I. KITSEE.

TELEGRAPHIC RECEIVING ORGANISM.

APPLICATION FILED OCT. 15, 1909.

985,680.

Patented Feb. 28, 1911.

2 SHEETS—SHEET 1.

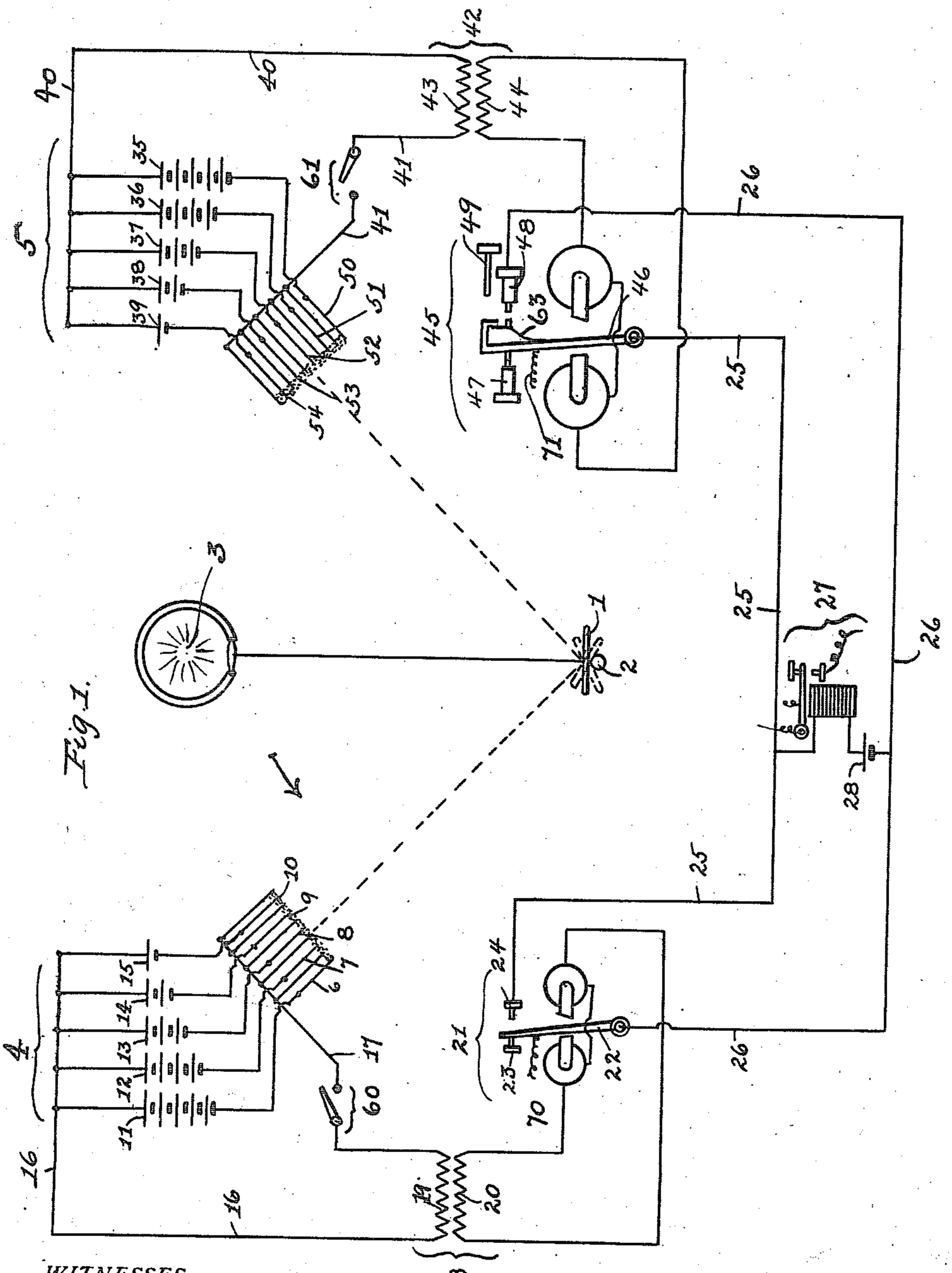

Fig. 1.

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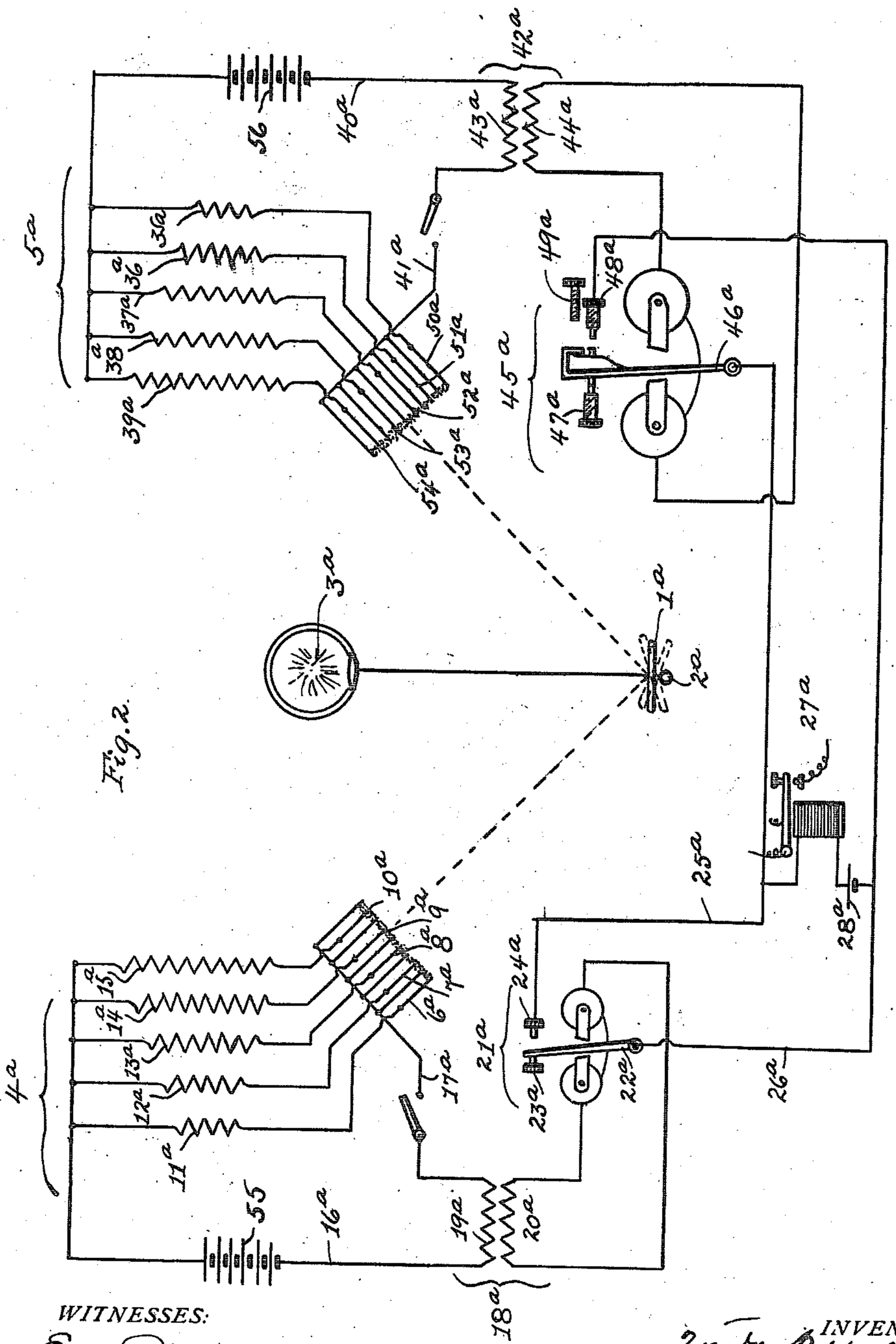

Fig. 2.

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TELEGRAPHIC RECEIVING ORGANISM.

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To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Telegraphic Receiving Organisms, of which the following is a specification.

My invention relates to an improvement in telegraphic receiving organism. Its object is, to translate or relay telegraphic impulses with the aid of receiving devices inserted in the line and has more special reference to telegraphing over lines with distributed capacity, such as submarine cables. To avoid any possibility of injury to the insulating coating of the cable, it is an essential condition that none but very weak currents should be employed and the receiving device has to be, therefore, of a very sensitive nature. With devices as are now employed in cable telegraphy, such as a reflecting galvanometer or siphon recorder, the messages transmitted can only be read with the aid of the flash or recorded curves. It is the aim of my invention to translate these impulses into sound, if so required, or to relay the same automatically to another line. I make use of the property of a selenium cell to change the resistance through rays of light. A selenium cell having normally a great resistance will offer to the flow of the current far less resistance when exposed to such rays. But the shifting of the zero bars entirely the employment of selenium cells with the arrangements of today.

It has to be borne in mind that the telegraphing over submarine cables is accomplished with both polarities; the positive polarity generally denoting a dot and the negative polarity a dash. Normally, the receiving device is at zero. When, now, the operator transmits two impulses of one polarity in succession, the movable part of the receiving device does not return to the zero position between the two impulses, but the action is such that at the first impulse, the movable part deflects a certain degree and then, before it has returned again to its normal position, the second impulse drives it to a greater deflection than the first. Persons versed in the art of telegraphing over cables know that this moving of the zero has so far barred every attempt to actuate a local circuit containing a sounder or recorder; and it is the aim of my invention to overcome this difficulty.

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

Figure 1 illustrates in diagrammatic view a receiving apparatus employing selenium cells provided with my arrangement and Fig. 2 is a similar view of a modified form.

In both figures, similar parts are designated by similar numbers with the exception that in Fig. 2, the letter "a" is added to the numbers.

I will first describe the arrangement as is illustrated in Fig. 1. In this figure, 1 is a reflector, such as a mirror supported by the movable part of a receiving device inserted in the line. This movable part may consist, in the case where a reflecting galvanometer is employed, of the movable needle, and where the recorder is employed, of the siphon itself, or any device substituted for said siphon and this support is designated by the numeral 2. 3 is a source of light; 4 and 5 are two selenium organisms; the organism 4 comprising here the cells 6, 7, 8, 9, and 10. The cell 10 is provided with a source of current 15; the cell 9 with a source of current 14; the cell 8 with a source of current 13; the cell 7 with a source of current 12 and the cell 6 with a source of current 11. It will be noticed that the voltage of the source of current of each succeeding cell is higher than the voltage of the source of current of the preceding cell. In this drawing, 10 is provided with a source of current of one unit pressure; 9 a source of current of two units pressure; 8 a source of current of three units pressure; 7 a source of current of four units pressure; 6 a source of current of five units pressure; and if each unit is represented by two volts, as for instance in storage batteries, it is obvious that cell 10 is provided only with two volts, whereas cell 6 is provided with ten volts and the voltage of the intermediate cells is progressively increased. The sources of current are connected here with one pole to one of the electrodes of the selenium cells and with the other pole, here the positive pole, through wire 16 to wire 17 and this wire is connected to the other of the electrodes of the selenium cells. This arrangement connects all the sources of current in multiple arc.

18 is a converter or transformer compris-

ing the primary 19 and secondary 20. The primary 19 is inserted in the circuit formed by wires 16 and 17 and in this circuit is also—for convenience—inserted the switch 60.

The selenium organism 5 comprises the cells 54, 53, 52, 51, and 50, provided with the sources of current 39, 38, 37, 36, and 35. These sources of current are also progressively increased as to their pressure or voltage in a manner, so that the first cell is connected to a source of current of the lowest electro-motive force and the last cell to a source of current having the highest electro-motive force. These sources of current are also connected with one pole to one of the electrodes of the selenium cells and are connected with the other pole through wire 40 to wire 41 and through this wire with the other of the electrodes of said selenium cells. This arrangement also places the different sources in multiple arc.

42 is a converter or transformer comprising the primary 43 and secondary 44. The primary 43 is connected in the circuit formed by the wires 40 and 41. The circuit is provided—for convenience—with the switch 61.

In organism 4, the secondary 20 of converter 18 has in its circuit the coils of relay 21. This relay is of the polarized type, and is provided with the forward stops 23 and 24 and the armature 22. In the drawing, the armature rests against stop 23 and is provided with the spring 70. The stop 24 is connected to wire 25 and the armature 22 to wire 26. Between the wires 25 and 26 is inserted the electro-magnet, here shown as a repeating sounder 27 and the source of current 28.

The secondary 44 of the converter 42 has in its circuit the coils of relay 45, preferably of the polarized type. This relay is—what is technically called—a dash relay, *i. e.* a relay provided with means to prolong the closing of a local circuit through an arrived impulse. For this purpose, this relay is provided with the two forward stops 48 and 49 and with the spring 63 and the back stop 47. This relay is also provided with the armature 46. The stop 48 connects with wire 26 and the armature connects with the wire 25.

The operation of this device is as follows:—Normally, *i. e.* when the movable part of the receiving device is at zero, the rays reflect in a straight line from the mirror and the source of light. It is supposed that the operator has transmitted over the cable an impulse adapted to deflect the movable part of the receiving device, and therefore the mirror to the left. The rays of light, therefore, will travel in the direction of the unfeathered arrow and will make active one or more of the selenium cells of organism 4. The rays of light will first be impinged on the cell nearest the zero, here designated as cell 10, and will then, in their travel, sweep over a greater or lesser number of said cells. When the effect of the arrived impulse has died out, then the movable part of the receiving device tries to assume its normal position. The deflected rays of light, therefore, will, in their return to the former position, sweep again over that part of the selenium organism which they swept when deflected. But, whereas, the rays of light, in their travel from the zero position, sweep successively over selenium cells with successively higher electro-motive force, the same rays of light, in their return, will sweep successively over the selenium cells with successively lower electro-motive force. When not impinged by the rays of light, all the selenium cells remain inactive. They offer such a high resistance to the flow of the electric current that the primary 19 of the converter 18 remains also inactive.

When the rays of light travel from the zero position toward and in contact with the selenium cells, then they will impinge in their travel cells provided each with successively increasing electro-motive force and when the rays of light return to their zero position, they will impinge in their return travel cells provided each with successively decreasing electro-motive force.

Normally, no current flows through the primary 19 of the converter 18. When, now, the rays of light, in their travel from the zero position, impinge first on the cell with the lowest electro-motive force, this cell will become active and a current will flow through the primary 19; the farther the rays advance, the greater will be this flow.

The commencement of the flow as well as the increase of the flow will result in the generating of a secondary impulse in 20 of a direction opposite to the direction of the current flowing in the primary 19 and no matter how much the increase of flow of the current in the primary 19, the direction of the impulse in the secondary 20 will always remain the same. When, now, the rays of light return toward their zero position, they will successively cease to impinge on successive cells of decreasing electro-motive force, till they have entirely ceased to impinge on any of the cells. The movement of the rays of light from a cell of higher electro-motive force to a cell of lower electro-motive force will reduce the flow of current in the primary 19 and this decrease in the flow of current will result in the generating of an impulse in the secondary 20 opposite to the first induced impulse; and when the rays of light, in their travel toward the zero position, entirely cease to impinge on the selenium cell, then the ceasing of the flow of the current in 19 will only intensify the second induced im-

pulse, but this impulse will always be in one and the same direction; that is, opposite to the direction of the first impulse, because the starting of the flow of a current in the primary, or an increase in the flow of a current in said primary, always generates in the secondary an impulse of a direction opposite to the flow in the primary and the decrease in the flow of the current in the primary or the entire ceasing of said flow in the primary induces an impulse in the secondary in the same direction as the current formerly flowing in said primary.

Let us suppose that the impulse generated in the secondary 20 through the commencement or increase in the flow of a current in the primary 19 is of a nature so as to impel the armature 22 of relay 21 to move from its stop 23 toward and in contact with stop 24. The contacting of the armature 22 with the contact 24 will close the circuit 25 and 26 including the repeating sounder 27 and battery 28. The sounder, therefore, will become active and will contact its armature with the lower stop, thereby producing the click denoting a dot and closing such circuits as are connected thereto for the purpose of translating said dot into the required character. It is well known that an induced current is only momentary and the armature 22, after momentarily contacting with 24, will, impelled by its spring 70, return to its normal position and come to rest at 23. This return movement will open the circuit 25 and 26 making the repeating sounder again inactive.

In this arrangement, it is immaterial if the rays of light, in their travel from the zero position, sweep the entire number of cells or only part of same; and it is also immaterial if the rays of light, in their return movement to zero, travel backward the whole series of cells, or only part of same. In other words, every movement of the rays of light toward a cell with increasing electro-motive force will produce in the secondary an impulse of one direction and every movement of the rays of light from a cell of high electro-motive force will produce in the secondary 20 an impulse of opposite direction, no matter how many cells were included in this forward or backward travel. The operation is the same when the light is deflected, so as to impinge upon one or the other of the cells of organism 5. But the resultant effect is somewhat different. The relay 21 in organism 4 is arranged so that an impulse will only allow a momentary contacting between 22 and 24, thereby denoting a dot, but the relay 45 of organism 5 is arranged in a manner, so that an impulse generated in the secondary 44 will compel the contacting of the spring 63 with the contact 48 for a period long enough to denote a dash. The repeating sounder, therefore, will be operated through the operation of relay 45 in a manner so as to denote a dash and translate the same into the translating circuit.

Referring to Fig. 2, parts of said figure similar to Fig. 1 are, as stated above, designated by similar numbers with the exception that the numbers carry in addition the letter "a". In this figure, the active sources 11, 12, 13, 14 and 15 are replaced by the resistances 11^a, 12^a, 13^a, 14^a, 15^a, and the sources 35, 36, 37, 38, 39 of organism 5 are replaced by resistances 35^a, 36^a, 37^a, 38^a, 39^a; one terminal of said resistances being connected to one of the electrodes and the other terminal to the other of the electrodes of the selenium cells. The wire 16^a is provided with a battery common to all resistances and numbered 55; and the wire 40^a is provided with a common battery 56. In all other respects, the arrangement is the same as in the former figure.

In Fig. 2, the selenium cells and resistances are so arranged that each succeeding cell rounding from the cell nearest the zero has a resistance lower than the resistance of the preceding cell. Therefore, in organism 4^a, the cell 10^a has the highest resistance and the cell 6^a the lowest resistance; and in organism 5^a, the cell 54^a has a resistance of the highest value and the cell 50^a the resistance of lowest value. It is obvious that when the rays of light strike the cell 10^a of organism 4^a, a smaller amount of current will flow through the primary 19^a than if said rays of light would strike the cell 6^a of the same organism; and it is also obvious that a larger amount of current will flow through secondary 44^a of organism 5^a when the rays of light strike cell 50^a of said organism, than if the rays would strike the cell 54^a.

In the drawing, only five selenium cells are illustrated, but it is obvious that any number of cells required may be added thereto. In fact, it is essential that the selenium cells shall cover a space sufficient so that the rays of light shall not extend, in their travel from the zero position, farther than the last of the selenium cells.

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

1. In a device of the class described means to deflect light rays in response to line current, a series of selenium cells adapted to be swept over by said light rays, sources of energy of different value controlled by said cells and means responsive to the change in relation of said sources for reproducing a signal.

2. In a device of the class described a movable member adapted to deflect light rays, a series of selenium cells each cell provided with means to allow a current flow

of different value when illuminated and means related to said cells for translating the movement of said movable member in a direction away from its normal zero as the beginning of a telegraphic character irrespective of whether or not said movement has commenced at the normal zero.

3. In a device of the class described means to deflect light rays in response to line current, a series of selenium cells adapted to be swept over by said light rays, sources of energy, each cell controlling a source different in degree from the source controlled by the succeeding cell, and means responsive to the change in relation of said sources for reproducing a signal.

4. In a device of the class described means to deflect light rays in response to current received by said device; a series of selenium cells in the region of said light rays when deflected; a plurality of sources of energy of different values controlled by said cells; a transformer primary associated with said sources of energy and a signal translating instrument controlled by the transformer secondary.

5. In a device of the class described means to deflect light rays in response to current received by said device; a series of selenium cells, a source of energy for each of said cells, the sources of energy differing in electro-motive force, and means for translating a signal in response to the impinging of the light rays on one or the other of said selenium cells.

6. In a device of the class described, a movable member adapted to deflect light rays, a series of selenium cells and means, differing in degree for each of said cells, to allow the flow of an electric current through one or the other of said cells when illuminated and operated inductively to translate the flow of said current into readable characters.

7. In a device of the class described sources of current of different value and means for rendering operative a gradually increasing or decreasing electro-motive force of said sources, in accordance with the greater or lesser movement of the movable part of said device.

8. In a device of the class described, a movable member adapted to deflect light rays, a series of selenium cells and means for said cells to generate an induced impulse of gradually increasing value through the movement of said light rays in one direction and for generating an induced impulse of gradually increasing value through the movement of said light rays in the opposite direction.

9. In a device of the class described, a movable member, selenium cells and sources of current therefor and means for rendering operative a greater or lesser number of said sources in accordance with the greater or lesser swing of the movable member of said device.

10. The method of overcoming the shifting zero effect in a telegraphic receiving device, which consists in causing the movable member of said device to make active different sources of current of different electro-motive forces in accordance with the amplitude of the swing of the movable part of said device, and causing each swing from the zero position to be translated as the commencement and each swing toward the zero position to be translated as the ending of one telegraphic character, independent of the amplitude of said swing.

11. In cable telegraphy, the method of overcoming the shifting of a zero in a receiving device, which consists in causing to be generated an induced impulse of gradually increasing value through the operation of the receiving device in one direction and causing to be generated an induced impulse of gradually increasing value through the operation of the receiving device in the opposite direction.

12. In a device of the class described, means for overcoming the shifting zero effect comprising a freely swinging member adapted to deflect light rays a greater or lesser degree in response to received impulses, a series of selenium cells adapted to be swept by said light rays, and sources of current of different amplitude controlled by said cells.

13. As a means for overcoming the shifting zero effect in a receiving organism, a movable member therefor, a series of selenium cells in operative relation to said movable member and a series of sources of current connected to said selenium cells, said movable member adapted to deflect the rays of light and to render operative a greater or lesser number of said sources for each movement, and means for translating each double movement as a telegraphic character irrespective of the greater or lesser electro-motive force rendered operative through said double movement.

14. Means to overcome the shifting of the zero in cable telegraphy, said means comprising means to deflect light rays in accordance with the incoming impulses, two series of selenium cells, an inductorium for each of said series, the inductorium primaries provided with means to generate one induced impulse through the moving of the light rays in one direction and an opposite impulse through the moving of the light rays in the opposite direction.

15. In a device of the class described, two series of selenium cells, an electric circuit for each of said series and an inductorium for each of said circuits.

16. In combination a telegraphic receiving device, two sets of selenium cells, each set

provided with batteries, an inductorium, a local circuit connecting operatively the selenium cells through the batteries with said inductorium and means operatively related to said receiving device to make active one or the other of said selenium cells.

17. In a device of the class described, means to deflect light rays in accordance with the incoming impulses, a series of selenium cells in the path of said light rays when deflected, an electric circuit for said cells, an inductorium, a polarized relay and a translating device, the primary of said inductorium inserted in the electric circuit, the secondary connected to said relay, and the translating device operatively related to the tongue and forward stop of said relay through a source of current, and electric means operatively related to said selenium cells to generate a gradually increasing impulse of one direction in the inductorium secondary through the movement of the light rays in one direction and to generate in said inductorium secondary a gradually increasing impulse of opposite direction through the movement of said rays of light in the reverse direction.

18. In a device of the class described, means to deflect light rays in accordance with incoming impulses, a series of selenium cells in the path of said light rays when deflected, a zero position for said light rays, said light rays adapted to sweep in their travel from said zero position over a number of said cells, an electric circuit operatively related to said cells, an inductorium, the primary connected to said electric circuit, and translating means operatively related to the secondary; in combination with sub-circuits connecting the different selenium cells to different parts of said electric circuit.

19. In a device of the class described, two selenium organisms, a local circuit for each, each organism comprising a series of individual selenium cells, each cell provided with means, differing in degree from each of the other cells, to change the electrical condition of the local circuit.

20. In a device of the class described, means to deflect light rays in accordance with the incoming impulses, a selenium organism comprising a number of individual selenium cells, adapted to be swept over by said light rays when deflected and means operatively related to said selenium cells to generate an impulse of one direction independent of a number of cells made active through said rays of light when traveling in one direction and means for said cells to generate an impulse of opposite direction on the return movement of the rays of light independent of the number of cells made active in said return movement.

21. In cable telegraphy, the method of rectifying the erratic movements of the movable part of a receiving device due to the capacity of said cable, which consists in causing to be generated induced pulses of gradually increasing intensity but of one direction through the movement of said movable part in one direction and causing to be generated induced pulses in gradually increasing intensity but opposite direction through the movement of said movable part in opposite direction, independent of the starting point and independent of the greater or lesser amplitude of said movements.

In testimony whereof I affix my signature in presence of two witnesses.

ISIDOR KITSEE.

Witnesses:
EDITH R. STILLEY,
MARY C. SMITH.