Nov. 17, 1931. E. W. GENT 1,832,294

SENSITOMETER

Filed June 6, 1929 2 Sheets-Sheet 1

FIG. 1.

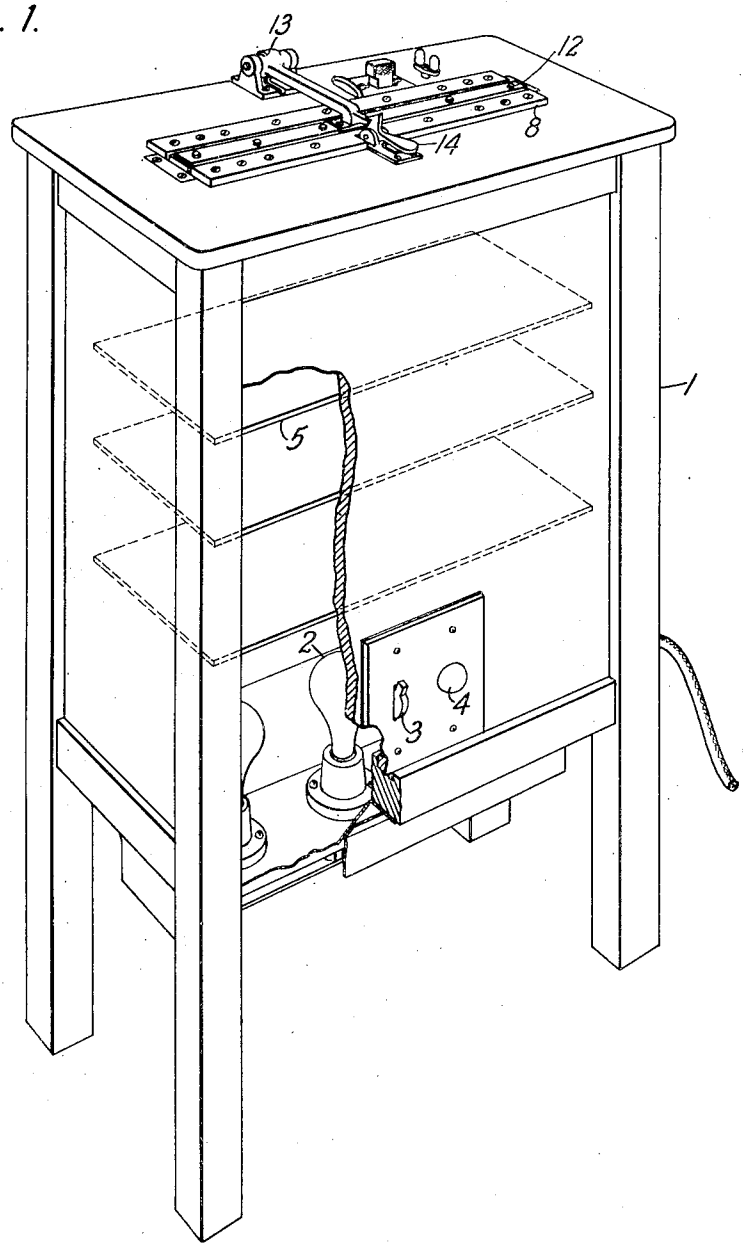

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FIG. 2.

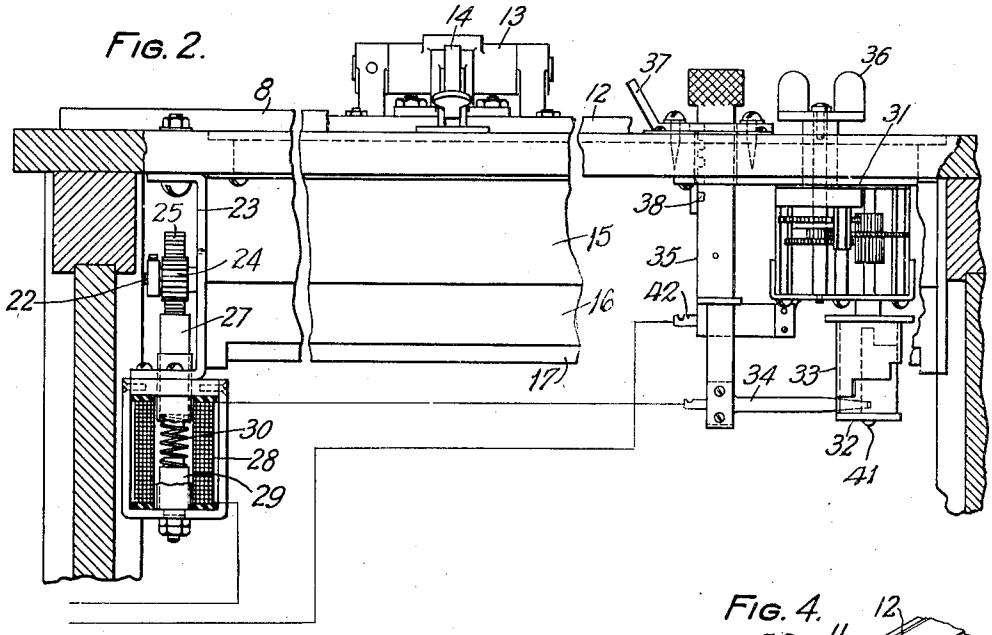


FIG. 4.

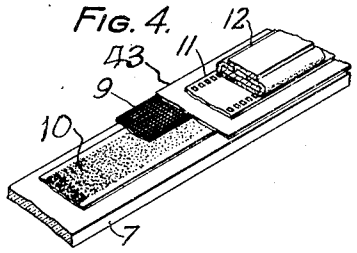


FIG. 3.

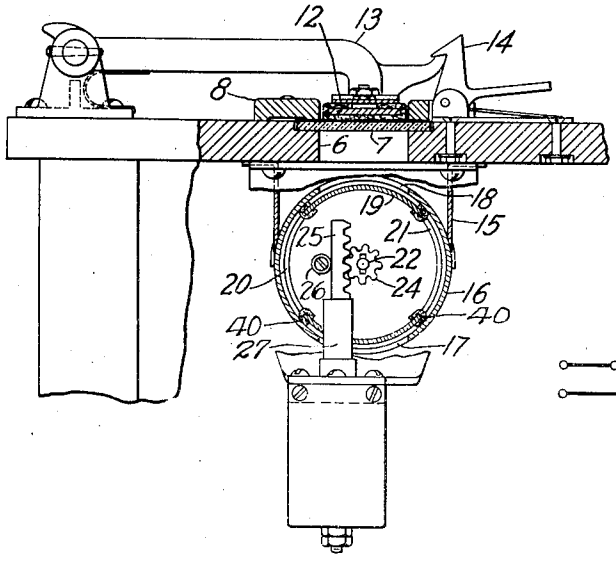
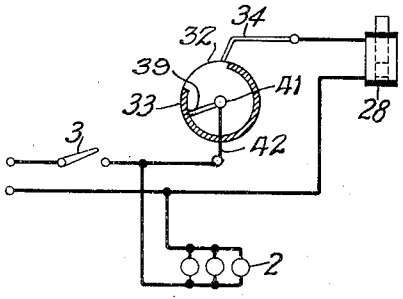


FIG. 5.



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Patented Nov. 17, 1931

1,832,294

UNITED STATES PATENT OFFICE

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SENSITOMETER

Application filed June 6, 1929. Serial No. 368,874.

The object of this invention is to provide a sensitometer, an instrument whereby tests may be made on a sensitive material from which the proper conditions for printing may be determined.

More specifically, it is the object of this invention to provide a sensitometer for impressing a series of exposures of graded intensities for definite and controllable times on different sections of the sensitive material.

Two factors are of primary importance in determining the conditions under which satisfactory prints are produced, and these are, the intensity of the light reaching the sensitive material and the length of time during which the material is exposed to the light. These factors should be adjusted to suit the sensitiveness of the material which can only be measured by indirect methods. These methods naturally fall into two main classes (1) impressing a series of exposures having intensities in a known ratio for a fixed time, and (2) impressing a series of exposures of fixed intensity for times having a known ratio. A well known method of obtaining a series of exposures having intensities in a known ratio is to permit light to reach the sensitive material through a screen having areas whose transmitting efficiencies are in a known ratio. However, if the exposure is timed for example, by a stop watch, inaccuracies are introduced due to human variations. Some attempts have been made to overcome this difficulty by using an automatic time switch to switch the lamp on and off, but this method introduces a further error due to the inertia of the lamp.

This invention provides a sensitometer in which the light reaches the sensitive material through a screen having areas of graded transmitting efficiency. Errors due to the inertia of the lamp are eliminated by having the lamp continuously lighted at constant brilliancy. The light falling on the screen is controlled by a shutter of novel design, which is opened for a definite time interval. The opening of the shutter is timed by a clockwork mechanism eliminating any errors due to human variations, and giving close uniformity of timing for each exposure. The mechanism may be set to various times of exposure which are in a known ratio.

In the drawings:

Fig. 1 is a perspective view of a sensitometer embodying this invention;

Fig. 2 is a partial front view, the front panel of the cabinet being removed;

Fig. 3 is a partial end view, partly in section;

Fig. 4 is a detail view showing the sensitive material in position; and

Fig. 5 is a circuit diagram.

The sensitometer comprises a light-proof cabinet 1 having at its lower end a plurality of lamps 2 supported in a reflecting trough and controlled by a switch 3. A tell tale 4 may be provided to indicate when the lamps are lighted. The light from the lamps is reflected upward through a series of translucent screens 5, so that an evenly diffused light reaches the top of the cabinet.

An opening 6, Fig. 3, slightly larger than the section of film to be tested, is cut in the top of the cabinet and covered by a translucent sheet 7, retained in place by suitable battens 8. An opaque strip 9, best seen in Fig. 4, is affixed to the sheet 7 so as to cut off the transmission of light through one-half of the sheet 7. Mounted under the strip 9 is a sensitometer strip 10 consisting of a series of areas of graded transmitting efficiency, a transparent cover 43 retained in place by the battens 8 may be placed over the opaque strip 9 and sensitometer strip 10 and serves to protect these strips from injury. The film or other sensitive material 11, is placed over the cover 43 and retained in place by the pad 12 which completely closes the opening 6. The pad 12 is attached to a lever 13 which is locked in its operated position by the latch 14.

The opening 6 on the inside of the cabinet is enclosed by a casing 15, the open end of which supports and is closed by a cylinder 16. At diametrically opposite points, the cylinder 16 is cut longitudinally to form the openings 17 and 18 adapted to allow the diffused light from the interior of the cabinet to fall on the sheet 7. Suitable covers (not

shown) are placed over the open ends of the cylinder 16 to prevent any light reaching the sheet 7 except through the openings 17 and 18. Concentric with the cylinder 16 is a second cylinder 19, also having at diametrically opposite points the longitudinal openings 20 and 21, which, when the cylinder 19 is rotated through a right angle, register with the openings 17 and 18 respectively to permit the light from the cabinet to reach the sheet 7. When the cylinder 19 is in the position shown the body of the cylinder closes the openings 17 and 18 and cuts off the light from the sheet 7. The edges of the openings 20 and 21 are lined with soft material 40 to prevent light leaking through the cylinders when in the closed position.

The cylinder 19 is supported by a short shaft 22 journalled in a bracket 23 affixed to the cabinet, and a similar shaft and bracket on the end not shown. Mounted on the shaft 22 is a pinion 24 actuated by the rack 25, which is held in engagement with the pinion 24 by the roller 26. A plunger 27 of soft iron is attached to the lower end of the rack 25 and adapted to move downward inside the electromagnet 28. A fixed core 29 of soft iron partially fills the space in the center of the electromagnet 28. A helical spring 30 is placed between the plunger 27 and the core 29. When the electromagnet 28 is energized the plunger 27 is drawn down, compressing the spring 30, and drawing the rack 25 downward, rotating the cylinder 19 through a right angle and permitting the light to reach the opening 6. When the electromagnet is deenergized the spring 30 extends, forcing the rack 25 upward and rotating the cylinder 19 to cut off the light from the opening 6.

Mounted on the top of the cabinet is a clockwork timing key 31, which may be of the type disclosed in U. S. Patent 1,306,054, issued June 10, 1919 to Joseph C. Field, but modified by a change in the timing cam.

A preferred form of this cam consists of a cylinder 32 having mounted thereon a conducting surface 33. A contact spring 34 mounted on a non-conducting rod 35, bears on the cylinder 32. When the handle 36 is rotated and released, the cylinder 32 will make one revolution in a known time. During the revolution of the cylinder 32, the contact arm 34 will be in contact with the surface 33 for a fraction of the revolution determined by the shape of the surface 33. The contact arm 34 may be raised by the rod 35, which is locked in the raised position by sliding the latch 37 into one of the notches 38. Thus by cutting away the surface 33 by differing amounts, the contact arm 34 will be in contact with the surface 33 for differing fractions of a revolution determined by the vertical position of the rod 35. The conducting surface 33 is connected through a pin 39 with the shaft 41 on which the cylinder 32 is mounted. The shaft 41 is connected through the metal frame of the key 31 with a terminal 42 suitably mounted on the key 31.

In the schematic circuit shown in Fig. 5, when the switch 3 is closed current flows from some suitable source of power (not shown), the lamps 2 are lighted, and a circuit is prepared for the operation of electromagnet 28, which is held open at contact 34. When the clockwork key is operated, the circuit is completed at contact 34 and surface 33, current flows from the source of power (not shown) through switch 3, terminal 42, the frame of key 31, shaft 41, pin 39, surface 33, contact 34, the winding of electromagnet 28 back to the source and electromagnet 28 is energized, opening the shutter. When the surface 33 has been rotated to where it ceases to make contact with the contact spring 34, the electromagnet 28 is deenergized releasing the shutter which is closed by the expansion of spring 30. As the clockwork key rotates the cylinder 32 in a known period of time, the shutter will be opened for a known and regulatable fraction of this period.

What is claimed is:

1. An instrument for determining the sensitivity of photographic material comprising a cabinet, a source of light in said cabinet, an exposure element having areas whose transmitting efficiencies are in a series of known ratio and variably adjustable automatic mechanism to control the admission of light to the exposure element.

2. An instrument for determining the sensitivity of photographic material comprising a cabinet, a source of light, an exposure element having graded light transmitting portions, variably adjustable automatic mechanism, and means to admit light to the exposure element for time intervals of predetermined duration under the control of said mechanism.

3. An instrument for determining the sensitivity of photographic material comprising a cabinet, a source of light, an exposure element having graded light transmitting portions, an electromagnetically actuated shutter, electrical contacts, clockwork mechanism for closing and opening said contacts for predetermined time intervals, and means to operate said shutter under the control of said contacts to admit light to the exposure element.

4. An instrument for determining the sensitivity of photographic material comprising a cabinet, a source of light in said cabinet, an exposure element having graded light transmitting portions, and a rotary shutter to control the admission of said light to the exposure element.

5. An instrument for impressing a series of graded exposures on a photo-sensitive material comprising a container, a source of light in said container, an exposure element having

graded light transmitting portions, means for retaining a portion of photo-sensitive material in contact with said element, a rotary shutter, a solenoid for operating said shutter and means for regulating the operated time of said solenoid.

6. An instrument for impressing a series of exposures in a definite ratio on a sensitive material comprising, a cabinet, a source of light in said cabinet, an exposure element having graded light transmitting areas, means for retaining a portion of said sensitive material in contact with said element, a rotary shutter, a solenoid for operating said shutter, electrical contacts, and clockwork mechanism adjustably controlling the operation of said contacts for regulating the operated time of said solenoid.

7. In a sensitometer, a cabinet, a source of light in said cabinet, diffusing screens for said light, a sensitometer strip comprising a series of light transmitting areas, the light transmission varying from area to area in a known ratio, means for retaining a portion of sensitive material in contact with said strip, a shutter comprising two concentric cylinders having diametrically opposite longitudinal openings, a solenoid for rotating one of said cylinders, electrical contacts, and clockwork mechanism adjustably controlling the operation of said contacts for regulating the operated time of said solenoid.

In witness whereof, I hereunto subscribe my name this 3d day of June, 1929.

EDGAR W. GENT.