No. 680,614. Patented Aug. 13, 1901.

J. POLIAKOFF.

PHOTOPHONOGRAPH-PHOTOPHONE OR SIMILAR DEVICE.

(Application filed July 17, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 2.

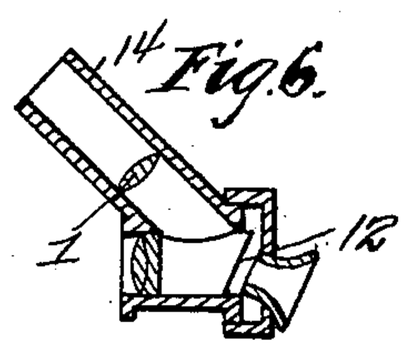

Fig. 6.

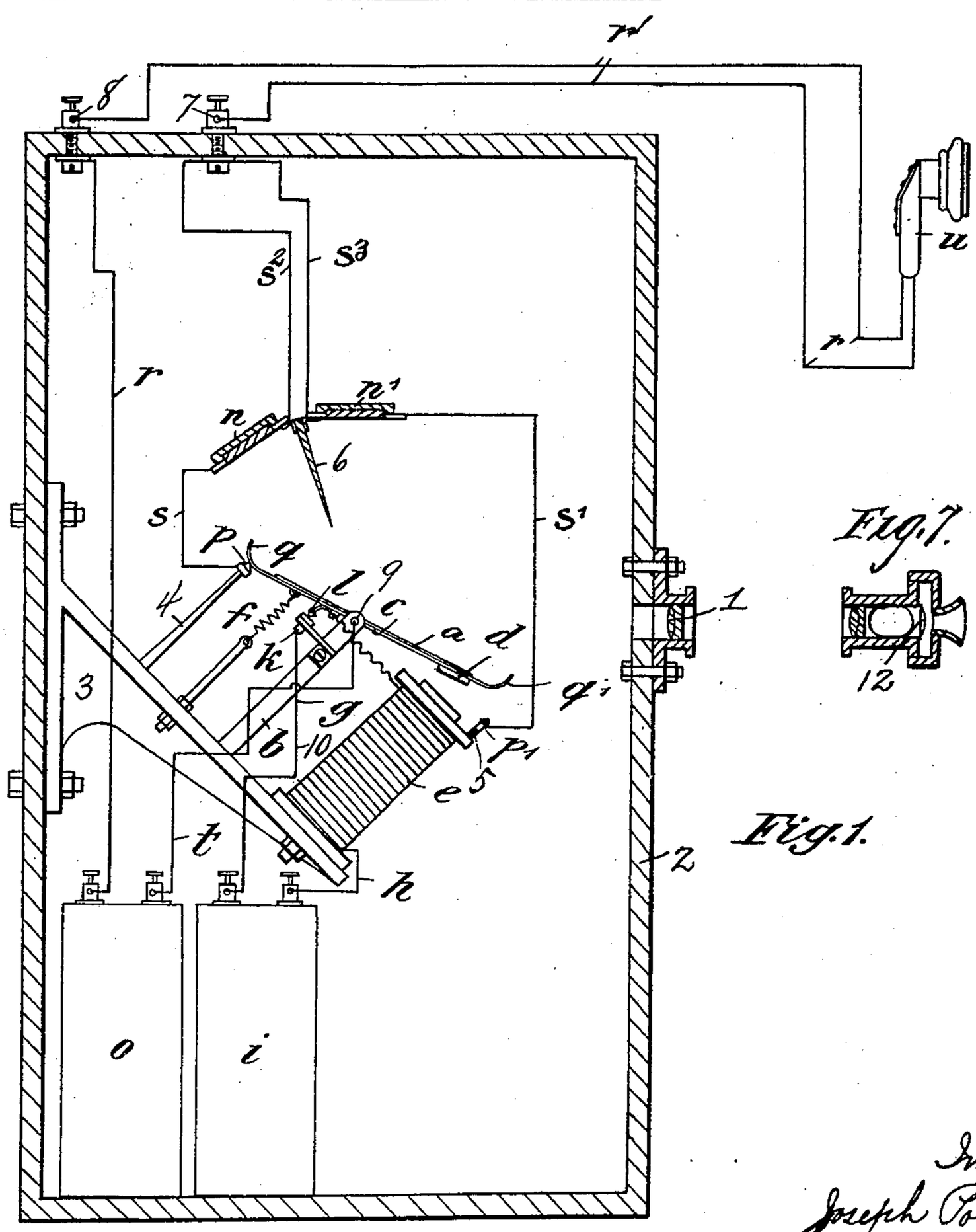

Fig. 1.

Fig. 7.

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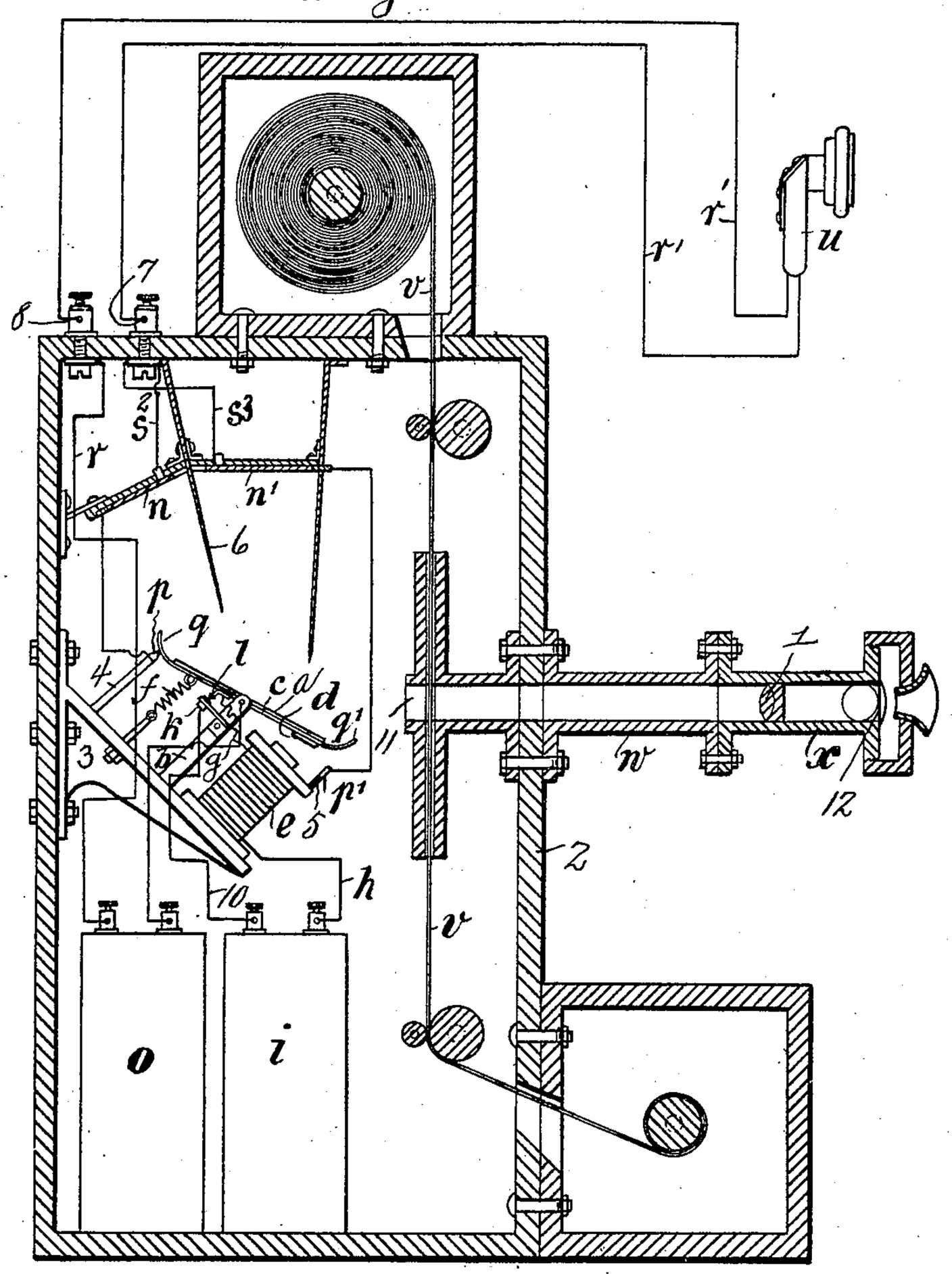
(No Model.) 4 Sheets—Sheet 2.

Fig. 3.



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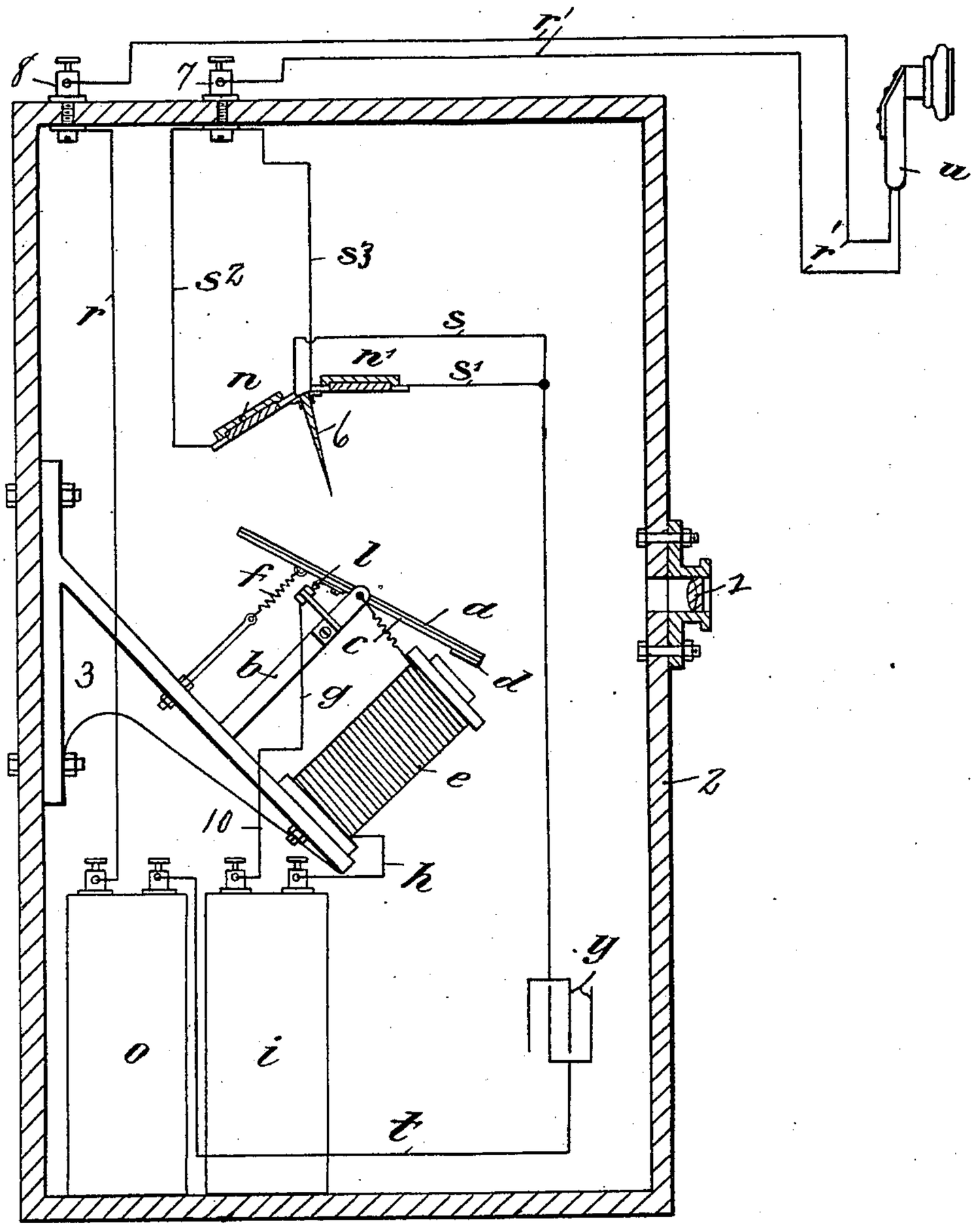
(No Model.) 4 Sheets—Sheet 3.

Fig. 4.



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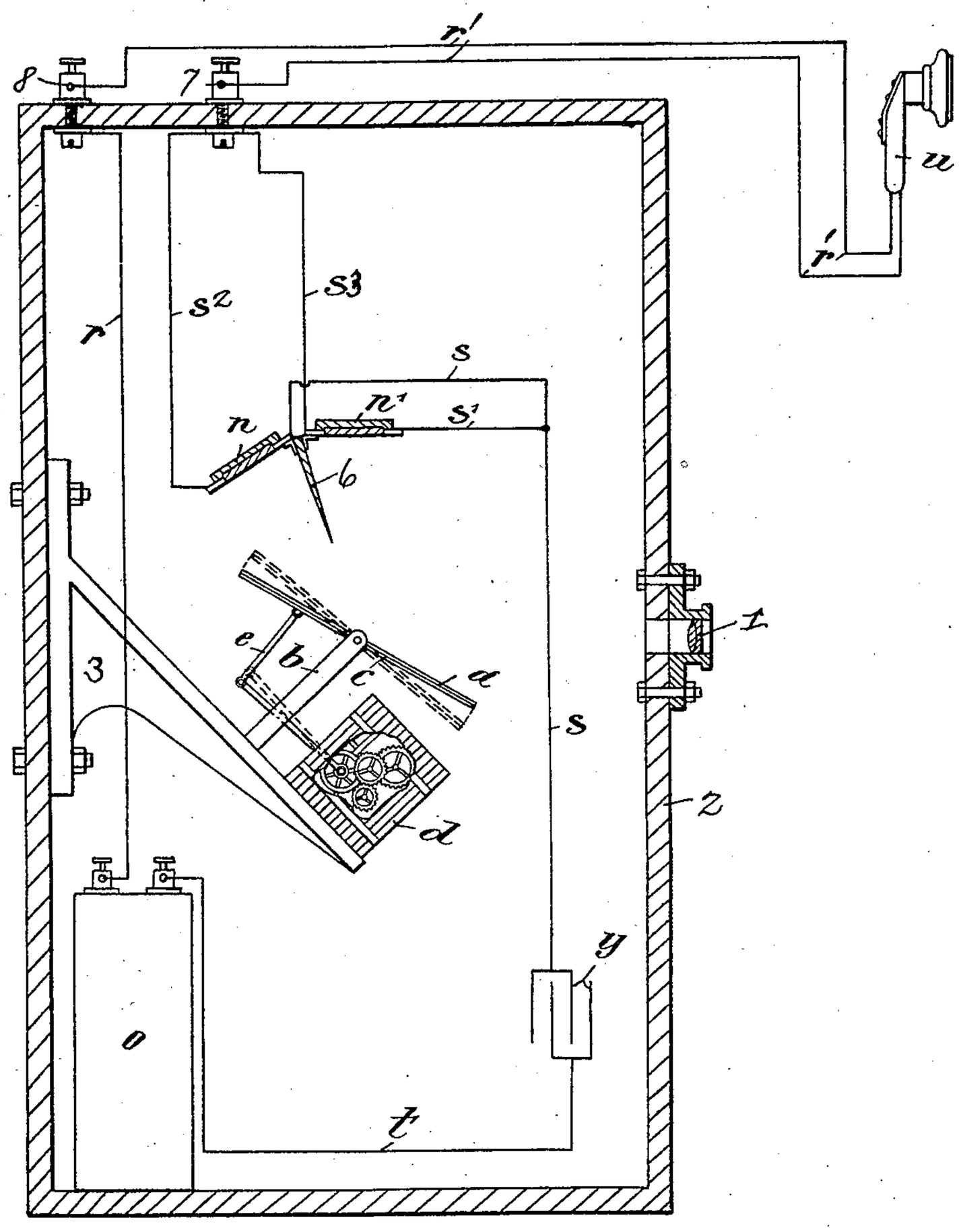
PHOTOPHONOGRAPH-PHOTOPHONE OR SIMILAR DEVICE.

(Application filed July 17, 1900.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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PHOTOPHONOGRAPH-PHOTOPHONE OR SIMILAR DEVICE.

SPECIFICATION forming part of Letters Patent No. 680,614, dated August 13, 1901.

Application filed July 17, 1900. Serial No. 23,921. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH POLIAKOFF, a subject of the Emperor of Russia, residing at Charlottenburg, near Berlin, Germany, have invented certain new and useful Improvements in Photophonograph-Photophones or Similar Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to photophonographs, photophones, and similar devices, and especially to that class of these instruments in which are employed selenium-cells, and has for its object to preserve as far as possible the intensity or power of these cells during the operation of the instruments. It is well known that a cell of this character when continually exposed to the action of light will decrease in sensitiveness, its resistance not varying according to the intensity of the light thrown on it, and if exposed long enough to the action of light the resistance becomes practically constant, in which state it is useless for the purposes of the instruments mentioned.

It is the purpose of this invention to maintain constant the photo-electric properties of the cells used and use novel features of construction, to be particularly described, and pointed out in the claims.

Referring to the drawings, in which like parts are similarly designated, Figure 1 shows a section of a photophone embodying my invention; Fig. 2, a top plan view of the same; Fig. 3, a section through a similar device or photophonograph, showing the use of a permanent sound-record. Figs. 4 and 5 are modifications in section of photophones, and Figs. 6 and 7 detail views of photophonic receivers.

A beam of light is focused from a lens 1 on a mirror *a*, secured to a two-armed vibrating lever *c*, made of conductive material and pivoted at or approximately at its center at 9 in a pair of standards or supports *b*, fastened to a bracket 3. The lens 1 is shown as secured to the casing 2 of the instrument, though not necessarily so positioned, to throw a beam of light on the mirror. The lever *d* carries at either end yielding contacts *q* and *q'*, adapted to touch contacts *p* and *p'*, the former supported on an insulated standard 4 and the latter on a similar standard or pin 5, located for convenience on one end of the solenoid *e*, secured to the bracket 3, and one terminal wire of said solenoid *e* is connected by wire *g* to a contact *l*, insulated from and carried by the lever *c*, the other end of the solenoid being connected by wire *h* to one pole of the battery *i* or other source of electricity. The standard *b* carries a contact *k*, coöperating with the contact *l*, between which the solenoid-circuit is broken, and said contact *k* is directly connected to the other pole of the battery *i*. An armature *d*, secured to one end of the lever *c*, is attracted by the solenoid *e*.

A pair of selenium-cells *n* and *n'* are placed above the mirror *a*, with a partition or screen 6 between them, and in such relative position to the mirror *a* that the ray reflected from the mirror *a* will when said mirror is vibrated first fall on one cell and then on the other, the screen 6, which, if desired, may be omitted, shielding each cell from the light falling on the other. The cell *n* is connected by wire *s* to the insulated contact *p* and the cell *n'* by wire *s'* to the insulated contact *p'* and both cells connected in parallel to a common binding-post 7 by their respective wires s^2 and s^3. This binding-post 7 forms one terminal of a metallic circuit *r'*, connected to a telephone-receiver *u*, the other terminal of said circuit being a similar binding-post 8, directly connected by wire *r* to one terminal of a second battery *o*, the other terminal thereof being connected by wire *t* to the pivots 9 of the vibrating lever *c*.

The operation of the device is as follows: The mirror *a*, carried by the conductive lever *c*, is caused to vibrate by the attraction of the armature *d* to the magnet against the stress of the spring *f*. The solenoid-circuit, including the battery *i* and independent of the other circuits, is as follows: Current flows from battery *i*, wire *h*, solenoid *e*, wire *g*, contacts *l* and *k*, wire 10, back to battery *i*. The solenoid *e* will be energized, the armature *d* and its attached parts attracted, circuit

broken at *k l*, and the lever *c* and armature *d* returned by spring *f* to the position shown in the drawings. Light coming through the lens 1, whose vibrations are varied by sound either in or across the path of the light, will be reflected from the vibrating mirror first on one and then on the other of the selenium-cells, their resistances being varied according to the modified reflected-light vibrations, and at the same time that light is on a cell circuit will be closed through it, the circuit through the other cell being open—viz., current flows from the battery *o* by wire *t* to pivot 9, lever *c*, yielding or spring contact *q*, contact *p*, wire *s*, cell *n*, wire s^2, post 7, wire *r'*, telephone *u*, back to post 8, wire *r*, back to the other terminal of the battery *o*. When the armature is attracted, the light is caused to fall on the other cell *n'* and circuit is closed from battery *o*, through wire *t*, pivot 9, lever *c*, spring-contact *q'*, contact *p'*, wire *s'*, cell *n'*, wire s^3, post 7, and back to battery *o*, as previously described.

In Fig. 3 the same arrangement is shown with a different means for producing variations in the light-waves, and this is done by means of a positive photographic sound-record, which can be made as follows: A sensitive ribbon *v* is mechanically fed past an opening or slot 11 and exposed to light whose vibrations are varied by a polished sound-vibrated diaphragm 12 or one carrying a mirror that reflects a ray through the lens 1 from a lens 13 in a tube 14 at an angle to the tube *x*. This negative is developed and a positive is made from it and fed at the same rate past the same opening 11, through which uniformly-vibrating light is passed to the mirror *a*, and these waves of varying intensity due to the difference of intensity of the film are then reflected to the cells and sound transmitted to the phone, as before described.

It is not absolutely necessary that the selenium-cell of the receiver described above, which at the time being is not exposed to light, be shunted off from the circuit as long as provision is made that the two selenium-cells do not disturb one another. In order to avoid reciprocal disturbances of two selenium-cells included in the circuit of a telephone apparatus, condensers or induction apparatus can be used with advantage. The condenser operates in this manner that the continuous or slowly-undulating currents cannot be transmitted thereby, but that the currents alternating in direction or intensity are transmitted without hindrance. The current that is led to one coating of the condenser produces a corresponding current in the second coating, from which it may be gathered that in the operation of one of the selenium-cells the other selenium-cell has no action on the telephone.

In Fig. 4 a condenser *y* is employed, one coating of which is connected with the branch circuits *s* and s^2, leading from the selenium-cells *u* and *u'*, respectively, and the other coating with the battery *o* by the wire *t*. Thus the above-described contact-breakers *p q* and *p' q'* are replaced by the condenser *y*. Instead of a condenser an inductor may be employed. In both instances the effect will be the same as described with reference to Figs. 1 and 2. The electric interrupter shown in Figs. 1 to 4 may also be replaced by a mechanical interrupting device.

In Fig. 5 a clockwork *w* is employed for the same purpose, which imparts to the mirror *a* the necessary vibratory motion by means of suitable connecting rods or levers.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In instruments of the class described, means for producing sound-modified light, devices for vibrating a reflected ray of such, and means arranged to receive said rays to affect an electric current, substantially as set forth.

2. In instruments of the class described, the combination with photo-electric cells, of devices for vibrating a ray of sound-modified light to one and then to another of said cells, substantially as set forth.

3. In instruments of the class described, the combination with photo-electric cells, of a light-screen between the cells and devices for vibrating a ray of sound-modified light from one cell to another, substantially as set forth.

4. In instruments of the class described the combination with selenium-cells connected in a telephone-circuit of a vibrating mirror, whereby a reflected ray of sound-modified light is sent alternately to one cell and to the other.

5. In instruments of the class described the combination with two selenium-cells connected in a telephone-circuit of a vibrating mirror and a vibrating lever carrying the armature of an electric interrupter and the said mirror.

6. In instruments of the class described, the combination with photo-electric cells arranged to be successively connected to a telephone-circuit, devices for vibrating sound-modified light-rays first to one cell and then to another, and means for cutting out of circuit those cells on which the sound-modified rays of light do not fall.

7. In instruments of the class described, the combination with photo-electric cells arranged to be successively connected to a telephone-circuit, of a screen between adjacent cells, a vibrating mirror a circuit-breaker connected thereto, whereby a reflected ray of sound-modified light is sent to and current simultaneously sent through the cells, substantially as set forth.

8. In instruments of the class described the combination with a pair of selenium-cells connected in a telephone-circuit, contacts electrically connected to said cells, a conductive electrically-vibrated lever adapted to close

circuit through either of the said contacts, a selenium-cell and the telephone-circuit an electrical connection between said lever and a source of current and a mirror carried by said lever, substantially as set forth.

9. In instruments of the class described, the combination with photo-electric cells arranged to be successively connected to a telephone-circuit, a screen between adjacent cells, an electrically-vibrated circuit-breaker and a mirror arranged to direct current through and sound-modified light successively to said cells, substantially as set forth.

10. In instruments of the class described, the combination with a pair of selenium-cells arranged to be alternately connected to a telephone-circuit, of a pair of contacts each electrically connected to a cell, a conductive vibrating lever arranged to alternately close circuit through one contact, cell and telephone-circuit, electrical connections between said lever and a source of electric supply, a mirror and an armature on said lever, a solenoid opposite the armature, an independent circuit for said solenoid and a circuit-breaker included in the solenoid-circuit and carried by said vibrating lever, substantially as and for the purpose set forth.

11. In instruments of the class described, in combination, a lens, a vibrating mirror at its focus, a mechanically-moved positive photographic record of sound-modified light-waves moving across the path of light focused from said lens to the mirror, a pair of selenium-cells arranged to alternately receive light-impressions from said vibrating mirror to said cells included in parallel in a telephone-circuit, substantially as set forth.

12. In instruments of the class described in combination, a lens, a vibrating mirror at its focus, a positive photographic sound-record mechanically moved across the path of light between the lens and mirror, a pair of selenium-cells included in a telephone-circuit and arranged to alternately receive the focused light from said mirror, screens for said cells to shield them from all light but that reflected from said mirror to the respective cells, and means for placing only that cell in circuit, which is affected by the reflected ray from the mirror, substantially as set forth.

13. In instruments of the class described, in combination, a photo-electric cell included in a telephone-circuit, a moving photographic sound-record, and means for passing light through said record to the cell, substantially as set forth.

14. In instruments of the class described in combination, a photo-electric cell included in a telephone-circuit, a moving positive photographic sound-record, and means for passing uniformly-vibrating light through said sound-record and focusing it on the cell, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOSEPH POLIAKOFF.

Witnesses:
MAX C. STAEHLER,
HENRY HASPER.