

May 19, 1942.

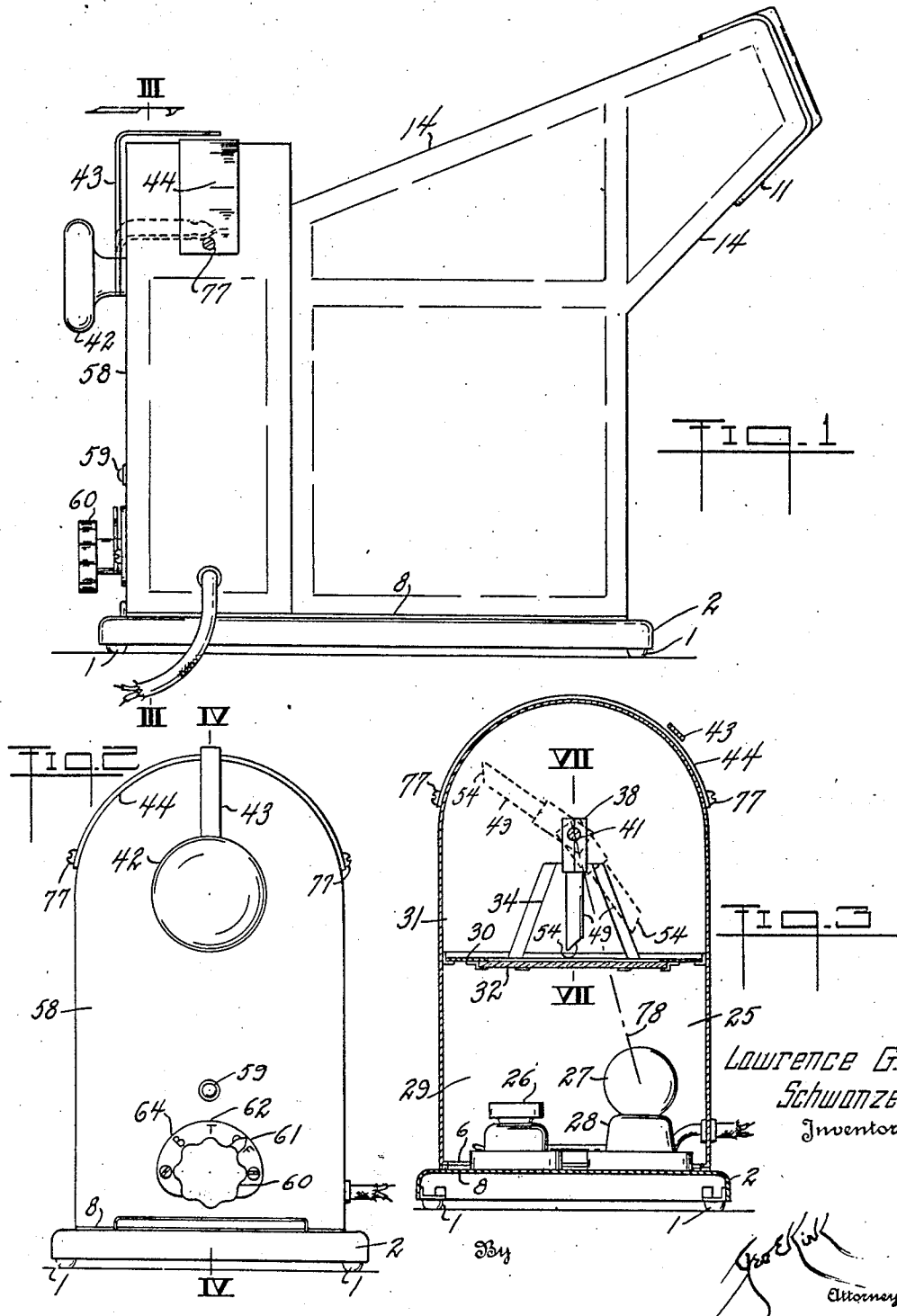
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EYE REACTION TESTING

2,283,769

SUBSTITUTE FOR MISSING XR

Filed Jan. 27, 1941

2 Sheets-Sheet 1



UNITED STATES PATENT OFFICE

2,283,769

EYE REACTION TESTING

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Application January 27, 1941, Serial No. 376,017

10 Claims. (Cl. 88—20)

This invention relates to testing equipment through vision.

This invention has utility when incorporated in apparatus for dark adaptation for determining light ray eye response, say after bleach, for comparison with immediate prior reaction.

More particularly this invention is a testing apparatus for the study of visual perceptions at low illuminations, even in the millifoot candle power range, and in making studies of the photochemical mechanism of the human eye, particularly with regard to certain reactions as in determining the regeneration of rhodopsin or visual purple in the retinal rod cells after being subjected to a light of sufficient intensity and proper wave-length to cause a bleaching of this pigment; the so-called dark-adaptation test or the study of the rhodogenesis.

Referring to the drawings:

Fig. 1 is a side elevation of an embodiment of the invention in a test unit;

Fig. 2 is a view of the housing in elevation from the left of Fig. 1, showing controls therefor;

Fig. 3 is a section on the line III—III, Fig. 1, showing the movable arm for varying the transmission of light rays;

Fig. 4 is a section on the line IV—IV, Fig. 2, showing the assembly of the parts in the housing;

Fig. 5 is a view on the line V—V, Fig. 4, showing the pilot light and check illumination windows;

Fig. 6 is a wiring diagram of the control features for the light source;

Fig. 7 is a view on the line VII—VII, Fig. 3, as to the transmission arm for the check illumination transmission, with herein a disclosure of a pilot transmission having an angle ray path in a translucent body;

Fig. 8 is a detail view on an enlarged scale of a window for the check illumination of different light ray transmission properties, say of the polarized screen type;

Fig. 9 is a section on the line IX—IX, Fig. 8, showing the mounting of the polarized pair of translucent elements; and

Fig. 10 is a detail view showing a closure flap as rocked into position at the limit of throw for the angular translucent means of the check illumination device.

Cushion feet 1 mount downwardly flanged base 2 (Fig. 4). This base 2 has eye 3 to receive hooks or lugs 4 as a ready locking means of the hinge type to have base flange portions 5, 6, 7, swing

into snug light closure engagement with packing felt 8 as angle 9 may be engaged by wing screw 10, thus firmly mounting housing having eye-piece 11 with light-seal base 12 surrounding opening 13. This is an effective light closure for the one using the apparatus, with the snug thrusting of the face for seating at this eye-piece. Side walls 14, extending in a tapering direction therefrom, provide chamber 15 and, with the exception of partition 16, have preferably an optical black lining to make the general wall structure for the interior of this chamber 15 non-reflective. The face of partition 16 is flat white, so that the rays of light from source 24 passing through window 21 will illuminate this area effectively. This chamber 15, opposite the viewpoint side having the eye-piece 11, has partition 16 with pilot light opening 17, say provided with red screen 18. In practice, this is desirable of the pin point type or so-called No. 52 drill in dimension of .0635" diameter. Adjacent this pilot window 17 for a red light, and desirably within 3° thereof and say thereabove as from the axis of the point of vision adjacent the eye-piece 11, there is located window 19 as the check illumination.

This chamber 15 has bottom 20 with window 21 therein, preferably of a green screen or filter glass. Below this bottom 20 for the chamber 15 is chamber 22, desirably of a reflective or white lining or interior wall. In this chamber 22 is mounted receptacle 23 for light source 24, herein of the usual type say 110 volt, 60 watt electric light bulb, so positioned that direct rays from the filament do not go through the window 21 to the observer at the eye-piece 11. This bulb receptacle 23 on the base 2 in the chamber 22 is separated by partition 25 from voltage regulator or rheostat 26, adapted to adjust electric current to bulb 27 in receptacle 28 in chamber 29, spaced by the wall 25 from the chamber 22. This rheostat may be of the manually operated type or of the automatic voltage regulator type. The electric light bulb 27 may be say 7½ watts.

The interior of this chamber 29 may be a reflective white, but, due to the requirement for subdued transmission of light rays, there is no purpose essentially in so doing. This chamber 29 has top 30 as a partition separating this chamber 29 from chamber 31. This partition 30 has therein window 32, say of ground glass, and with the purpose to transmit a subdued light from the chamber 29 to the chamber 31. This chamber 31 is desirably lined with optical black to render its walls generally non-reflective.

From this chamber 29 through port 33 as confined by wall 34 is light ray passage from the illumination source 27 to the pilot window 17 for red filter light observation by one looking in at the eye-piece 11.

Bearings 35, 36, at the chamber 31, are coaxial with the window 19 for check illumination, and mounted in the bearing 35 is arm 37, which extends to split block 38 assembled with the arm 37 by clamp screws 39. Screw 40 assembles therewith control stem 41 extending through the bearing 36 to handle 42, with which is fixed arm 43 as a pointer along scale 44 exterior of the housing. Interior of this housing or unit on this stem 41 is collar 45 fixed therewith by set screw 46 to coact with compression spring 47 as a friction holding means in any angular shifting or rocking of the arm 37 as to the bearing 35.

This arm 37 at the clamp 38 has elbow 48, from which there depends arm 49. There is thereby provided L-piece of these parts 37, 48, 49, desirably of a polymer of methyl methacrylate. This is a plastic of light ray transmission properties in a path bent to conform to the direction thereof. Quartz or other translucent means may be adopted. Herein at the elbow or bend 48 chamber 50 is provided for this clamp member 38 to be clear of contacting the bend 48, and this block 38, being of white metal, has its interior portion as exposed or in the chamber 50 of reflective value. However, the straight portions 37 and 49 of this elbow means as extending from the clamp have optical black or non-reflective opaque coating 51, 52, thereon. Terminus 53 at the window 19 is desirably ground or minutely roughened, as is face 54 at the terminus of the arm 49. This terminus as adopted herein is away from perpendicular to the axis of this depending arm 49, and, in this departure from perpendicular, presents a greater area than the cross section path of the arm to receive light from bulb 27 through window 32. In practice, a desirable angle adopted herein is 45°, and the direction or rotation of such as taken causes the greater surface area of the arm 49 to be presented toward and from the bulb 27 so that the light as received therefrom may be increased or gradually diminished. In this swing or rocking, there is reduced the visibility response effective as through the window 19 for the observer at the eye-piece 11. In practice, this swing operation may be as much as 160° and, as approaching the limit of swing, depending arm 55 may be struck by the rising arm 49 and rock this arm 55 on pivot 56 to throw its depending closure 57 (Fig. 10) as a flat face against the inclined light ray receiving portion 54 of the transmission path. This insures the starting of the device at zero or no transmission.

Remote from the eye-piece 11 is housing side 58 (Fig. 2) having signal window 59 as a disclosure to the operator as to whether or not the bulb 27 may be functioning in the chamber 29 as switch 60 is operated to have the pointer from "off" position 61 to "test" position 62, thereby past the voltage control or rheostat 26 to the test bulb 27. This rheostat or voltage regulator 26 is normally in the chamber 29 against disturbance by the operator, the purpose being that the light bulb 27 is normally adjusted as to the rheostat and is, during its life, of sufficiently close approximation, and under the conduct of test is efficiently responsive hereunder.

In practice, the observer or one to undergo dark adaptation test therethrough is placed in a darkened room for a period of time. Then being

placed at the apparatus, he snugly places his eyes at the eye-piece 11 as a light seal against light outside the device. As the one gazes through the eye-piece 11 as snugly closed to shut off all light rays into the chamber 15, there is illumination at this time only from the window 17 of the red pin-hole light serving as a pilot, target, or fixation point. When the transmission arm is at "off" position, the light 27 is on as the light source. The attendant or operator may, through handle 42, rock the stem 41 and with it the pointer 43 and the light transmission path 52, 48, 37, from non-transmitting position. This operation is conducted slowly or in small steps. When the one observing through the eye-piece 11 is able to detect a check illumination at the window 19, he so indicates, and the calibration on scale 44, which is in millifoot candles, is visible to the operator. Such reading is recorded.

When the handle 60 is shifted to point 64, in thereby cutting out the light source 27 and cutting in the bulb 24, effective bleaching light is thrown on the face of the partition 16 to effect certain bleaching or photo-chemical eye reactions. After this predetermined interval, and with the observer still retaining the position at the eye-piece 11, the handle 60 is again shifted to bring the pointer 61 from the point 64 to the point 62. This cuts out the bulb 24 and cuts in the bulb 27, with the result that the pilot or target window 17 has its red glow. Before operating the handle 60, the handle 42 (Fig. 2) is to have the arm 52 out of transmission position. Accordingly, now it is in order to swing this arm 52 down toward the window 32 gradually or in small steps until the observer at the eye-piece 11 may, in addition to the pilot light 17, detect at the window 19 in focal point check illumination. This will give a second reading, also recorded.

As the test is repeated at definite intervals, say, two minutes or less for the bleach test and even thereafter, the return or adaptation of the vision is checked as to the readings determined by the graduations 44. All readings having been recorded, the eye response of the observer may then be studied. The time necessary for regeneration to the test made prior to bleach may give valuable information relative to say vitamin A deficiency.

In lieu of the housing 34 from the port 33 to the pilot window 17, there may be located flange 65 (Fig. 7) to mount angular light path transmission element 66 having optical black coating 67. This member 66 has terminus 68 through port 69 from the chamber 31 to the chamber 29 and thus transmitting through red window screen 70 pilot light illumination at the window 17.

The rockable control for varying the light intensity herein is of value in that the light source 27 is undisturbed throughout, and there is accordingly retention of its quality and spectrum composition with merely a cutting off of the intensity. Iceland spar element 71 (Fig. 9) is fixed in bearing 72 at the window 19, and complementary Iceland spar or polarizing member 73 is mounted in toothed member 74 and operable from pinion 75 on the stem 41. This means that these light ray vibrations may, as transmitted from the member 73 to the member 71 and as at limit angular relations therebetween, say 90°, be nil; but as coming into departure therefrom, the strength or quantity of transmitted light is

stepped up at a determined rate, and such may be used as the scale determining points.

As occasion may arise for access or inspection of the chamber 31, such may occur through port 76 (Fig. 4) normally closed with opaque strip of the graduated arc or scale 44, anchored or attached to the housing by terminal screws 77.

A maximum of light rays will be gathered at the face 54 of the light transmission path when the axis of the arm 49 is in line with the longitudinal axis 78 of the rays emitting from the lamp 27 through the window 32, and such extent of light rays to be transmitted is curtailed as the swing is into perpendicular with the window and therepast to shut-off position.

The extent of the swing of the arm 49 may be such as to travel in opposite directions beyond maximum transmission position. Due to the angularly extending face 54, the scale 44 may have two sets of calibrations, for, as the arm 49 swings clockwise (Fig. 3), the face 54 is very gradually turned from the light source and hence the transmitted light is proportionally very gradually diminished. However, as the arm is swung counter-clockwise, the face 54 is more abruptly turned from the light source and hence there is a swifter diminishing light transmission and a correspondingly different scale reading.

It will be noted that at no time during the operation of this device is there light shining directly into an observer's eyes. The observer at the eye-piece 11 may see the window 21 as lighted by the bulb 24. The light from this bulb 24 accordingly does not shine directly into the eyes of the observer. When the bulb 27 is on, such may act to show at the window 32 and to be observed therefrom at the window 19 due to the light ray transmission of the elbow 37, 48, 49, of internal reflection powers. Accordingly, the light from the bulb 27 does not shine directly into the eyes of the observer.

What is claimed and it is desired to secure by Letters Patent is:

1. Eye reaction testing equipment comprising a chamber provided with an observation point adapted to be closed by one looking into the chamber to receive a test, an illumination-point-providing window in the chamber for directing eye response of the one at the observation point receiving the test, an additional illumination window in said same chamber laterally adjacent the point window and having therefor a light source, and light ray transmission means from the source to the additional window embodying between the source and the window a swingable internal reflection light ray transmission member of angular extent, said two windows being common for observation by the one at the observation point.

2. Eye reaction testing equipment comprising a chamber adapted to be closed by one looking into the chamber to receive a test, an illumination-point-providing window in the chamber for eye response of the one receiving the test, and an additional illumination window laterally adjacent the point window in said same chamber and having therefor a light source, and light ray transmission means from the source to the additional window embodying between the source and the window a pivotally mounted internal reflection light ray transmission of angular extent member coaxial with the additional window.

3. Eye reaction testing equipment comprising a chamber adapted to be closed by one looking into the chamber to receive a test, a first window

having a fixation point in the chamber for eye response of the one receiving the test, a second window laterally adjacent the first window in said same chamber and having therefor a light source, a light ray transmission device from the source to the second window embodying between the source and the window a bearing adjacent the second window, rockable internal reflection light ray transmission means of angular extent in the bearing, and an actuator for the means including a scale device for disclosing the position as to which actuated.

4. Eye reaction testing equipment comprising a chamber adapted to be closed by one looking into the chamber to receive a test, a first window having a point in the chamber for directing eye response of the one receiving the test, a second window laterally adjacent the first window in said same chamber and having therefor a light source, a light ray transmission device from the source to the second window embodying between the source and the window a bearing adjacent the second window, a rockable angle internal reflection light ray transmission means in the bearing, and an actuator for the means.

5. Eye reaction testing equipment comprising a chamber adapted to be closed by one looking into the chamber to receive a test, a first window having a point in the chamber for eye response of the one receiving the test, a second window laterally adjacent the first window in said same chamber and having therefor a light source, a light ray transmission device from the source to the second window embodying between the source and the window a bearing adjacent the second window, a rockable angle internal reflection light ray transmission means in the bearing, said angle means having an arm toward the light source to terminate in a face at an angle to the direction of the arm for departure from arm cross sectional area of rays from the light source.

6. Eye reaction testing equipment comprising a chamber adapted to be closed by one looking into the chamber to receive a test, a first window having a point in the chamber for eye response of the one receiving the test, a second window in said same chamber laterally adjacent the point and having therefor a light source, a light ray transmission device from the source to the second window embodying between the source and the window a bearing adjacent the second window, a rockable angle internal reflection light ray transmission means in the bearing, said angle means having a light ray impinged terminal face of greater area than the cross section of the means for gathering rays from a light source.

7. Eye reaction testing equipment comprising a chamber adapted to be closed by one looking into the chamber to receive a test, a first window having a point in the chamber for eye response of the one receiving the test, a second window laterally adjacent the first window in said same chamber and having therefor a light source, a light ray transmission device from the source to the second window embodying between the source and the window a bearing adjacent the second window, a rockable angle internal reflection light ray transmission means in the bearing, said angle means having a light ray impinged terminal face of greater area than the cross section of the means for gathering rays from the light source, and an actuator for swinging the angle means for the face to be shielded by its shield extent in cutting out rays from the light source.

8. In an apparatus for testing eye reaction, a window, a light source having a constant light value, and a rockably mounted internal reflection light ray transmission element of angular extent from the light source to the window, said element being provided with a cylindrical portion with a terminus having a plane at an angle to the axis of the cylindrical portion and adapted to receive a maximum impinged light when the line of the axis is coextensive with the light rays from the light source, said transmitted light being in a more rapidly diminishing cycle when said element is swung in one direction from said maximum transmission position than when swung in the opposite direction.

9. In apparatus for testing eye reactions, a housing having a partition therein dividing said housing into a viewing chamber and a light receiving chamber, a window in said partition, a light source in the light receiving chamber below the window, and a light ray volume adjustment device comprising a swingable internal reflection member of angular extent for conduct-

ing light rays from the light source to said window, said member having a pair of diverging arms, one mounted axially toward the window and the other extending radially from the one and axially swingable into and out of the path of the light rays.

10. In apparatus for testing eye reactions, a housing having a viewing chamber, a chamber therebelow having a light source therein, a partition therebetween having a light filter screen window, an additional chamber having a second light source therein, a light transmitting chamber thereabove, the partition therebetween having a second light diffusing screen window, a partition between this latter chamber and the viewing chamber, a third differently effective light screen window in said latter partition, means in the light transmitting chamber for transmitting light from the second light source to the third window, and switch means to light one or the other of the light sources.

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