

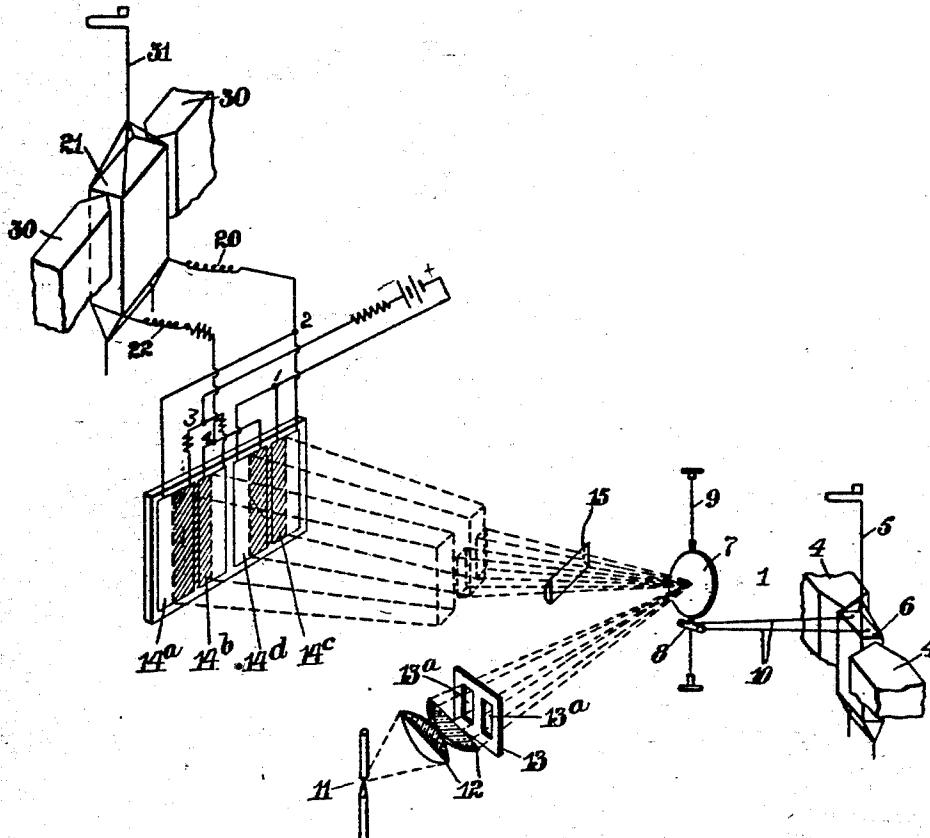
76

T. B. DIXON.
TELEGRAPHY.

APPLICATION FILED JULY 13, 1916.

1,316,699.

Patented Sept. 23, 1919.

Attest:
May J. Trimble
May J. Trimble

by

Inventor:
Thomas B. Dixon
H. M. Marble
Atty

88

UNITED STATES PATENT OFFICE.

THOMAS BULLITT DIXON, OF NEW YORK, N. Y.

TELEGRAPHY.

1,316,699.

Specification of Letters Patent.

Patented Sept. 23, 1919.

Original application filed December 5, 1913, Serial No. 804,873. Divided and this application filed July 13, 1916. Serial No. 108,988.

To all whom it may concern:

Be it known that I, THOMAS BULLITT DIXON, citizen of the United States of America, and a resident of New York city, county and State of New York, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

My invention relates to improvements in what may be termed selenium relays, *i. e.*, instruments wherein a pencil of light, deflected variably by the influence of current pulses upon a movable member of an electric instrument, is caused to sweep across the surface of a selenium cell or across the surfaces of a plurality of coating selenium cells, thereby varying the resistance of such selenium cells and so varying the resistance of a circuit or circuits connected to such selenium cells and so actuating an instrument or instruments located in such circuits. In terming the device embodying the present invention a selenium relay I do not intend to limit myself to the use of a selenium cell or selenium cells; for it is known that other substances than selenium are affected as to electrical qualities by variation of illumination; actinium is one such substance, and other substances are known to have similar properties; nor do I intend to limit myself to the use of light as the particular variety of radiant energy employed. Thermo couples may be used in lieu of selenium cells, in which case heat rays may be employed in lieu of light rays; and it is well known that heat rays may be reflected and refracted in the same manner and by the same means as light rays. In fact, I have found it desirable to use the term "radio-electro-sensitive element" as comprehensive of various devices such as selenium cells, thermo couples, etc., which are affected as to electrical qualities (resistance, current generation, etc.) by radiant energy such as light or heat. However, selenium relays are the most commonly known devices of the nature to which my invention relates.

Therefore, in the following description, I will refer to the selenium cells or elements specifically, it being understood that the principles described herein are applicable to other forms of radio-electro-sensitive devices; and similarly I will refer to light specifically as the type of radiant energy employed, though it will be understood that

the heat rays may be acted upon in a precisely similar manner.

My invention comprises a radio electric relay (specifically a selenium relay) wherein a plurality of pencils of radiant energy are derived from the same condensing lens, are projected therefrom upon the movable reflector of a primary actuating device adapted to be controlled by current pulses in a suitable controlling circuit, and from such reflector are projected each upon a radio-electro-sensitive device or pair of such devices, and by the action of such primary actuating device are caused to move across the surfaces of such radio-electro-sensitive device or devices, in unison, thereby varying an electrical quality (resistance, current generation, etc.) whereby another instrument in the circuit of such radio-electro-sensitive device or devices is actuated. My invention also comprises a condensing lens interposed between the said primary actuating device and the said radio-electro-sensitive device or devices and of such nature that the beams or pencils of radiant energy are condensed in one direction without interference with the movement of such beams or pencils in a direction at right angles to the direction of condensation.

The object of my invention is to increase the efficiency of radio electric relays of the type referred to.

I will now proceed to describe my invention with reference to the accompanying drawing showing diagrammatically apparatus embodying my invention, and will point out the novel features in claims.

The said drawing shows diagrammatically a primary actuating device, means for producing a plurality of beams of radiant energy coincident upon such primary actuating device and reflected therefrom as two separate beams of radiant energy upon two pairs of radio-electro-sensitive devices, together with a condensing lens interposed between the said radio-electro-sensitive devices and said primary actuating device, and arranged to condense such pencils of radiant energy in one direction without interfering with movement of such pencils of radiant energy in a direction at right angles. The said drawing also shows circuits comprising such radio-electro-sensitive devices and an instrument in such circuit controlled by the variation in electrical

quality of such radio-electro-sensitive devices, due to the varying action of radiant energy thereon.

In the said drawing 1 designates a primary actuating device comprising a coil 6, of the general nature of a galvanometer coil, having a fiber suspension 5 and located in the field of force of magnet poles 4 and connected by traces 10 to a light member 8 having a fiber suspension 9 and carrying a light reflector 7. 11 designates a source of radiant energy (the particular source shown being the carbons of an electric arc lamp); and 12 shows a pair of condensing lenses (these lenses being sectioned horizontally to show their characteristic shape); while 13 indicates a screen interposed between said condensing lenses 12 and the primary actuating device reflector 7, such screen having two apertures 13^a of a shape adapted to produce light beams of the desired cross sectional shape.

14^a, 14^b, 14^c and 14^d designate radio-electro-sensitive devices (specifically selenium cells) in the paths of the light pencils reflected from primary actuating device reflector 7. In the arrangement shown these selenium cells are rectangular, and such rectangular shape is preferable in most cases. There being two apertures 13^a in the screen 13, there are two light pencils incident upon these selenium cells, and in the normal or rest position of primary actuating device reflector 7, each light pencil will be, usually, half upon one selenium cell and half upon an adjacent selenium cell; there being two selenium cells for each light pencil. As each light pencil incident upon the selenium cells moves (and both light pencils move together) the illumination of one cell of each pair will decrease while the illumination of the other cell of each pair will increase. By means hereinafter described the decrease of illumination of one cell of each pair (whereby the resistance of that cell is increased) and the increase of illumination of the companion cell of each pair (whereby the electrical resistance of that cell is decreased) are caused to exert a cumulative or additive result upon the instrument actuated by such selenium cells.

For various practical reasons all of the light from a condensing lens or pair of condensing lenses, such as the lenses 12, cannot be utilized. While the light beams or pencils may be shaped to a considerable and very useful extent by a further shaping lens such as the lens 15 hereinafter mentioned, yet the pencil or pencils of light incident upon the reflector 7 must for best results have some relation to the shape of the selenium cells employed; furthermore, for best results, such beams of light must be sharply defined at their margins, par-

ticularly those margins, the positions of which shift with the movement of the reflector 7. For these reasons it is necessary to shape the light pencil or pencils, at or near the condensers 12, by some means, 70 such for example as the screen 13. But while for best results the light pencil employed should be narrow, yet it is possible to take a plurality of such light pencils from a single condenser or pair of condensers; for which reason the screen 13 is shown as provided with two light apertures 13^a each of a proper shape to produce a light pencil of the desired cross section. These light pencils impinge coincidentally 80 upon the reflector 7, and, being reflected thereby, diverge and each strike the surfaces of a pair of selenium cells.

In order that the light pencils employed may permit the utilization of a large portion of the light projected from the condensing lenses 12, it is desirable that the light apertures in the screen 13 be of as great height as they may be and yet be filled by the light from such lenses. The resulting light pencils would be, in general, of greater height, where such light pencils impinge upon the selenium cells, than the height which it is desirable that such selenium cells should have, were it not for the employment, between such selenium cells and the primary actuating device reflector 7, of the condensing lens 15. An ordinary spherical condensing lens may not be employed, to best advantage, at this point, because such a lens, if employed, will interfere with the movement of the pencils of light across the surfaces of the selenium cells, greatly reducing the amplitude of movement as compared with the amplitude of movement obtained if no such condensing lens be present. But a cylindrical condensing lens placed as shown has no influence of that nature. On the other hand, it produces condensation of the light pencil or pencils in a direction at right angles to the direction of movement of such light pencils, and thus permits the condensation of such light pencils, in a direction at right angles to the direction of movement (*i. e.*, in a vertical direction, in the arrangement shown) so as to bring those light pencils within the surface limits of the selenium cells, and makes the illumination of the cells correspondingly of greater intensity, this increase in intensity of illumination greatly improving the operation of the apparatus. Of course, adjustment of the position of lens 15 will vary the height of the light pencils where incident upon the selenium cells.

Various circuit arrangements may be employed to permit the cumulative action of the various selenium cells in the operation of the actuated instrument, 20. In my prior application Serial No. 804,873, filed Decem-

88

1,316,699

3

ber 5, 1913, of which this is a division, I have indicated various such circuit arrangements, and therefore in the present instance I have thought it necessary to indicate one
 5 arrangement only, wherein the several cells 14^a, 14^b, 14^c, and 14^d are connected in a Wheatstone bridge arrangement, the coil 21 of a receiving instrument (of the general nature of a galvanometer, and which in practice is usually a siphon recorder) being included in the cross-wire 20—22 of the Wheatstone bridge.

30 indicates the pole pieces of the magnets creating the magnetic field in which
 15 coil 21 is located. This coil is shown as provided with an ordinary fiber suspension 31.

What I claim is:—

1. A radio-electric relay comprising in combination radio-electro-sensitive means, a
 20 primary actuating device comprising a reflector adapted to cause one or more pencils of radiant energy to move across such radio-electric-sensitive means, and means for projecting convergently into coincidence on
 25 such reflector a plurality of pencils of radiant energy, the said pencils, by reason of their convergent relation as incident pencils, being reflected divergently from such reflector, said radio-electro-sensitive means being
 30 located to intercept the said reflected pencils and to be influenced by movement of such pencils, and electro-magnetic means controlled by such radio electro-sensitive means.

2. A radio-electric relay comprising in combination a plurality of radio-electro-sensitive means, a primary actuating device comprising a reflector adapted to cause
 40 pencils of radiant energy to move across such radio-electro-sensitive means, means for projecting convergently from a single source into coincidence on such reflector a plurality of pencils of radiant energy, the said pencils, by reason of their convergent relations
 45 as incident pencils, being reflected divergently from such reflector, said radio-electro-sensitive means being located to intercept the said reflected pencils and to be influenced by movement of such pencils, and
 50 electro-magnetic means controlled by said radio-electro-sensitive means.

3. A radio-electric relay comprising in combination a plurality of pairs of radio-electro-sensitive means, a primary actuating
 55 device comprising a reflector adapted to cause pencils of radiant energy to move across said radio-electro-sensitive means, and means for projecting convergently from a single source into coincidence on such
 60 reflector a plurality of pencils of radiant energy, the said pencils by reason of their convergent relation, as incident pencils, being reflected divergently from such reflector, each of said pairs of radio-electro-sensitive means being located to intercept

one of the said reflected pencils and to be influenced by movement thereof, the action of the radiant energy on one such radio-electro-sensitive means of each pair increasing as the action of the radiant energy on
 70 the other radio-electro-sensitive means of such pair decreases, and electro-magnetic means controlled by such radio-electro-sensitive means comprising means whereby increasing action of radiant energy on one
 75 radio-electro-sensitive means of each pair is assisted by decreasing action of radiant energy on the other radio-electro-sensitive means of each pair.

4. A radio-electric relay comprising in
 80 combination a plurality of radio-electro-sensitive means, a primary actuating device comprising a reflector adapted to cause one or more pencils of radiant energy to move across such radio-electro-sensitive means, a
 85 source of rays of radiant energy, condensing means therefor adapted to concentrate rays from such source upon said reflector, a screen interposed in the path of such rays and comprising a plurality of apertures
 90 which convert the said rays into a plurality of pencils of radiant energy convergent into coincidence on such reflector, the said pencils, by reason of their convergent relation as incident pencils, being reflected divergently
 95 from such reflector, as a plurality of reflected pencils, the said radio-electro-sensitive means being located so that each such means intercepts one of the said reflected pencils in a manner to be influenced by movement
 100 of that pencil, and electro-magnetic means controlled by such radio-electro-sensitive means.

5. A radio-electric relay comprising in combination radio-electro-sensitive means, a
 105 primary actuating device comprising a reflector adapted to cause a pencil of radiant energy to move across such radio-electro-sensitive means, means for projecting upon such reflector a shaped pencil of radiant
 110 energy which is reflected divergently from such reflector, condensing means in the path of the reflected pencil arranged to condense such reflected pencil in a direction at right angles to the direction of motion of such
 115 pencil due to motion of such reflector, but not to interfere with motion of such pencil, said radio-electro-sensitive means being located to intercept the reflected pencil after passage through such condensing means,
 120 and electro-magnetic means controlled by such radio-electro-sensitive means.

6. A radio-electric relay comprising in combination radio-electro-sensitive means, a
 125 primary actuating device comprising a reflector adapted to cause a pencil of radiant energy to move across such radio-electro-sensitive means, means for projecting upon such reflector a shaped pencil of radiant energy which is deflected divergently from
 130

such reflector, a cylindrical condensing lens in the path of said reflected pencil and having its axis in the plane of movement of such pencil, said radio-electro-sensitive means being located to intercept the reflected pencil after passage through such condensing lens, and electro-magnetic means controlled by such radio-electro-sensitive means.

7. A radio-electric relay comprising in combination radio-electro-sensitive means of rectangular shape, a primary actuating device comprising a reflector adapted to cause a pencil of radiant energy to move across such radio-electro-sensitive means, means for projecting upon such reflector a rectangular-section pencil of radiant energy which is reflected divergently, from such reflector, a cylindrical condensing lens in the path of the reflected pencil and having its axis in the plane of movement of such pencil, the section of such reflected pencil being such

that, except for the condensing action of such lens the dimension of such pencil, in a direction at right angles to its plane of movement, would exceed the corresponding dimension of the radio-electro-sensitive means at the point of incidence of such pencil upon such means, said condensing lens adapted to condense such reflected pencil, in the direction at right angles to its direction of movement, to bring such pencil within the corresponding dimension of such radio-electro-sensitive means, and electro-magnetic means controlled by such radio-electro-sensitive means.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS BULLITT DIXON.

Witnesses:

ARTHUR R. RULLEY,
E. N. COOKE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Dixon	1,193,999	250- 8
Cox	1,158,375	178- 88
Dixon	1,197,461	178- 63