

May 27, 1924.

1,495,763

T. D. SIMPSON ET AL

COLORIMETER

Filed July 31, 1923

2 Sheets-Sheet 1

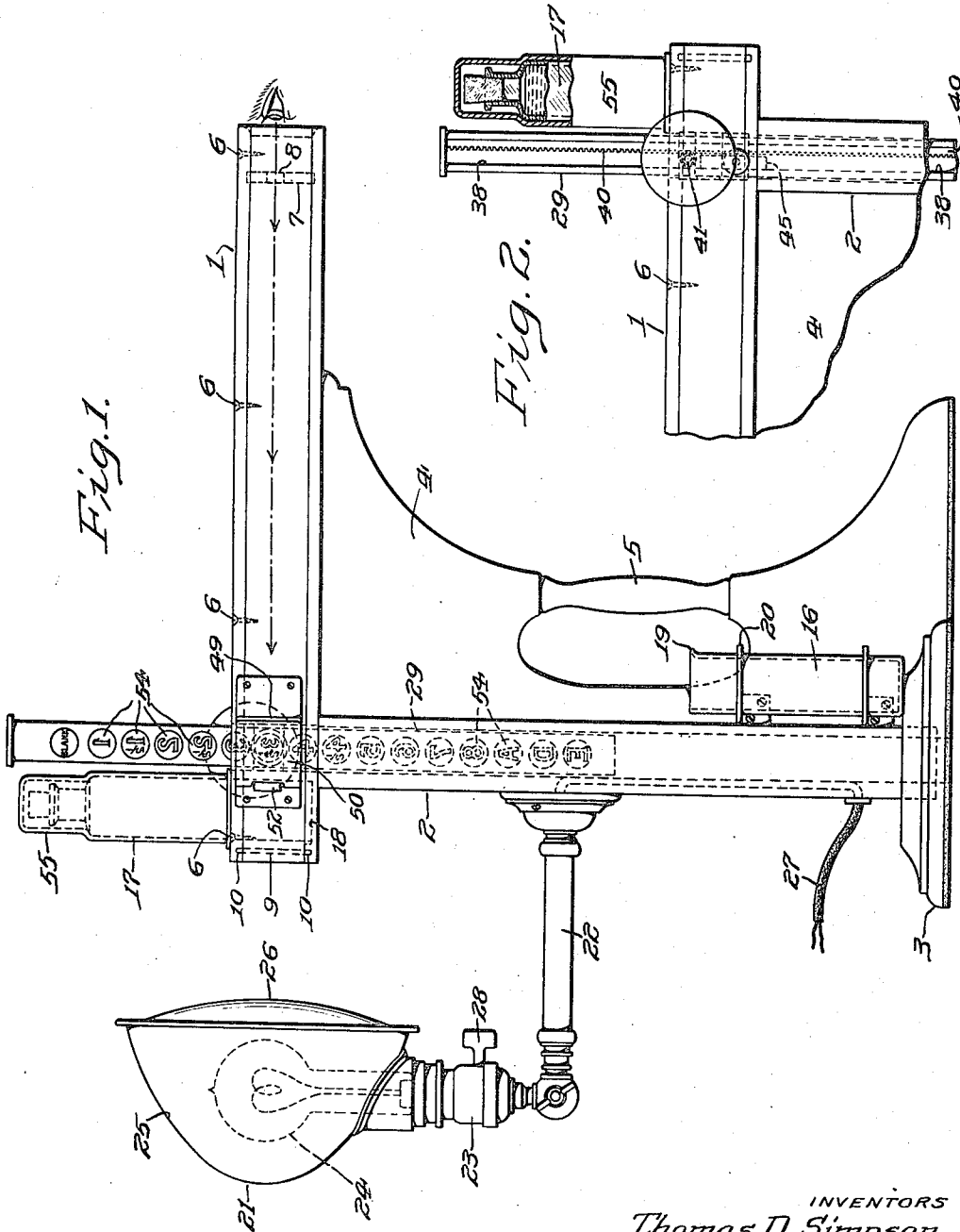


Fig. 1.

Fig. 2.

WITNESS

F. J. Hartman.

BY

Clayton Woodman

INVENTORS

Thomas D. Simpson,

A. Clayton Woodman.

ATTORNEYS

May 27, 1924.

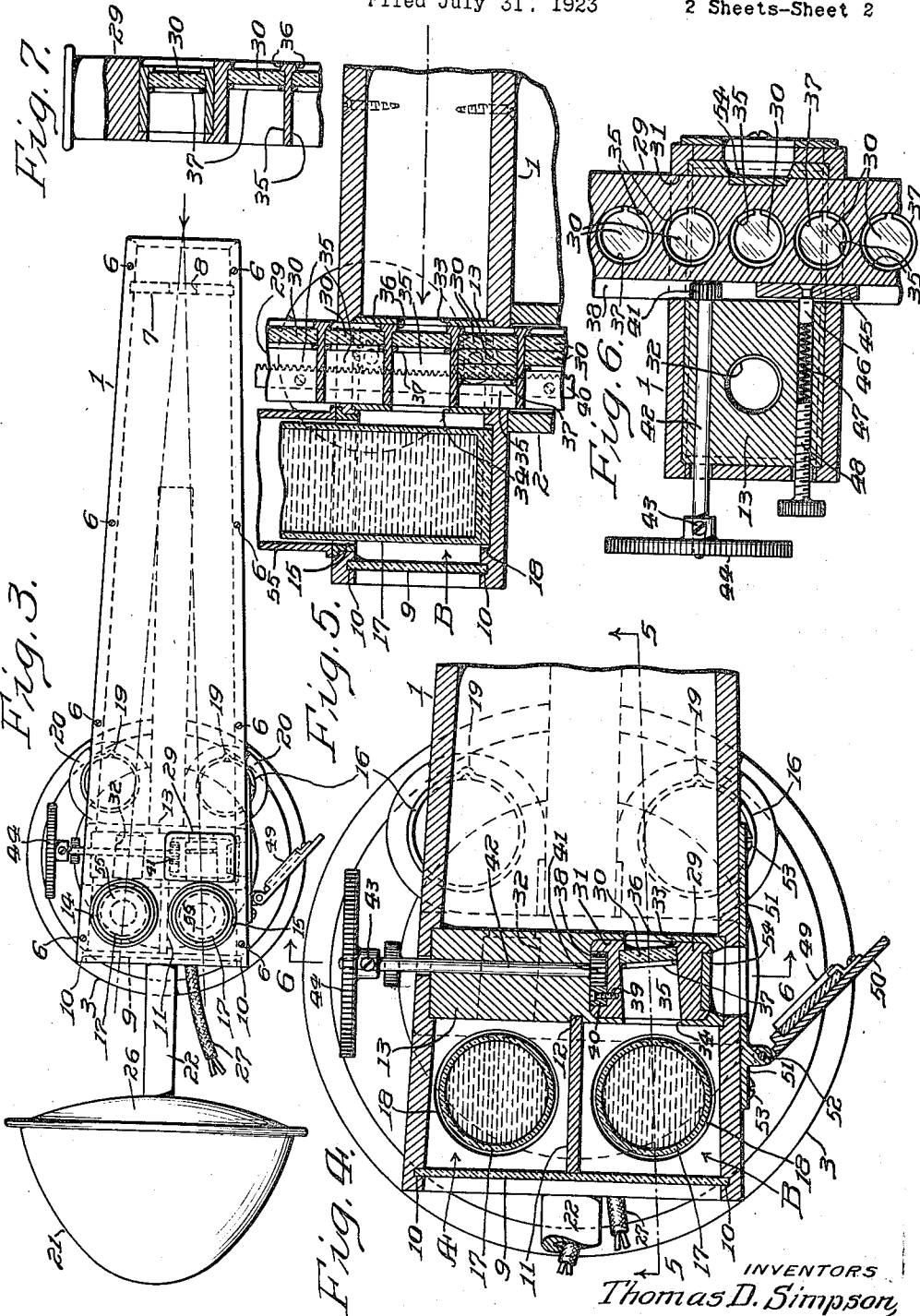
T. D. SIMPSON ET AL

1,495,763

COLORIMETER

Filed July 31, 1923

2 Sheets-Sheet 2



WITNESS

H. J. Hartman.

BY

INVENTORS
Thomas D. Simpson,
A. Clayton Woodman
David W. Woodman
ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS D. SIMPSON, OF MARCUS HOOK, AND A CLAYTON WOODMAN, OF MERION, PENNSYLVANIA, ASSIGNORS TO SINCLAIR REFINING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

COLORIMETER.

Application filed July 31, 1923. Serial No. 854,845.

To all whom it may concern:

Be it known that we, THOMAS D. SIMPSON and A CLAYTON WOODMAN, citizens of the United States, and residents of Marcus Hook, county of Delaware, and State of Pennsylvania, and Merion, county of Montgomery, and State of Pennsylvania, respectively, have invented certain new and useful Improvements in Colorimeters, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to means for measuring or determining colors of liquids.

A principal object of our invention is to provide means for ascertaining, according to recognized standards, the colors of liquids and more particularly of lubricating oils to assist in the grading thereof.

A further object of our invention is to provide an apparatus wherein samples of oils may be compared as to color with certain accepted standards of color, accurate determination made of the color of the samples, which may then be marked for refinery and sale purposes, according to a table of color standards.

A still further object of our invention is to provide a color grading apparatus for lubricating oils in which there is a magazine of color standards, vertically adjustable, whereby different standards may be quickly positioned so as to enable the observer to compare samples of oil therewith and determine their grade as to color.

A still further object of our invention is to provide an apparatus for grading liquids, more particularly lubricating oils, as to color and providing therein a source of light which is practically constant in intensity and color value.

A still further object of our invention is to provide an apparatus for measuring or grading lubricating oils as to color according to accepted glass color standards and also providing means for the comparison of colors of any two liquids.

Our invention further includes all of the other various objects and novel features of construction and arrangement hereinafter more definitely specified and described.

In the accompanying drawings we have illustrated one embodiment of our invention in which Figure 1 is a side elevation of our

improved colorimeter; Fig. 2 is a fragmentary reverse side elevation of Fig. 1; Fig. 3 is a top plan view; Fig. 4 is an enlarged fragmentary horizontal sectional view; Fig. 5 is a section on the line 5—5 of Fig. 4; Fig. 6 is a section on the line 6—6 of Fig. 4 and Fig. 7 is a view partially in section of the top portion of the carrier or magazine.

Referring to the drawings, a box 1, made of wood or other suitable material tapering longitudinally oblong and rectangular in transverse vertical section, is horizontally mounted on a hollow standard 2 seated upon a base 3. Additional support for the box 1, standard 2 and the base 3 is provided by the bracket 4 which may be joined to said parts in any suitable way, as by gluing. A hand grip 5 may be provided for convenience in handling and portability.

The box 1, which preferably is about eighteen inches in length, has four walls which may be joined by gluing and by screws 6 and the interior finish of the box is preferably of a dull black. A transverse vertical partition 7 with a circular peep hole 8 in the center approximately one-half inch in diameter is positioned preferably about one and one-eighth inches from the "observation" end of the box.

The "light" end of the box is closed by a rectangular piece of pure white opal glass 9 ground or etched on its inner side to diffuse the light; this glass 9 may be secured in any suitable manner, as by fitting it in grooves 10 in the walls of the box, as shown. Extending rearwardly from the glass 9 along the longitudinal axis of the box is a vertical wooden partition 11, the inner end of which engages in a groove 12 in the magazine holder 13, hereinafter referred to. This partition 11 is approximately one-eighth of an inch in thickness and together with the holder 13 divides the "light" end of the box into two compartments, A and B. In the top of the box and immediately over the centers of compartments A and B, circular holes 14 and 15, respectively, are provided suitable in size to accommodate standard jars 16 or a four-ounce standard oil sample bottle 17. Recesses 18 in the bottom of the box may be provided in which the jars or bottles may be seated. The standard jars 16 should be true cylinders of clear colorless glass pro-

vided with lips 19 for convenience of pouring and preferably should have an internal diameter of not less than 32.5 mm. nor more than 33.5 mm.; the thickness of the wall of the jar should be approximately 1.75 mm. and its height approximately 5 inches. Convenience for the storing of the jars when not in use is provided by the rings 20 through which the jars may be slipped to seat against the base 3. The four-ounce standard oil sample bottles 17 are cylindrical in shape and of substantially the same dimensions as the jars 16. The color of oils varies with the size of the column of oil and by providing fixed color standard units and fixed standard jars or bottles for the oil, we are enabled to obtain an accurate measurement and determination of the colors of oils.

An artificial daylight lamp 21 is mounted in any suitable manner on the standard 2 as by a bracket 22 carrying a swiveled socket 23 into which the incandescent lamp 24 is secured; a 50-watt C2 lamp has been found satisfactory. A parabolic metal reflector 25 is fitted on the swivel in front of which is mounted a dished glass color screen 26 of such composition and color as, in conjunction with the lamp 24, will yield by spectrum analysis a light approximating northern daylight. As is evident, the daylight lamp may be brought closer to the opal glass when desirable. A wire 27 leads to a source, not shown, of electric current and a switch 28 is provided for turning the current on and off. Should electric current be not available, our improved colorimeter may be used by exposing the opal glass 9 to northern daylight.

Within the box 1 and rearwardly of the holes 14 and 15 is positioned the holder 13 for the magazine 29 of color standards 30. The holder 13 may be of cast metal, wood or other suitable material and may be fitted into suitable recesses provided in the walls of the box, as shown. The left hand side of the holder, viewed from the "observation" end of the box, is provided with a passageway 31 through which the magazine 29 may be moved as hereinafter described. In the right hand side of the holder 13 is provided a cylindrical opening 32 at a slight angle to the longitudinal axis of the box and concentric openings 33 and 34 are provided in the passageway 31. The opening 32 and the openings 33 and 34 being formed at a slight angle to the longitudinal axis of the box, the lines of vision extend in straight lines from the peep hole 8 through the centers of the openings 32 on the one hand and 33 and 34 on the other hand and diametrically through the jars 16 or bottles 17 in the compartments A and B.

In order to prevent any interference with the vision which might be caused by the interior surface of the opening 32 or of

the magazine in which the color standards are mounted, the "observation" end of the opening 32 is made slightly smaller than the opposite end and the opening 33 slightly smaller than the opening 34 whereby the said interior surfaces are cut off from the line of vision.

Within the passageway 31 in the holder 13 is the magazine 29, which may be made of metal, wood or other suitable material. In practice we have found that aluminum is admirably suited for the purpose. Within the magazine, suitably placed, are provided substantially cylindrical openings 35 inclined at the same angle as the openings 31 and 32 so as to be in alignment therewith and provided with ledges 36 against which the glass color standard units 30 are seated and held removably in place by spring rings 37. The color standards preferably used are compound standards of the well-known Lovibond system but any glass color standards may be used. Provision is made in the embodiment of our improved colorimeter shown in the drawings for the magazine 29 to carry fifteen recognized color standard units, the number of units being, however, variable, with an additional opening marked "Blank" for the comparing, when desired, of two bottles or jars of oil or other substances. The glass color standards 30 are preferably at least five-eighths of an inch in diameter and, it will be understood, may be kept mounted in the magazine or placed therein from time to time as suits convenience.

The inner side of the magazine 29 is provided with a channel 38 on one side of which is fastened, by screws 39, a rack 40 with which is adapted to engage a pinion 41 secured to the shaft 42 in any suitable way, said shaft being rotatably mounted in the holder 13 and having secured thereto, by the screw 43, a hand wheel 44. As will be understood, the pinion may be operated to move vertically the rack and the magazine 29 to which it is secured and thereby bring any desired color standard (or the opening "Blank") into registry with the openings 33 and 34 of the holder 13.

A brake shoe 45 rides in the channel 38 and presses against the magazine 29 to assist in holding the latter in any desired position. The brake shoe 45 is supported by a pin 46 permanently secured thereto against which the spring 47 presses, the pressure of the spring being adjusted by the screw threaded member 48. We do not consider the brake shoe essential to the satisfactory operation of our device but we have found that it contributes to convenience.

A mirror 49 is mounted in a holder 50 which is secured to a plate 51 by the hinge 52, the plate 51 being attached by screws 53 to the box 1 and circular openings being

provided in the box and plate 51 in registry, whereby the index numbers or letters 54, displayed in reverse form on the magazine, each being opposite a color standard identified by the particular index number or letter, are reflected in the mirror 49, enabling an observer to know which of the color standard units is in his line of vision during the operation of the colorimeter.

The shields 55, of any suitable material and preferably of dull black interior, may be placed over the jars or bottles so as to exclude all light from those portions thereof extending above the box 1, thereby assisting in the accuracy of the color determination of the oil or other substance under observation.

The operation of our colorimeter is as follows: the oil to be examined is placed in a standard jar 16 or a sample bottle 17 and the jar or bottle seated in compartment A, as shown. In compartment B is seated a jar or bottle of distilled water or water white petroleum and both of the jars or bottles are then covered with shields 55 and the artificial daylight lamp 21 lighted. The magazine is then moved vertically by the engagement of the pinion 41 with the rack 40 and the color standards, one by one, are brought into registry with the openings 33 and 34 until the color standard nearest in color to the oil in the jar or bottle in compartment A is found. When electric current is unavailable the "light" end of the box is exposed to northern daylight with no objects in the immediate foreground.

The observer notes the index number or letter of the nearest color standard and by referring to the table of standards is able to classify the oil sample as to color therefrom for refinery and sales purposes.

While we have herein described a preferred embodiment of our invention, we do not thereby desire or intend to limit ourselves to any precise details of constructions or arrangement of parts as the same may be modified in minor particulars from those shown in the drawings and herein described without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described our invention, we claim and desire to protect by Letters Patent of the United States:

1. A colorimeter for oils and the like comprising an observation chamber, a hollow vertical support for said chamber, a peep-hole within said chamber and adjacent one end thereof, an opal glass closure for the other end of said chamber, two compartments within said chamber adjacent said closure, a glass container of distilled water in one of said compartments, a glass container of oil in the other compartment, a magazine of vertically disposed glass color standards tracking within said support, a

rack upon said magazine, a holder within said chamber for said magazine provided with a pinion to move said rack and magazine vertically, openings in said holder with which said color standards may be brought into registration, one line of vision of an observer extending from the peep-hole through said openings, the color standard in registry therewith, and said distilled water, and another line of vision extending from the peep-hole through an opening in said holder in alignment with said container of oil.

2. A colorimeter for liquids comprising an observation chamber having a peep-hole at one end and an opal glass closure at the other end, a vertically movable magazine, intermediate the ends of the chamber, of color standards in vertical arrangement, a holder within said chamber for said magazine, an index symbol displayed on the magazine for each color standard, a mirror carried by the chamber for reflecting the index symbols, two compartments adjacent the glass closure, a glass container of a sample liquid in one of said compartments, a glass container of distilled water in the other compartment, openings within said holder in alignment with said peep-hole and said containers, and means for moving said magazine to bring any color standard into alignment with one of said openings.

3. A colorimeter for oils and the like comprising an observation chamber, a hollow vertical support for said chamber, a peep-hole within said chamber and adjacent one end thereof, an opal glass closure for the other end of said chamber, two compartments within said chamber adjacent said closure, a glass container of distilled water in one of said compartments, a glass container of oil in the other compartment, a magazine of vertically disposed glass color standards tracking within said support, a rack upon said magazine, a holder within said chamber for said magazine provided with a pinion to move said rack and magazine vertically, openings in said holder with which said color standards may be brought into registration, one line of vision of an observer extending from the peep-hole through said openings, the color standard in registry therewith, and said distilled water, another line of vision extending from the peep-hole through an opening in said holder in alignment with said container of oil and said peep-hole, and an artificial daylight lamp mounted on said support adapted to direct light into said chamber through said glass closure.

4. A colorimeter for liquids comprising an observation chamber having an "observation" end and a "light" end, two compartments at the "light" end, a bottle of a sample liquid in one of said compartments, a bottle

of distilled water in the other compartment, from the "observation" end through the
a magazine of glass color standards, means sample liquid to the "light" end.
for vertically adjusting said magazine to In witness whereof we have hereunto set 10
bring any color standard into the line of our hands this 28th day of July, 1923.
5 vision from the "observation" end through
the distilled water to the "light" end, and
means for providing another line of vision

THOMAS D. SIMPSON.
A CLAYTON WOODMAN.