

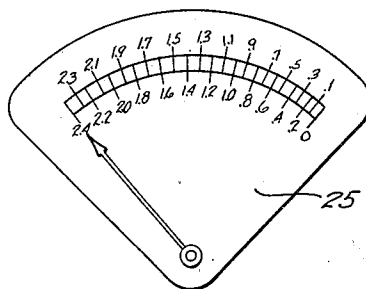
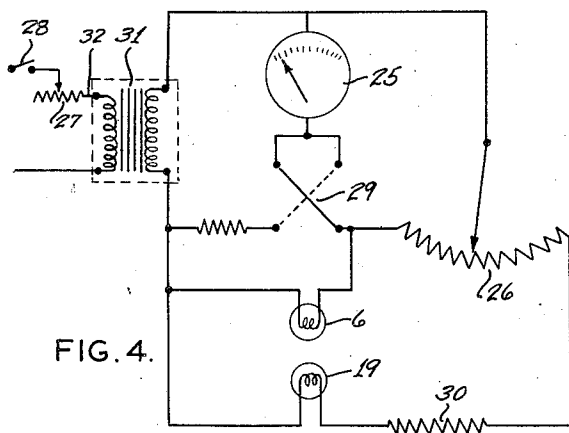
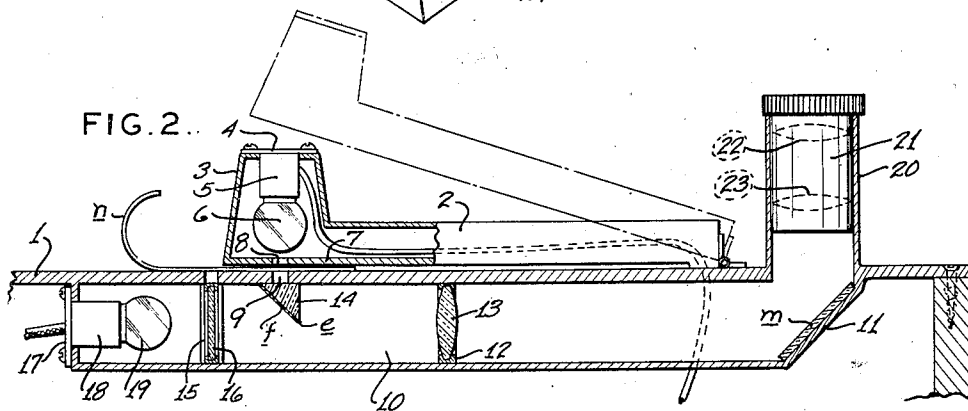
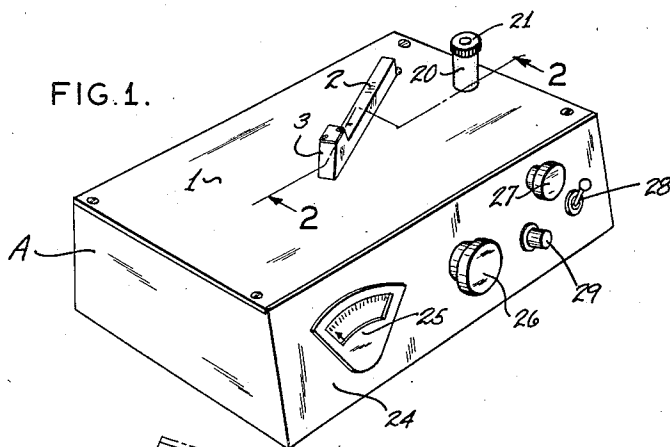
Oct. 10, 1944.

R. G. POINDEXTER

2,359,873

PHOTOMETER

Filed May 15, 1941



INVENTOR.

RICHARD G. POINDEXTER

BY

Richard G. Poindexter

ATTORNEY

UNITED STATES PATENT OFFICE

2,359,873

PHOTOMETER

Richard G. Poindexter, Clayton, Mo.

Application May 15, 1941, Serial No. 393,575

2 Claims. (Cl. 88—14)

This invention relates in general to optical analysis for chemical and photographic purposes. More particularly, my invention relates to a certain new and useful improvement in instruments of the class variously technically designated as photometers, nephelometers, colorimeters, or densitometers for especially measuring the transmission of light through a solid or liquid medium.

My invention has for its primary objects the provision of an instrument of the type stated which is comparatively inexpensive and economical in cost of construction and maintenance, which is precisely and accurately capable of determining the transmission of light through various types of suspensions, emulsions, solutions, and the like regardless of the presence or absence of interfering color matter, which may be quickly and conveniently adapted for density determinations over a wide range, the instrument being thus extremely universal in its adaptation and application to various analytical problems, which is unusually simple in operation and quickly and speedily usable with accurate results even by the most unskilled operator, and which is highly efficient and satisfactory in the performance of its stated functions.

And with the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing,

Figure 1 is a perspective view of a photometer or nephelometer constructed in accordance with and embodying my present invention;

Figure 2 is a fragmentary longitudinal sectional view of the photometer, taken approximately along line 2—2 of Figure 1;

Figure 3 is an enlarged elevational view of the indicating dial of the photometer; and

Figure 4 is a wiring diagram of the electrical circuit employed in the photometer of my invention.

Referring now in more detail and by reference characters to the drawing, which illustrates a practical embodiment of the present invention, the instrument includes a suitable outer shell A preferably of rectilinear form and hingedly provided upon its upper or top wall 1 adjacent one corner with a tubular arm 2 extending diagonally inwardly to approximately the center of the top wall 1 and enlarged at its forward or free end in the provision of a lamp housing 3, which is, in turn, provided with a removable top-plate 4 for supporting a depending lamp socket 5 and bulb

6. Formed in the bottom wall 7 of the arm 2 beneath the bulb 6, is an aperture 8, and similarly the top wall 1 of the shell A is provided with an aperture 9 registering with the aperture 8.

Formed preferably integrally upon the under face of the top wall 1 and extending longitudinally of the shell A on opposite sides of, and enclosing, the aperture 9, is a light tunnel 10 preferably of rectangular cross section and closed at its forward end by an oblique end wall 11 provided on its upper face with a plane surfaced mirror *m*. Disposed within the tunnel 10 between the aperture 9 and wall 11, is a fixed lens-mount 12 suitably bored and counter-bored for receiving a lens 13. Also disposed within the tunnel 10 beneath the aperture 9, is a 45° reflector or prism 14 having its oblique face *f* oppositely presented at 90° to the oblique end wall 11, and its bottom edge *e* disposed in the plane of the optical axis of lens 13. Preferably, though not necessarily, the oblique face *f* of prism 14 is silvered to improve its optical efficiency as a reflector. Suitably located within the tunnel 10 rearwardly of the prism 14, is a fixed pair of spaced slide-ways 15, and intermediate the ways 15, the shell top wall 1 is slotted for removably accommodating a filter or light-screen 16. Mounted in the vertical end wall 17 of the tunnel 10, is a lamp socket 18 and bulb 19, all as best seen in Figure 2.

Formed integrally in and extending upwardly from the shell top wall 1 directly above the mirror *m*, is a tubular telescope-sleeve 20 for shiftably accommodating an eye-piece or ocular 21 having lenses 22, 23, forming a conventional optical system, the optical axis of which is aligned with the optical axis of the lens 13.

The shell A is also provided with a preferably oblique front wall or panel 24 having a conventional volt meter 25, a potentiometer 26, a primary rheostat 27, a main switch 28, and a push-switch 29. Mounted within the shell A, is a fixed resistance 30 and a 110-8v. transformer 31, the primary of which is connected by means of a conventional electric wire 32 through the switch 28 and primary rheostat 27 to a source of electric current (not shown), it being always desirable when using the present instrument to standardize the current delivered to the lamps 6, 19, as will be well understood. The various electric elements and the lamp bulbs 6, 19, are connected as shown in the wiring diagram, Figure 4.

Accordingly, in use, a section of photographic negative *n* may be placed between apertures 8, 9, as shown in Figure 2, so that the rays of light passing through the negative fall directly upon

or register with the upwardly presented or objective face of the reflector or prism 14. The operator then, by suitable manipulation of the potentiometer 26 and peering through the eye-piece ocular 21, will observe a somewhat circular field of vision which appears to be split along a diameter into two contiguous semi-circular segments of different intensity or density, the one segment representing the incident light projected through the negative and reflected by the prism 14 and mirror *m*, and the other segment representing the light generated by the lamp 19 passing through the filter 16 and beneath the lower edge *e* of prism 14 and finally reflected to the eye-piece 21 by mirror *m*.

The operator thereupon adjusts the potentiometer 26 to reciprocally vary the intensities of the lamps 6, 19, by respectively increasing and decreasing the voltage transmitted to them from the secondary of the transformer 31 until the colors or densities of the two segments of the optical field are identical, when the diametral line of vision across the optical field will completely disappear and the operator will observe only a single circular field of uniform color and density or intensity. At this point, the value or reading may be taken from the scale or dial of the volt meter 25, and when the instrument is calibrated in units which are

$$\log \frac{1}{\text{transmission}}$$

the operator will be enabled to ascertain from such reading the precise density of the photographic negative and thus determine the amount of exposure which must be employed during the enlarging process. During the course of use, the correctness of the zero setting may be checked from time to time by depressing the push-switch 29 and, if necessary, adjusting the primary rheostat 27.

It will thus be evident that, by my invention, the commonly used trial-strip methods of enlarging may be entirely obviated, and, in addition, the instrument may, when suitably calibrated and provided with proper color screens, be employed as a color comparometer for many analytical purposes.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the in-

strument may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

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

1. A densitometer including a light-proof housing having a wall provided with an aperture, an electric light source disposed within the housing for generating a first beam of light, an eye-piece mounted in and extending outwardly from the housing, an arm swingably mounted on said wall and having a light-proof compartment at its free end, said compartment being provided with a wall having an aperture for registration with the aperture of the housing wall when the arm is swung into overlying position thereupon for holding therebetween a translucent medium the light-density of which is to be determined, an electric light source disposed in the compartment for generating a second beam of light which will pass through the apertures and translucent medium into the housing, means within the housing for directing the two beams of light into the eye-piece in proximate optical fields, and electrical means for matching the intensities of the two light beams.

2. A densitometer including a light-proof housing having a wall provided with an aperture, an electric light source disposed within the housing for generating a first beam of light, an eye-piece mounted in and extending outwardly from the housing, an arm swingably mounted on said wall and having a light-proof compartment at its free end, said compartment being provided with a wall having an aperture for registration with the aperture of the housing wall when the arm is swung into overlying position thereupon for holding therebetween a translucent medium the light-density of which is to be determined, an electric light source disposed in the compartment for generating a second beam of light which will pass through the apertures and translucent medium into the housing, means within the housing for directing the two beams of light into the eye-piece in proximate optical fields, electrical means for matching the intensities of the two light beams, and means for indicating the electrical conditions in the lamp circuits to provide a measuring of the light-density of the translucent medium.

RICHARD G. POINDEXTER.