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APPARATUS FOR MEASURING THE HEAT OPACITY OF PHOTOGRAPHIC FILM

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Fig. 1.

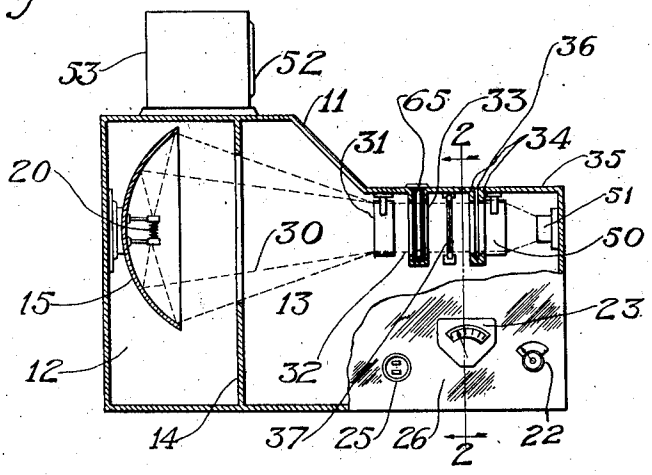


Fig. 2.

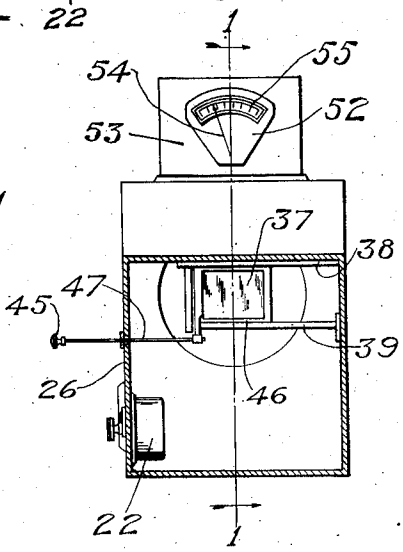
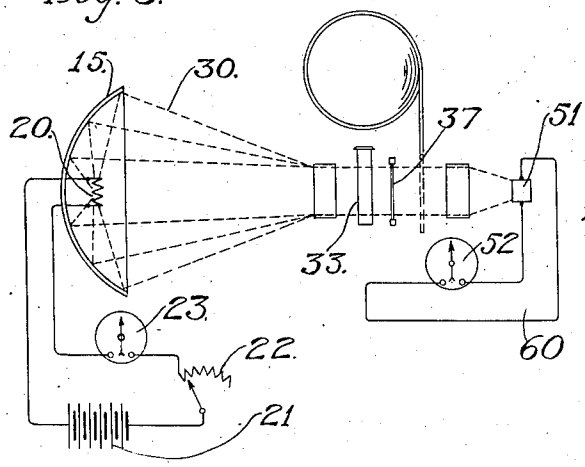


Fig. 3.



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APPARATUS FOR MEASURING THE HEAT OPACITY OF PHOTOGRAPHIC FILM.

Application filed December 6, 1921. Serial No. 520,448.

This invention relates to the photographic industry and particularly to apparatus for comparing the heat opacity of translucent materials with a standard plate of a known heat opacity.

It is an object of my invention to provide an apparatus of this character in which objects of translucent material may be interposed between a source of heat and a thermometric registering device, the intensity of the heat radiations being allowed to pass through the translucent object, due to its heat opacity noted upon the registering device.

Other objects and advantages will be made evident hereinafter.

Referring to the drawing which is for illustrative purposes only:

Fig. 1 is a side elevation of a device embodying my invention, being partially in section, as indicated by the line 1—1 of Fig. 2.

Fig. 2 is a sectional view taken substantially upon a plane represented by the line 2—2 of Fig. 1.

Fig. 3 is a diagrammatic representation of the device.

As shown in the drawing, I provide a case 11 providing chambers 12 and 13 divided by a partition member 14. Within the chamber 12 I mount a reflector 15 having situated centrally therein a heating element 20 in circuit, as best shown in Fig. 3, with an electrical energy source 21, a rheostat 22, and an ammeter 23. The electrical source 21 is preferably the 110 V. lighting system and I provide a two-point contact plug receptacle 25 upon the side 26 of the case 11 for connecting into the lighting circuit by means of a drop cord.

The radiations of heat from the element 20 are converged by the reflector 15 as indicated by the dotted lines 30 and when not thereby rendered substantially parallel, they may be passed into a rectifying lens 31 which is preferably of a substance of slight interference with the passage of heat radiations, and which lens causes the parallelization of the heat rays as indicated by the dotted lines 32. The parallel rays are adapted to pass through a screen holder 33 and apertures provided in vertical walls 34 which extend downwardly from the top 35 of the case 11 to provide a film slot 36. The parallel rays may also be intercepted by a plate 37 of a desired standard opacity which is mounted upon slides 38 and 39 and adapted to be moved into a position of interceptance, as illustrated in Fig. 2, by pulling out a knob 45 which connects through a rod 47 to the frame 46 holding the plate 37.

After passing through the aperture in walls 34 forming the slot 36 the parallel rays are received by a converging lens 50 which directs them against a thermo-reactive element such as a thermopile 51. The thermopile 51 is in circuit with a galvanometer 52 mounted in a box 53 on the top of the case 11 in a position wherein the readings of the pointer 54 upon the dial 55 thereof may be conveniently noted by the operator.

My device is especially adapted to the testing of exposed film in order that the amount of development which such film shall be given may be accurately determined. The device is also of importance in determining the intensity and duration of light to which film should be subjected in the printing thereof as it has been found that each negative film requires separate consideration in the printing operation.

My device is essentially useful in the testing of new or unexposed film to determine the amount or thickness of the emulsion layer thereupon, or to check up the uniformity of unexposed film. My device eliminates the use of light rays in the testing of opacities using heat radiations instead thereof, thereby making it possible to test unexposed film without danger of fogging.

Owing to the variable conditions that exist in certain heat-reactive elements I provide a means of regulating the heat source to give a desired reading of the galvanometer 52 in circuit with the thermopile 51 to correspond to a certain heat opacity of film. In acomplishing this regulation of the heat source I move the plate 37 into the position in which it is shown in Fig. 2, so that the heat rays will be intercepted thereby. The plate 37 is of a known opacity and preferably corresponding to the opacity to which the films are to be developed to give the best results. The heat radiations passing through the plate 37 are tempered, due to the heat opacity of the plate, and upon being received by the thermopile 51, cause an electric current to flow in the circuit 60 indicated in Fig. 3, in which circuit both the thermopile 51 and the galvanometer 52 are situated. By

manipulating the rheostat 22 to increase or decrease the energization of the element 20 the intensity of the radiations finally reaching the thermopile 51 may be adjusted to give a reading of the galvanometer corresponding to the heat opacity of the plate 37. The plate 37 is then removed from the position, shown in Fig. 2, by moving the knob 45 into a position against the side 26 of the case 11 and a film is placed in the slot 36 with the frame desired to be tested before the opening 38 in the walls 34. The heat then passing therethrough will be received by the thermopile 51 and if the film corresponds to the heat opacity as represented by the plate 37 the reading of the pointer 54 upon the dial 55 will be the same as the reading given by the plate 37 in the adjustment of the source of heat 20. A condition of heat opacity in a film being tested above or below that of the standard of heat opacity as represented by the plate 37 will be faithfully indicated by higher or lower reading of the pointer 54 upon the dial 55 which may be calibrated to read the different degrees of heat opacity directly.

When a luminous heat source is used at 20 I provide a screen 65 which is placed in the screen frame 33 to absorb the light rays but allow the heat rays to pass uninterrupted. This screen 65 may consist of a glass vessel containing a solution of carbon bisulphide which has a characteristic of interfering with the passage of light rays. A known solution of the character referred to is prepared by the admixture of iodine with carbon bisulphide.

I claim as my invention:

1. An apparatus for measuring the heat opacity of light-sensitive photographic material said apparatus comprising: means for passing heat radiations through a light-sensitive photographic material without passing light rays thereto; and a thermometric device for receiving the heat radiations passed through the light-sensitive material.

2. In an apparatus for measuring the heat opacity of light-sensitive photographic material, the combination of: a heat-radiating body; a thermometric device adapted to receive heat radiations from said body, said apparatus being adapted to receive a light-sensitive photographic material between said body and said device; and a light screen for preventing the passage of light rays from said heat-radiating body to said light-sensitive material.

3. In an apparatus for measuring the heat opacity of light-sensitive photographic material, the combination of: a heat-radiating body, a thermopile; means for focussing heat radiations emanating from said body upon said thermopile; an electrical indicating instrument connected to said thermopile, said apparatus being adapted to receive a light-sensitive photographic material between said body and said thermopile; and a light screen for preventing the passage of light rays from said heat-radiating body to said light-sensitive material.

4. In an apparatus for measuring the heat opacity of translucent materials, the combination of: a heat radiating body; a thermopile; means for focusing the heat radiations from said body upon said thermopile; means for interposing a translucent object between said body and said thermopile; a light screen for preventing the passage of light rays from said heat radiating body to said translucent object; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity to be interposed between said thermopile and said body; and means for varying the intensity of the heat radiations projected through said object of known opacity to bring said galvanometer to a point of registration corresponding to said known opacity.

5. In an apparatus for measuring the heat opacity of translucent materials, the combination of: a heat radiating body; a thermopile; means for focusing the heat radiations from said body upon said thermopile; means for interposing a translucent object between said body and said thermopile; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity removably interposed between said thermopile and said body; means for varying the intensity of heat radiations projected through said object of known opacity to bring said galvanometer to a point of registration corresponding to said known opacity; and a screen holder whereby light absorbing filter means may be projected into the path of said heat radiations.

6. In an apparatus for measuring the heat opacity of translucent materials, the combination of: a heat radiating body; a thermopile; a reflector adapted to convergingly direct the heat radiations from said body towards said thermopile; a rectifying lens to parallelize said heat radiations; means for interposing a translucent object in the path of said parallel heat radiations; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity removably interposed between said thermopile and said heat radiating body; and means for varying the heat radiations projected through said object of known opacity to bring said galvanometer to a point of registration corresponding to said known opacity.

7. In an apparatus for measuring the heat opacity of translucent materials, the combination of: a heat radiating body; a

thermopile; a reflector adapted to convergingly direct the heat radiations from said body towards said thermopile; a rectifying lens to parallelize said heat radiations; means for interposing a translucent object in the path of said parallel heat radiations; means for converging said heat rays upon said thermopile; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity removably interposed between said thermopile and said heat radiating body; means for varying the heat radiations projected through said object of known opacity to bring said galvanometer to a point of registration corresponding to said known opacity; and a screen holder whereby light absorbing filter means may be projected into the path of said heat radiations.

8. In an apparatus for measuring the heat opacity of translucent materials, the combination of: a heat radiating body; a thermopile; a reflector adapted to convergingly direct the heat radiations from said body toward said thermopile; a rectifying lens to parellelize said heat radiations; a converging lens to direct said parallelized radiations against said thermopile; means for interposing a translucent object in the path of said parallel heat radiations; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity removably interposed between said thermopile and said heat radiating body; and means for varying the heat radiations projected through said object of known opacity to bring said galvanometer to a point of registration corresponding to said known opacity.

9. In an apparatus for measuring the heat opacity of translucent materials, the combination of: an electric heating element; a thermopile; a reflector adapted to convergingly direct the heat radiations from said element toward said thermopile; a rectifying lens to parallelize said heat radiations; means for interposing a translucent object in the path of said parallel heat radiations; means for converging said heat rays upon said thermopile; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity adapted to be interposed between said thermopile and said element; and means in circuit with said element for adjusting the energization thereof to bring said galvanometer to a point of registration corresponding to said known opacity.

10. In an apparatus for measuring the heat opacity of translucent materials, the combination of: an electric heating element; a thermopile; a reflector adapted to convergingly direct the heat radiations from said element toward said thermopile; a rectifying lens to parallelize said heat radiations; a converging lens to direct said parallelized radiations against said thermopile; means for interposing a translucent object in the path of said parallel heat radiations; a galvanometer in circuit with said thermopile to register the variations of heat to which said thermopile is subjected; an object of known heat opacity adapted to be interposed between said thermopile and said element; and means in circuit with said element for adjusting the energization thereof to bring said galvanometer to a point of registration corresponding to said known opacity.

11. In an apparatus for measuring the heat opacity of light-sensitive photographic materials, the combination of: a heat radiating body; a thermometric device adapted to receive heat radiations from said body; means for interposing a light-sensitive photographic object between said body and said thermometric device; a body of standard heat opacity removably interposed between said heat radiating body and said thermometric device; means for preventing light rays reaching said light-sensitive photographic object; and means for varying the heat of said heat radiating body to give a desired reading of said thermometric device when said body of standard opacity is interposed between said heat radiating body and said thermometric device.

12. In an apparatus for measuring the heat opacity of translucent materials, the combination of: a heat radiating body; a thermometric device; means for focusing the heat radiations from said heat radiating body upon said thermometric device; means for interposing a translucent object between said body and said thermometric device; a body of standard heat opacity removably interposed between said heat radiating body and said thermometric device; and means for varying the heat of said heat radiating body to give a desired reading of said thermometric device when said body of standard opacity is interposed between said heat radiating body and said thermometric device.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 30th day of November, 1921.

VINCENT C. DE YBARRONDO.