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CROSS REFERENCE SEARCH ROOM

Nov. 17, 1925. 1,561,837

J. J. DOWLING

THERMIONIC INDICATING MEANS RESPONSIVE TO LIGHT VARIATIONS

Filed July 30, 1924

Fig. 1.

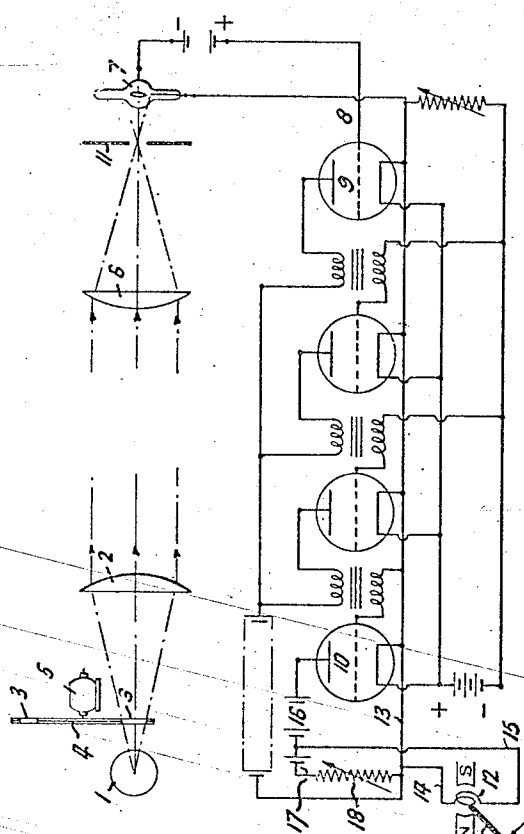


Fig. 2.

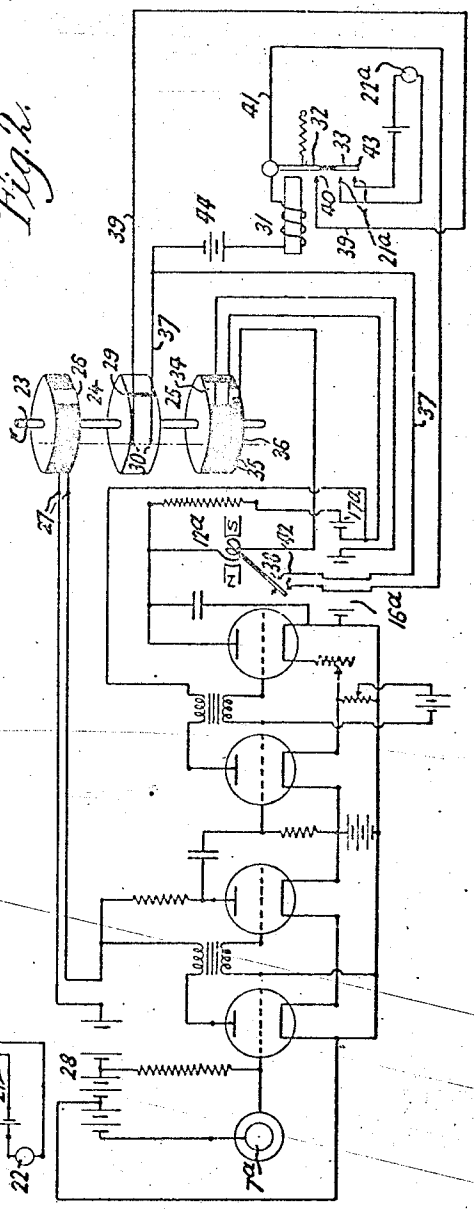


Fig. 3.



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THERMIONIC INDICATING MEANS RESPONSIVE TO LIGHT VARIATIONS.

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To all whom it may concern:

Be it known that I, JOHN JOSEPH DOWLING, a citizen of the Irish Free State, residing at Rathgar, Dublin, in the county of Dublin, Irish Free State, have invented Improvements in or Relating to Thermionic Indicating Means Responsive to Light Variations, of which the following is a specification.

This invention relates to thermionic indicating means responsive to light variation and it has for its object to effect certain improvements, the most prominent of which is directed to the production of an arrangement that shall be of extreme reliability in use and hence particularly adapted for signalling systems although it may also be employed for various other purposes.

Broadly, the invention consists in including a photo electric cell in circuit with a thermionic valve system and arranging for the continuous subjection of said system to electric current oscillations, persistence of which is necessary to prevent any indication being given that predetermined light conditions are departed from, the said current oscillations being caused by the regular interruption of a beam of light upon the cell aforesaid so that although the latter may be exposed and not screened, as is preferred, against all light except that of the regularly interrupted beam, the valve system will remain unaffected by variations of steady illumination such as mark the change from day to night. The valve system may be such that it is at all times responsive to persistence of oscillations as referred to or only at regular periods.,

Breakdown or failure of such a system will at once afford an indication just as the presence of an obstruction in the path of the rays of the interrupted beam is made known. In the accompanying drawings Figs. 1 and 2 are diagrams illustrating two different ways of carrying out the invention suitable for detecting the presence of fog for example, Fig. 3 being a fragmentary view of a part of Fig. 1 taken at right angles.

As shown in Fig. 1, the light from a suitable source such as a lamp or projector 1 intermittently reaches a collimating lens 2 through apertures 3 of a pierced disc 4 continuously driven by a motor 5, the rays from said lens 2 being collected by another distant lens 6 and directed on to a cell 7 which whilst it may be an ordinary selenium cell it is preferred should be one of a very high resistance which may be also specially sensitive to a particular part of the spectrum although a cell sensitive to infra red i. e. heat rays and an ultra violet sensitive cell may be employed, the said cell being introduced into the grid circuit 8 of the first valve 9 of an audio frequency valve amplifier of one or more stages, the system shown being one that is well known and per se forms no part of the present invention. One valve, in this case the final valve 10 is employed to rectify the alternating current delivered by the amplifier, and anode rectification is availed of in preference to cumulative grid rectification.

The light rays from the receiver lens 6 may be brought to a focus in front of the photo electric cell 7 at which point can be located a diaphragm or screen 11 to limit the amount of daylight that may have access to the cell, and if desired a color filter or combination of filters may be employed in such diaphragm or screen which, as in the case of cells sensitive to special regions of the spectrum, enable a selective action to be obtained, as may be necessary or desirable in detecting haze and fog.

The indicating device may be any suitable form of relay associated with the valve that effects rectification, in this case the valve 10, being exemplified as a well known type of Weston moving coil relay with the coil 12 connected to lead 13 through lead 14 and through a lead 15 to a point between battery 16 and a smaller battery 17 connected in series with a regulating resistance 18. As long as the valve system remains excited by the reception of light impulses from the lamp 1 the battery 16 will so preponderate over the battery 17 that the coil 12 will take a position such that an arm 19 bears against a dead contact 20. If, however, by reason of fog for example the valve system is no longer effective the battery 17 will cause a reverse current to flow through the coil 12 and so move the arm 19 as to cause the contacts 21 in the local circuit of a bell or other suitable signal device 22 to be completed.

It will be seen from what has been described that stoppage or break down of any of the parts from lamp 1 to relay 10, but not in battery 17, must necessarily cause the relay to act and give the warning signal which normally results when the oscillations of current derived with the aid of the photo-

electric cell 7 become sufficiently feeble. By using adequate amplification the saturation current can be attained in the last valve 10 or equivalent so that unless light falls in intensity below a predetermined value the relay will not act.

The lenses 2 and 6 referred to may be replaced by any other suitable optical means.

The details may be varied in many ways, it being permissible for example to employ various other valve systems.

As the continuous operation of the device in a satisfactory manner for very long periods without alteration may be desirable, clock work or similar mechanical means may be employed to disconnect the batteries except for a very brief period, say every minute.

An arrangement of this kind is shown in Fig. 2 where three contact discs 23, 24, 25 are arranged to be collectively driven. The contact disc 23 is of insulating material with a metallic strip 26 cooperating during each revolution with a pair of brushes 27 adapted to complete and open the circuit of battery 28 associated with the photo-electric cell 7^a. The contact disc 24 is of metal but includes a strip 29 of insulating material cooperating with a pair of brushes 30 associated with an auxiliary relay winding 31 the armature 32 of which has a spring bias towards the dead contact 33 when the relay is deenergized. The contact disc 25 is of insulating material with a metallic strip 34 of two different widths with which cooperate a pair of brushes 35 adapted to complete the circuit between the large and small batteries 16^a 17^a associated with the main relay embodying coil 12^a as well as a brush 36 adapted to connect one end of the said coil to both batteries at the same point but only after the connection between the batteries is established and to disconnect the said end of the coil before the connection between the batteries is interrupted. One of the brushes 30 is connected by lead 37 to one contact 38 of the main relay and the other brush 30 is connected by lead 39 to a contact 40 adapted to be engaged by the armature 32 when the auxiliary relay is energized, said armature having a connection 41 leading to a second contact 42 of the main relay. The armature 32 further carries an insulated contact 43 adapted to engage contacts 21^a of a local circuit that includes the signal device or bell 22^a. Normally the parts occupy the the position shown from which it will be apparent that the batteries 16^a, 17^a and 28 are idle. During rotation of the devices 23, 24 and 25 the circuit of battery 28 is completed through brushes 27 at the same time as brushes 35 act to connect the batteries 16^a and 17^a together. Immediately afterwards brush 36 acts to connect the coil 12^a of the main relay to such batteries. If there be no fog, the valve system becomes active immediately the circuits or batteries 16^a, 17^a and 28 are complete and the coil 12^a of the main relay when connected has current established in it instantly at its proper value. The result is that the armature 19^a of the main relay remains in the position shown as in the first example described and no signal is given. If however by reason of fog the valve system is not effective battery 17^a will act to move the armature 19^a and cause contacts 38 and 42 to be electrically connected. A circuit is accordingly completed through the coil of relay 31, including a battery 44, by way of lead 41 and part of lead 37. Armature 32 of the auxiliary relay is in consequence attracted and the circuit of the bell 22^a completed through contacts 21^a and 43. This obtains until the insulating strip 29 of the disc 24 passes the brushes 30 after which the said brushes again engage the metallic portion of the disc and complete a holding circuit for battery 44 and relay coil 31 by way of the armature 32, contact 40, lead 39 and part of lead 37, whereupon notwithstanding that the circuits of batteries 16^a 17^a and 28 are again interrupted at brushes 35 and 27 the signal will continue to be given during the completion of the rotation of the discs. If during the next rotation of the discs the fog still persists the battery 44 of the auxiliary relay will be again energized first by the battery 17^a as before, whilst the insulating strip 29 of disc 24 interrupts the holding circuit, and subsequently by such holding circuit, but if there be no fog and the valve system is effective to prevent closure of the circuit of battery 44 by the main relay, then the passage of the insulating strip 29 of disc 24 under brushes 30 will result in the auxiliary relay being released. The signal will thus no longer act.

In addition to the advantages already referred to the invention enables transformers to be used for amplification whilst the employment of an intermittently interrupted beam of light overcomes the necessity of having to resort to direct current amplification in which, as is known, it is difficult to obtain sufficiently steady conditions with batteries and relays.

Other uses to which the invention may be put may be the recording of the passage of objects to be counted. For instance newspapers or printed articles may be provided with dark zones adapted to enter the path of continuously interrupted light rays as referred to so as to constitute an obstruction which will give the indication desired.

What I claim is:—

1. Light responsive means of the kind referred to comprising a thermionic valve

system, indicating means associated therewith, means for continuously subjecting the said system to electric current oscillations, persistence of which is necessary to prevent any indication being given that predetermined light conditions are departed from, and means automatically rendering the thermionic valve system responsive only at regular periods to the persistence of the electric oscillations to which it is continuously subjected.

2. Means of the kind herein referred to comprising a source of light from which a beam emanates, means for regularly interrupting such beam, a photo electric cell exposed to said interrupted beam of light, a thermionic valve system with which the cell is operatively connected, indicating means rendered inoperative whilst the valve system is subject to the action of the regularly interrupted beam of light and conversely rendered operative when the regularly interrupted beam of light is obscured, and means whereby the valve system is automatically rendered responsive to the interrupted beam of light only at intervals.

3. In light responsive means of the kind herein referred to a thermionic valve system embodying an audio frequency valve amplifier, an indicating device, a relay, a battery influencing said relay under control of the valve system and a smaller battery influencing the relay independently of the system, the said relay acting, when the larger battery is functioning, to prevent the indicating device operating and the smaller battery at other times rendering the indicating device operative, substantially as described.

4. In light responsive means of the kind herein referred to, a thermionic valve system embodying an audio frequency valve amplifier, an indicating device, a relay, a battery influencing said relay under control of the valve system, a smaller battery influencing the relay independent of the system, a second relay influenced by the first named relay and means controlled by the first named relay for influencing said second relay when no longer influenced directly by the first relay, said second relay being adapted to render the indicating device operative and inoperative, substantially as described.

5. In light responsive means of the kind herein referred to, a thermionic valve system, an indicating device, a relay directly associated with the said system, a relay directly associated with the first named relay and adapted to operate the indicating device and mechanically driven switching means adapted to render the valve system periodically inoperative, substantially as described.

6. In light responsive means of the kind referred to, a thermionic valve system, an indicating device, a relay directly associated with the said system, a relay directly associated with the first named relay and adapted to operate the indicating device, means for influencing the relay of the indicating device independently of the first named relay, mechanically driven switching means adapted to render the valve system periodically inoperative and switch means also mechanically driven adapted to control the relay of the indicating device, substantially as described.

Signed at Dublin, Ireland, this 10th day of July, 1924.

JOHN JOSEPH DOWLING.