March 3, 1931. J. W. LEGG 1,794,966

OPTICAL SYSTEM FOR OSCILLOGRAPHS

Filed May 31, 1927

Fig. 1.

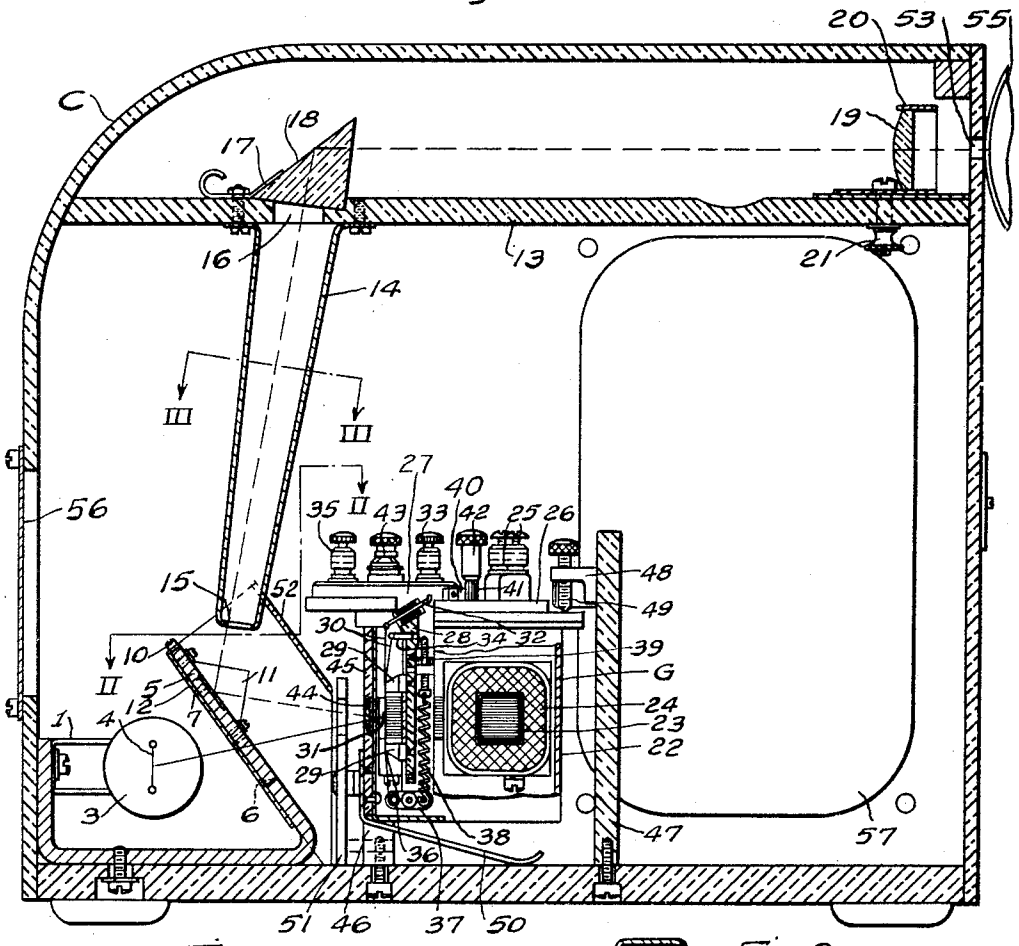


Fig. 2

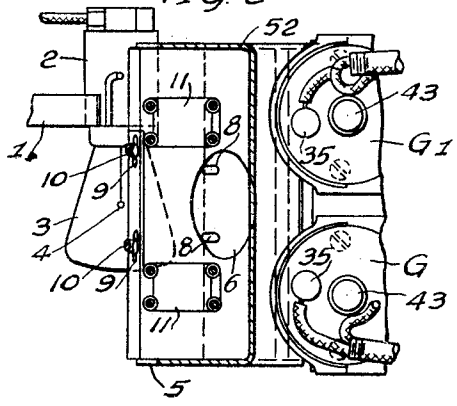
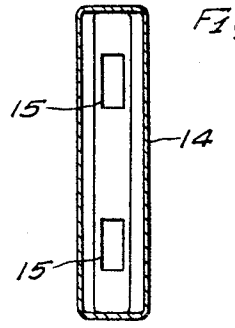


Fig. 3.



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OPTICAL SYSTEM FOR OSCILLOGRAPHS

Application filed May 31, 1927. Serial No. 195,399.

My invention relates to an optical system and has particular reference to one traversed by a beam of light emanating or reflected from a vertically disposed moving system of a galvanometer.

An object of my invention is to provide a compact oscillograph that shall be simple in construction and effective in operation.

A further object of my invention is to provide a compact oscillograph comprising one or more vertical deflecting systems and an optical system for increasing their optical leverage.

The feature of a light shield and a reflecting prism positioned between a galvanometer and a viewing or recording surface is described and claimed in my copending application, Serial No. 305,857, filed September 13, 1928 (a division of application, Serial No. 752,421, filed November 26, 1924).

In accordance with my invention, from a single source, separate beams of light are passed to a plurality of light-reflecting mirrors individually carried by vertically disposed deflecting or vibrating systems of individual galvanometers, the reflected beams of light thereafter traversing an optical system whereupon they are focussed substantially as points of light on to a viewing or recording surface of suitable character.

Further in accordance with my invention, an optical system as aforesaid, comprises a plurality of light-reflecting prisms through which a light-beam successively passes after which it traverses a suitable condensing lens, whereby it is focussed on to an indicating surface, as aforesaid.

Further in accordance with my invention, there may be disposed within a casing or housing a plurality of galvanometer mechanisms having individual movable systems normally disposed in substantially a vertical plane, one galvanometer mechanism responding to variations in a single quantity and another of said mechanisms responding to variations in a plurality of quantities jointly contributing to the production of another quantity, the light-beams reflected from said movable systems traversing an optical system of suitable character and thereafter engaging a suitable viewing or recording surface.

My invention resides in the optical system and features of construction of the character hereinafter described and claimed.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawing, in which

Figure 1 is a vertical sectional view of apparatus constructed in accordance with my invention.

Fig. 2 is a transverse horizontal sectional view, partly in plan, taken on the line 11—11 of Fig. 1.

Fig. 3 is a transverse horizontal sectional view taken on the line 111—111 of Fig. 1.

Referring to Fig. 1, there is illustrated a generally rectangular cabinet, casing or housing C, the wall structure of which should be of a character preventing the passage of light from outside sources to the interior of the cabinet. The aforesaid wall structure may be constructed of any suitable material such, for example, as a phenol condensation product.

Carried by a bracket 1 extending laterally from the rear wall of the casing C is the socket 2 of an evacuated bulb 3 containing a filament 4, preferably straight-line in character and extending vertically, Fig. 1.

In the example shown, the bulb 3 is disposed within a pocket or recess formed by a member or plate 5 angularly related with respect to the base of the casing C and carried thereby. The member 5 comprises an opening 6 of relatively large extent, Fig. 2. Disposed on one side of the member 5 is a cover plate 7 comprising a plurality of spaced openings or passages 8. The flanged end of plate 7 engages the upper edge of member 5 and is provided with one or more slots 9 through each of which extends a screw 10 threaded into said member 5.

Carried by that face of the member 5 most removed from the bulb 3 is or are one or more reflecting prisms 11, each spaced substantially equi-distantly from the center of the opening 6. Beneath each prism 11, the member 5 should be recessed as indicated at

12, Fig. 1, so as to preclude impairment of the reflecting qualities of the prisms.

Extending transversely of the casing C in the upper portion thereof is a plate or shelf 13. Depending from and suitably secured to the plate 13 is a light shield 14 open at its lower end or provided with a plurality of openings 15, each in alignment with a prism 11. As will readily be understood, the longitudinal axis of the light shield 14 should be substantially perpendicular to the upper plane faces of the prisms 11, Fig. 1.

The wall structure of the light shield 14 surrounds a light-transmitting passage 16 in the plate 13 having substantial length transversely of the casing C. Disposed above the passage 16 and suitably secured, as by one or more spring clips 17, to the plate 13 is an elongated reflecting prism 18.

Disposed interiorly of the casing C and adjacent its front wall is an elongated cylindrical condensing lens 19 carried by a frame 20 freely adjustable, when a nut 21 is loosened, along the member 13 toward or from the rear casing wall.

An optical system of the character herein described is designed especially for utilization with a plurality of galvanometer mechanisms G, G_1, each comprising a movable system normally disposed in a vertical plane and including a light-reflecting mirror. The movable systems may be vibrated or deflected in accordance with changes in a characteristic of a single quantity or they may be actuated in accordance with a plurality of quantities jointly contributing to the production of another quantity.

However, and preferably, one galvanometer mechanism G_1 is of the first mentioned type, while the galvanometer mechanism G is of the second mentioned type.

The galvanometer mechanism G is fully described and claimed in my copending application Serial No. 182,653, filed April 11, 1927.

By way of brief explanation, the galvanometer mechanism G is herein illustrated as comprising a casing 22 having supported therein a magnetizable structure 23 with which coacts a field winding 24 having its terminals connected to the binding posts 25 carried by a plate 26 disposed at the top of said casing 22.

Disposed on the plate 26 is a member or disc 27 from which depends a stem 28 having secured thereto in suitable spaced relation, a plurality of supporting members 29 of ivory, or other suitable insulating material. The members 29 are provided with aligned vertically extending passages in which are disposed a pair of substantially parallel conductors 30, having a light-reflecting mirror 31 cemented, or otherwise suitably secured thereto. One end of one of the conductors 30 is connected to a conductive member 32, insulated from the stem 28, but connected to a binding post or terminal 33 disposed on the aforesaid disc 27. One end of another conductor 30 is secured to a post 34 grounded on to the stem 28. A binding post or terminal 35 is in conductive relation with the disc 27 and stem 28; accordingly, the binding post 35 is conductively related with one end of the last mentioned conductor 30.

Conductors 30, 30 are in effect one integral conductor and, as illustrated, are looped around an insulating member 36 carried by one end of a lever 37 pivoted in the bifurcated end of the aforesaid stem 28. The other end of lever 37 has secured thereto a helical spring 38, the tension of which may be varied, upon adjustment of a nut 39, to vary the tension under which the conductors 30, 30 are placed.

Secured to the disc 27 is a gear segment 40, meshing with a pinion 41 disposed on a stem 42.

Upon actuation of stem 42, disc 27 and the vibratory or deflecting system comprising the conductors 30 and mirror 31 associated therewith may be rotated in either direction, thereby adjusting the mirror 31 about a vertical axis and bringing the reflected beam of light into a desired position in a horizontal plane.

Upon removal of a knob 43, and a pin formed integrally therewith around which the disc 27 is rotatable, the disc 27 may be moved rearwardly and then upwardly to withdraw the stem 28 and the vibratory system carried thereby from its operating position within the container 22.

A lens 44 is disposed over an opening of substantial diameter in the front wall of the container 22, said opening being in alignment with the mirror 31. In the example illustrated, lens 44 is suitably positioned as, by cement and a plate 45 suitably held to the exterior surface of the front wall of said container.

The aforesaid galvanometer mechanism G may be supported within the casing C in any suitable manner. There may be utilized a pair of spring arms 46 rising from the container base and disposed adjacent each side wall of the container base and disposed adjacent each side wall of the container 22 to which each of said arms is detachably secured in suitable manner. Rising from the base of the container C is a member 47 having secured thereto a bracket 48 into which a screw 49 is threaded, which, when adjusted, causes the container 22 to be swung either clockwise or counter-clockwise, Fig. 1, thereby compressing or releasing a spring member 50 carried by said container and tilting the mirror around a horizontal axis to cause the light beam reflected therefrom to assume a desired position in a vertical plane.

Disposed in front of each galvanometer

mechanism G and G_1 is a plate or member 51, having an opening of substantial diameter in alignment with a lens 44.

Forming a chamber with the plate 5 and the member 51, is a structure 52, utilizable for preventing the passage of undesired light rays into the region traversed by the reflected light rays before passage thereof into the light shield 14.

The operation is as follows:

Initially, screws 10 should be loosened and the plate 7 adjusted to bring the perforations 8 therein in alignment with the respective paths traversed by the light beams from the filament 4 to the respective light-reflecting mirrors 31 of the galvanometer mechanisms.

Thereafter, with the filament 4 at incandescence, a beam of light is transmitted to each mirror 31 by which it is reflected and passed through a prism 11, whereupon each beam passes upwardly, Fig. 1, through an opening 15 in the light shield 14. After reflection by the prism 18, the respective light-beams pass along a substantially horizontal path through the condensing lens and, after passing through an opening 53, are focussed substantially as points of light on to viewing or recording structure 55, which may be of any suitable character, either a light-sensitive surface, a viewing mirror, or otherwise as desired.

By proper adjustment of the mirrors 31 as effected by the respective pinions 41, the focussed spots of light may be brought into superposed or side by side relation on the structure 55.

At the rear of the casing C there may be provided a light-shielding door or window 56 which, upon removal, permits access to the interior of the casing C. It will be noted that upon removal of window 56, an observer may note the position of the mirrors 31 since there is a passage for this purpose between the end of the light shield 14 and the upper end of plate 5.

It may be desirable to provide the side walls of the casing C with one or more openings, 57. In actual operation, however, such an opening or openings is or are closed by a panel carrying suitable apparatus utilizable for controlling the herein described mechanism or mechanisms associated therewith. However, the provision of such panel or panels in no manner interferes with the light proof character of the casing C.

I claim as my invention:

1. The combination with a plurality of galvanometer mechanisms each comprising a deflecting system normally disposed in substantially a vertical plane, of a source of light, a member including a passage between said source of light and said galvanometer mechanisms, a second member including a plurality of light-transmitting passages coinciding with said first named passage, and means for adjusting said second member transversely of the light paths between said source of light and said galvanometer mechanisms.

2. The combination with a plurality of galvanometer mechanisms each comprising a deflecting system normally disposed in substantially a vertical plane, of a source of light, a member including a light-transmitting passage between said source of light and said galvanometer mechanisms, and a reflecting prism carried by said member and positioned in the path of the light reflected from said deflecting system.

3. The combination with a plurality of galvanometer mechanisms each comprising a deflecting system normally disposed in substantially a vertical plane, of a source of light, a member including a light-transmitting passage between said source of light and the deflecting systems, and a plurality of reflecting prisms carried by said member and cooperating individually with a galvanometer mechanism.

4. The combination with a plurality of galvanometer mechanisms each comprising a deflecting system normally disposed in substantially a vertical plane, of a source of light, a member comprising a light-transmitting passage between said source of light and said galvanometer mechanisms, and a light-shielding structure forming with said member a passage through which light-beams are transmitted toward and from said galvanometer mechanisms.

5. The combination with a plurality of galvanometer mechanisms each comprising a deflecting system normally disposed in substantially a vertical plane, of a source of light, a member comprising a light-transmitting passage between said source of light and said galvanometer mechanisms, a light-shielding structure forming with said member a passage through which light-beams are transmitted toward and from said galvanometer mechanisms, and a reflecting prism supported in said second named passage.

6. The combination with galvanometer mechanisms comprising a deflecting system, of a light shield traversed by a beam of light emanating from said system, a reflecting prism interposed in the path of said beam of light and between said light shield and said deflecting system, and a second reflecting prism interposed in the path of the beam of light reflected from said first-named prism.

7. The combination with a galvanometer mechanism comprising a deflecting system normally disposed in substantially a vertical plane, of a source of light, a member including a passage between said source of light and said galvanometer mechanism, a second member including a light-transmitting pas-

sage coinciding with said first-named passage and means for adjusting said second member transversely of the light paths between said source of light and said galvanometer mechanism.

8. The combination with a galvanometer mechanism comprising a deflecting system normally disposed in a substantially vertical plane, of a source of light, a member comprising a light-transmitting passage between said source of light and said galvanometer mechanism, and a light-shielding structure forming with said member a passage through which light beams are transmitted toward and from said galvanometer mechanism.

In testimony whereof, I have hereunto subscribed my name this 25th day of May, 1927.

JOSEPH W. LEGG.