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METHOD AND MEANS OF TESTING PHOTOGRAPHIC DEVELOPERS

Filed April 2, 1930

FIG. 1

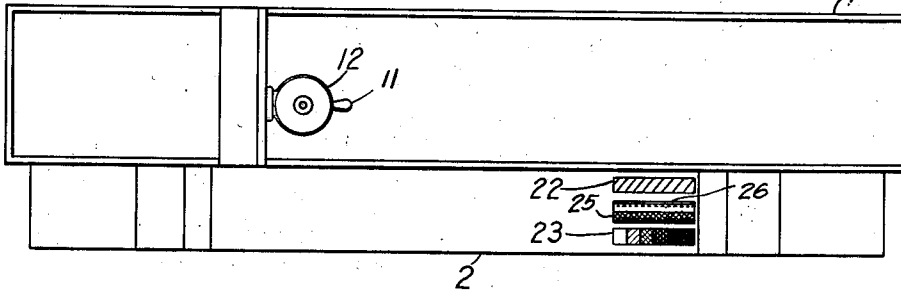


FIG. 2

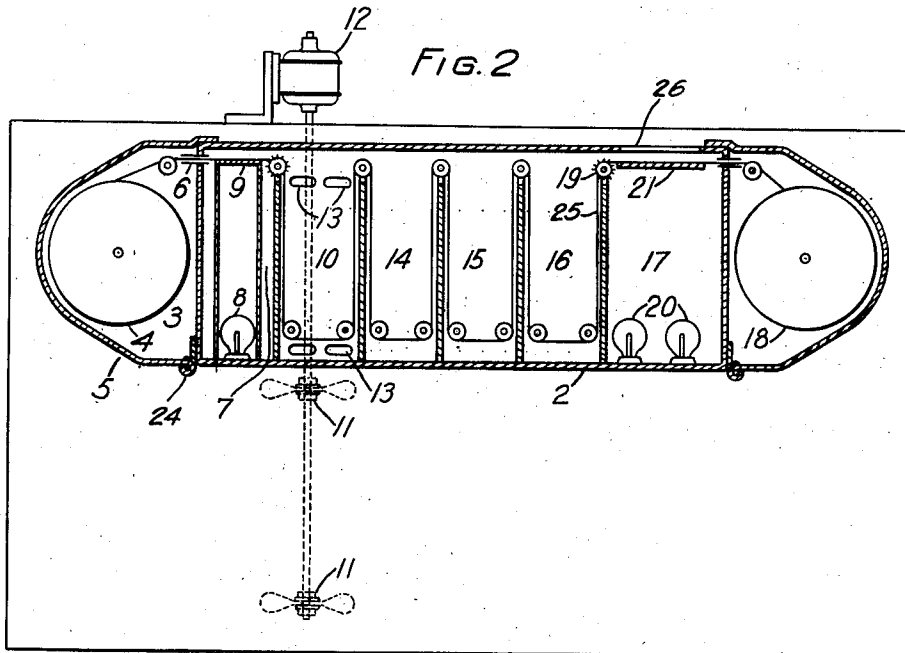
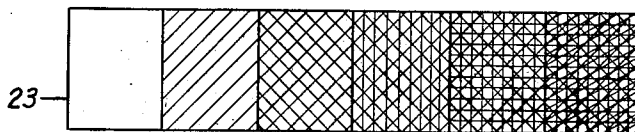


FIG. 3



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METHOD AND MEANS OF TESTING PHOTOGRAPHIC DEVELOPERS

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This invention relates to photography and has for its object the provision of a method and means of testing a photographic developer.

A photographic developer may be assumed to have a useful life which is terminated when the developer produces an excessive amount of stain and fog in the film, or when the activity of the developer is so reduced that the time required for development of a film is unduly long. As the developer approaches the end of its useful life, the stain and fog produced tends to become more noticeable in the film and also the time of development of the film must be increased to compensate for the reduced activity of the developer.

A feature of this invention is a method and means of measuring the stain and fog produced by the developer by comparing the density of an unexposed area of a film developed in the developer for a definite time with an arbitrary standard of maximum permissible density.

Another feature of this invention is a method and means of testing the exhaustion of the developer by comparing the density of a film flashed to a definite exposure and developed in the developer with a standard film having areas of graded density.

A further feature of this invention is the adaptation of these methods to continuously test the developer in use in an automatic developing machine.

An unexposed test film is drawn at constant speed past an exposure window illuminated by a constant light which flashes one half of the width of the film to a definite exposure. The other half of the width of the test film is not exposed. The test film is then developed for a definite time at a known temperature in the developer under test. The film is washed, fixed and washed clean. The test film is then placed in front of an examining window illuminated by a constant light. The transmission of the unexposed but developed portion of the film is compared with the transmission of a standard illuminated by the same light and having a density which forms an arbitrary standard for stain and fog. If the transmission of the unexposed

portion of the test film is less than the transmission of the standard, the developer is rejected. If the film passes the first test satisfactorily the transmission of the exposed portion of the test film is then compared with a standard having areas of graded transmission illuminated by the same light as the test film. The correct time of development is known for each area of graded transmission. The area having a transmission approximating to the transmission of the test film is selected and the correct time of development of the film is indicated by the known time for this area. When the correct time of development is impracticably long the developer is rejected as exhausted. The testing apparatus may be arranged to test the developer continuously. When used to test the developer in a continuous process developing machine, the correct time of development may be attained by regulating the speed of travel of the regular film through the machine by any suitable method such as regulating the speed of the driving motor.

In the drawing

Fig. 1 is a top view of one embodiment of the invention applied to a continuous process developing machine.

Fig. 2 is an elevation in part section of the same embodiment.

Fig. 3 is an enlarged view of the areas of graded transmission.

In Fig. 1, a continuous type film developing machine 1 is diagrammatically represented. A preferred embodiment of this invention having the general form of a container 2 is affixed to the side of the machine 1. Affixed to one end of the container 2 is a compartment 3 arranged to contain a reel 4 of light sensitive film, mounted so as to rotate easily. The cover 5 of the compartment 3 is suitably mounted, as on hinges 24, so that the reel 4 may be changed when desired. The light sensitive film is drawn off the reel 4 and through a light trap 6 into a compartment 7 containing a shielded light source 8 arranged to illuminate a small area of a glass sheet 9 over which the film is drawn. The illuminated area is restricted so that only one half of the film is exposed and the length of

the window 9 and the speed of the film are adjusted to the intensity of the source 8 so that a convenient value of exposure is attained.

5 The film is then drawn into a compartment 10 which is filled with developing fluid obtained from the main developing machine. To insure that the sample of developer in the compartment 10 is a true average of the
10 developer in the developing machine, a suitable agitator 11 driven by the motor 12 may be used. The agitator 11 should produce a continuous circulation of the developer through the openings 13 leading from compartment 10 into the developing machine 1
15 so that the developer in compartment 10 is always a fair sample of the developer in the machine. The size of the compartment 10 is so related to the speed of the film that the
20 film is developed to the desired degree during its passage through compartment 10. The developed film is then drawn through compartment 14 where it is washed. The developed film is drawn through compartment
25 15 where it is fixed and is then drawn through compartment 16 where it is again washed. The developed film 25 is drawn past the examination window 26 in compartment 17 to the take up reel 18. Suitable driving means
30 well-known in the art are used to move the film slowly through the various compartments. These driving means have been diagrammatically indicated by the take up reel 18 and drive sprocket 19 driven by a suitable
35 constant speed motor (not shown).

In compartment 17 a suitable source of light such as lamps 20, 20, causes a uniform illumination of the window 21. Adjacent to the developed but unexposed area of the film
40 25, is a standard 22 illuminated by the light passing through window 21 and having a density which forms an arbitrary standard for strain and fog. If the transmission of the unexposed but developed portion of the
45 test film 25 is less than the transmission of the standard 22, the developer in the developing machine 1 is replaced with fresh developer. If the developer passes the above test successfully, the transmission of the exposed and developed portion of the film 25
50 is compared with the standard 23, also illuminated by the light passing through window 21. The standard 23, shown enlarged in Fig. 3 comprises a series of areas of graded transmission varying from about 90% transmission to about 10% transmission in convenient steps. The correct time of development corresponding to each area is known. For example, using developer of full standard
60 strength at normal temperature, the standard exposure given to the test film will result in the test film being developed to approximately the same density as the area having least transmission. As the developer decreases in strength, the standard exposure

given to the test film will result in the test film being developed to a less and less density. Thus, in order to secure full development of the film in the developing machine, the time of development must be increased. The correct time of development is known for each area of the series. The area having a transmission nearest to the transmission of the exposed and developed area of the test film is selected and the correct time of development is indicated by the known time for this area.
70 The speed of the film through the developing machine may then be adjusted to give this time of development. When the time of development becomes impracticably long, the developer in the developing machine 1 is replaced with fresh developer.
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What is claimed is:

1. The method of testing a photographic developer which comprises moving a portion of photosensitive material past an illuminated area, moving said exposed material in said developer for a known time at a known temperature, rinsing, fixing and again rinsing said developed material and comparing the density developed in said material with a series of areas of graded density to indicate the increase in time required for complete development.
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2. The method of testing a photographic developer which comprises moving a portion of the area of a photographic film past an illuminated area, moving said film in said developer for a known time at a known temperature, rinsing, fixing and again rinsing said film, comparing the transmission of the exposed portion of said film with the transmission of a series of areas of graded density to indicate the increase in time required for complete development and comparing the transmission of the unexposed portion of said film with the transmission of an arbitrary standard of density to indicate the extent of formation of stain and fog by said developer.
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3. In a device for testing photographic developers, in combination, a photographic film, a sprocket for moving said film at uniform speed, an exposure opening illuminated by light of constant known value, means for exposing one half of said film to the light at said opening, means for subjecting said film to the action of said developer for a known time and then to the action of washing and fixing agents, an inspection window illuminated by light of constant known value, an arbitrary standard of density covering a portion of said window, a series of areas of graded density covering another portion of said window, and means for guiding said film over said window with the exposed portion in juxtaposition to said areas of graded density and the unexposed portion in juxtaposition to said arbitrary standard of density.
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4. The method of testing a photographic developer which comprises moving at con-
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stant speed a portion of photosensitive material past a uniformly illuminated area, moving at constant speed said exposed material in said developer for a predetermined time and comparing the density developed in said material with a series of areas of graded density to indicate the time required for complete development.

5. The method of testing a photographic developer which comprises moving at constant speed a portion of the area of a photographic film past a uniformly illuminated area, moving at constant speed said film in said developer for a predetermined time, comparing the transmission of the exposed portion of said film with the transmission of a series of areas of graded density to indicate the time required for complete development and comparing the transmission of the unexposed portion of said film with the transmission of an arbitrary standard of density to indicate the extent of formation of stain and fog by said developer.

In witness whereof, I hereunto subscribe my name this 20th day of March, 1930.

IAN H. PARSONS.

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