 25 having a handle 26 and a tooth 27 adapted to engage the ratchet 28 on the side of the sprocket 23, to prevent its forward rotation. Its normal position is that shown in dotted lines in Fig. 5, permitting the sprocket to turn freely. The film then passes to the reserve supply unit 3 comprising the frame members 29 in the upper part of which is supported a shaft 30 upon which are the freely rotatable idle rollers 31. Vertically slidable in the frame

is the weighted member 32, carrying a shaft 33 upon which are the freely rotatable idle rollers 34.

When the machine is in operation, the mechanism hereinafter to be described will draw the film from the supply unit, the weighted member 32 will be at its lowest position and the film, guided over the rollers 31 and 33 and sprocket 23, will be drawn from the reel 1. As the end of a length of film approaches, the operator will throw the pawl and ratchet into engagement, stopping and holding the sprocket. The film will continue to be drawn from the reserve unit, the lower weighted frame being raised by the film. The operator will splice the film and then release the ratchet, whereupon the weighted frame will fall, until the normal reserve of film is drawn from the supply reel.

The film passes from the reserve unit 3 under an idle roll 35 to the first tank 4. As here disclosed the tanks are designed for successively developing, rinsing, fixing and washing the film, two tanks being shown for the last purpose. Within the tanks are film advancing and guiding racks 36, two such racks being shown in each tank except the second wherein only one is shown, it being understood that the number of racks and the number of rollers on them are merely matters of design dependent on the speed of movement of the film, the strength of the baths, and the particular processes employed.

These racks may be single or double, a double rack being shown in Figs. 8 and 9, and a single rack in Figs. 11 and 12. A typical rack consists of a skeleton frame having vertical corner pieces 37, and horizontal frames 38 and 39 at the top and bottom respectively, uniting the corner pieces. Rotatably mounted in the upper horizontal frames are driving shafts 40 on each of which is rigidly mounted a single driving sprocket 41, and a plurality of guide rolls 42, which are free to turn independently on the shaft. The sprockets are of the usual double flange type, but only one flange is necessary on each of the rolls 42 as shown in Fig. 8. If desired, however, double flange rolls 43 may be used throughout as shown in Fig. 11.

Vertical guide rods 44 are arranged on the sides of the rack and may extend from the bottom frames 39 to the top frames 38 as shown in Fig. 9, or they may extend to cross bars 45 part way up the unit as shown in Figs. 11 and 12. In either case weighted frames 46 are guided thereon and carry cross shafts 47 carrying the loose idle pulleys 48. Lateral extensions 49 on the frames 38 are adapted to engage the tops of the tanks 4 to 8 and support the rack as a whole. The units may also carry hooks 50 by which they

may be suspended above the tanks from cross rods 51 carried by elevated members 52 of the frame 20.

The shafts 40 at one end have slots 53 and when the racks rest in the tanks these shafts register with shafts 54 carried by the frame 20 and carrying sleeves 55 slidable thereon by the pin and slot connection 56, and having cross pins 57 adapted to engage the slots 53, thus making a clutch connection by which shaft 54 may drive shaft 40, but permitting the shaft 40 to be moved away when the rack is lifted.

Shaft 54 is journaled in member 59 of frame 20, and carries abutment members 60 and 61 fixed thereon. Spring 62 coiled around shaft 54, bears at one end against abutments 60 and at the other against a loose washer 63 which contacts the hub 64 loosely mounted on the shaft and carrying a sprocket 65 and the friction pad 66 which bears against abutment 61. On the end of shaft 54 is removably mounted a handle 67. An endless driving chain 68 engages all of the sprockets 65 and also certain idle sprockets 69 so positioned as to maintain the chain taut on the driving sprockets, and a sprocket 70 on a driven shaft 71 by which the chain is moved to turn all of the sprockets. One arrangement of the chain sprockets is shown in Fig. 2.

It is obvious that any one of the shafts 40 can be disconnected from its corresponding shaft 54 by moving sleeve 55 and the rack lifted out of the tank. Any one of the shafts 40, when connected to its corresponding shaft 54, can be manually turned backward or forward by handle 67, the friction clutch permitting slip between the shaft and its sprocket. The weighted frame will rise and fall, the loose pulleys turning on the shafts regardless of their rotation to adjust the loops of film automatically.

After the film F has left the final tank, it passes over an idler 80 to a wiper or squeegee 9 of any suitable type, where all loose moisture is removed before the film enters the drier 10. As here shown a suction squeegee 72 of the venturi type is used and comprises chambers 73 on opposite sides of the film with suction slots 74 through which air and moisture are drawn and pass to nozzle 75 in the water pipe 76, (see Fig. 13). This water pipe 76 furnishes water to the second washing tank 8, which is connected by siphon or overflow 78 to the rinse tank 5, this arrangement being indicated in Fig. 14. The water thus supplied to tank 5 will be a very dilute acid fixing solution, tending to act as a "stop bath".

From the wiper 9, the film F passes over idler 79 to the drying cabinet 10. In this cabinet is an upper driven shaft 81 journaled at its ends and at two intermediate points 83 in the fixed frame, and dividing

the drying cabinet into three units. A series of rollers are mounted on the shaft 81. Of these the entrance roller of each unit is a sprocket 84 fixed to shaft 81, and the other 5 rollers 85 except the final one in the third unit are independently and loosely mounted on the shaft 81. The final roller is a sprocket 86 frictionally engaging the shaft 81 and normally driven thereby. This 10 sprocket 86 is rigid with a tubular shaft 87, surrounding shaft 81 and extending through the frame of the drier and carrying an exterior sprocket 88. Shaft 81 carries rigidly two sprockets 89 and 90, the first being 15 driven by chain 91 from sprocket 92 on the power shaft 71. Sprocket 88 is connected by chain 96 with sprocket 97 on stub shaft 98 and may be turned by handle 99.

In each of the sections of the drying cabinet are floating lower racks, each comprising a weighted member 93 on vertical guides 94 and carrying a series of idle rollers 95. There is no means for readily adjusting the position of the rack in the first two sections, 25 which remain permanently in about the same position, having slight movement only due to variation in length of the film because of varying shrinkage during drying.

From the sprocket roller 86 the film passes 30 to the film reserve unit 11 which is similar to unit 3 and carries the same reference characters, and thence over idle roller 100 to idle sprocket 101 which carries a ratchet 102 engaged by the spring pressed pawl 103 to prevent backward movement. The film then 35 passes through a projector 104 where the image is projected for inspection on a screen 105 and is then wound on the final reel 106. Reel 106 is driven through chains 108 and 40 sprockets indicated at 107 and 121 from sprocket 90, there being the usual slip connection between reel 106 and sprocket 121. The frame 32 will normally be at the top of the reserve unit 11. From time to 45 time the operator will hold the film with his fingers at some convenient point near the projector, thus stopping it, and will look at the projected image of the picture at that point to inspect its quality. Meanwhile, the 50 frame 32 will be sinking, accumulating reserve loops. When the operator ceases his examination, the take up roll will draw up the film to the normal amount.

In use when a batch of film has been run 55 through the apparatus and work is to be stopped, a blank strip of film is spliced upon its rear end and run through the machine and left there. When work is resumed the exposed film is spliced upon the blank strip 60 and run through. The film first passes through the developing tank and as it emerges it is viewed by the light of the inspection window 108 located between the tanks 4 and 5. If it seems to be over-devel- 65 oped, the handle controlling the sprocket in

tank 5 is turned forwardly moving the sprocket faster than its shaft and drawing film out of the tank 4 and causing the lower rolls on the second rack in tank 4 to rise. If it is seen to be under-developed, the han- 70 dle is held still or turned backwardly, causing film to accumulate in tank 4. The loops in all the tanks are normally of such length that the adjustable frame is positioned above the bottom of the tank and allow adjust- 75 ment in either direction. In practice, the film in the first rack in the development tank is not usually adjusted. The second rack may carry a vertical rod 109 with a pointer 110 at its upper end opposite a scale 111 sup- 80 ported on frame 20 and calibrated in terms of minutes required for film to pass through the tank 4 when the loops on the first rack are in a normal or standard position and the second rack only is adjusted. 85

It is possible in the same way to adjust the size of the loops in any of the tanks, but adjustment is usually practiced only in the developing tank. A second inspection win- 90 dows 112 is provided between the fixing tank and the first washing tank.

Should the film break at any point, the weighted frame of the rack in which the break occurred would drop to the bottom of 95 the tank. The operator would stop the machine, disconnect the sleeve clutch 55 of the rack, lift the rack out of its tank and hang it up, draw the broken ends of the film together and repair them. The loops of film would automatically adjust themselves to 100 such operations. When not in use, all the racks can be suspended clear of the tanks.

Opposite any of the sprockets throughout the machine the usual spring pressed rolls 113 may be used to hold the film in engage- 105 ment with the sprockets in case of slackness due to breakage or other cause. These rollers are omitted for the sake of clearness except in Figs. 11 and 12. A further precaution to prevent film leaving the lower 110 rollers is provided by cross bars 114 carried on frames 46 and having notches 115 opposite the flanges of the pulleys. If the film breaks and the weighted frame 46 falls the film will remain threaded around these roll- 115 ers and can be repaired without great confusion.

While my preferred practice is to locate the sprockets 41 to engage the film as it enters each rack, as indicated on Fig. 1, it 120 may be sometimes desirable in a double rack, particularly in the developing tank, to have the sprocket as the exit member as shown in Fig. 8. A plan of the first two tanks with this arrangement is shown in Fig. 10, 125 where the parts are shown and indicated in general as in Fig. 1. The sprocket however engages the film as it leaves tank 4 and another sprocket engages it as it enters tank 5. It is therefore desirable to have 130

these sprockets synchronously operated. I accordingly mount on the abutment members 61 of each a second chain sprocket 117 and connect these by a chain belt 118 so that both will turn together.

It is to be understood that the structure herein described is by way of example and that I contemplate as within the scope of my invention such modification and equivalents as fall within the appended claims.

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

1. A unit intended for use in apparatus for the continuous treatment of motion picture film and comprising an open frame, means on said frame whereby it may be removably supported in a tank, a shaft journaled in the upper part of said frame, a series of rollers free to turn independently on said shaft, a sprocket rigid with said shaft, vertical guide members in said frame, a weighted support adapted to slide on said guide members, a shaft in said support and a series of rollers free to turn independently on said shaft.

2. In apparatus for the continuous treatment of motion picture film, a supporting frame work, a series of tanks in said frame work, a series of hanger members above said tanks, and a series of units removably supported in said tanks and having hanger members adapted to engage the first named hanger members whereby the units may be supported above the respective tanks, each of the units having a series of rollers over which a strip of film may be looped.

3. In apparatus for the continuous treatment of motion picture film, a supporting frame work, a series of tanks in said frame work, a series of hanger members above said tanks, and a series of units removably supported in said tanks and having hanger members adapted to engage the first named hanger members whereby the units may be supported above the respective tanks, each of the units having a series of rollers over which a strip of film may be looped, certain of said rollers in each unit being adjustably mounted, whereby when only one unit is elevated from the tanks, the loops embracing said certain rollers may automatically be adjusted in size.

4. In apparatus for the continuous treatment of motion picture film, a tank, a unit removably supported in said tank, and comprising a frame, shafts journaled in the upper and lower parts of said frame respectively, series of rollers on said shafts whereby a strip of film may be conducted in loops through said tank, a driven shaft fixed in position with respect to the tank and a coupling between said driven shaft and one of the shafts on the unit whereby said shaft in the unit may be driven, said coupling being adapted to be readily uncoupled whereby the said shafts may be entirely disconnected to permit the unit to be removed.

5. In apparatus for the continuous treatment of motion picture film, a tank, a unit removably supported in said tank and comprising a frame, a shaft journaled in the upper part of the frame and carrying rollers, some of which are free to turn on the shaft, a shaft adjustably supported below said first named shaft and carrying rollers free to turn thereon, means in said apparatus for connection to said upper shaft to turn the same when properly positioned in the tank, but disconnectible therefrom to permit the removal of the unit from the tank.

6. In apparatus for the continuous treatment of motion picture film, a tank, a unit removably supported in said tank, and comprising a frame, a shaft journaled in a fixed position in the upper part of the tank and carrying a series of rollers loosely mounted thereon and a film engaging sprocket rigidly mounted thereon and a shaft adjustably mounted below said first named shaft and carrying a series of rollers loosely mounted thereon, a third shaft fixed in position with respect to the tank, a driving sprocket having a friction driving relation to the third shaft, a coupling between the third shaft and the upper shaft in the unit, and a handle for turning the third shaft, whereby the third shaft may be connected to the upper shaft to turn the latter from the sprocket or from the handle, and whereby, when the coupling is disconnected, the unit may be removed from the tank.

Signed at Rochester, New York, this 14th day of May, 1925.

JOHN G. CAPSTAFF.