No. 675,878. Patented June 11, 1901.

M. BECK.

ELECTROGRAPH.

(No Model.) (Application filed Aug. 8, 1899.)

4 Sheets—Sheet 1.

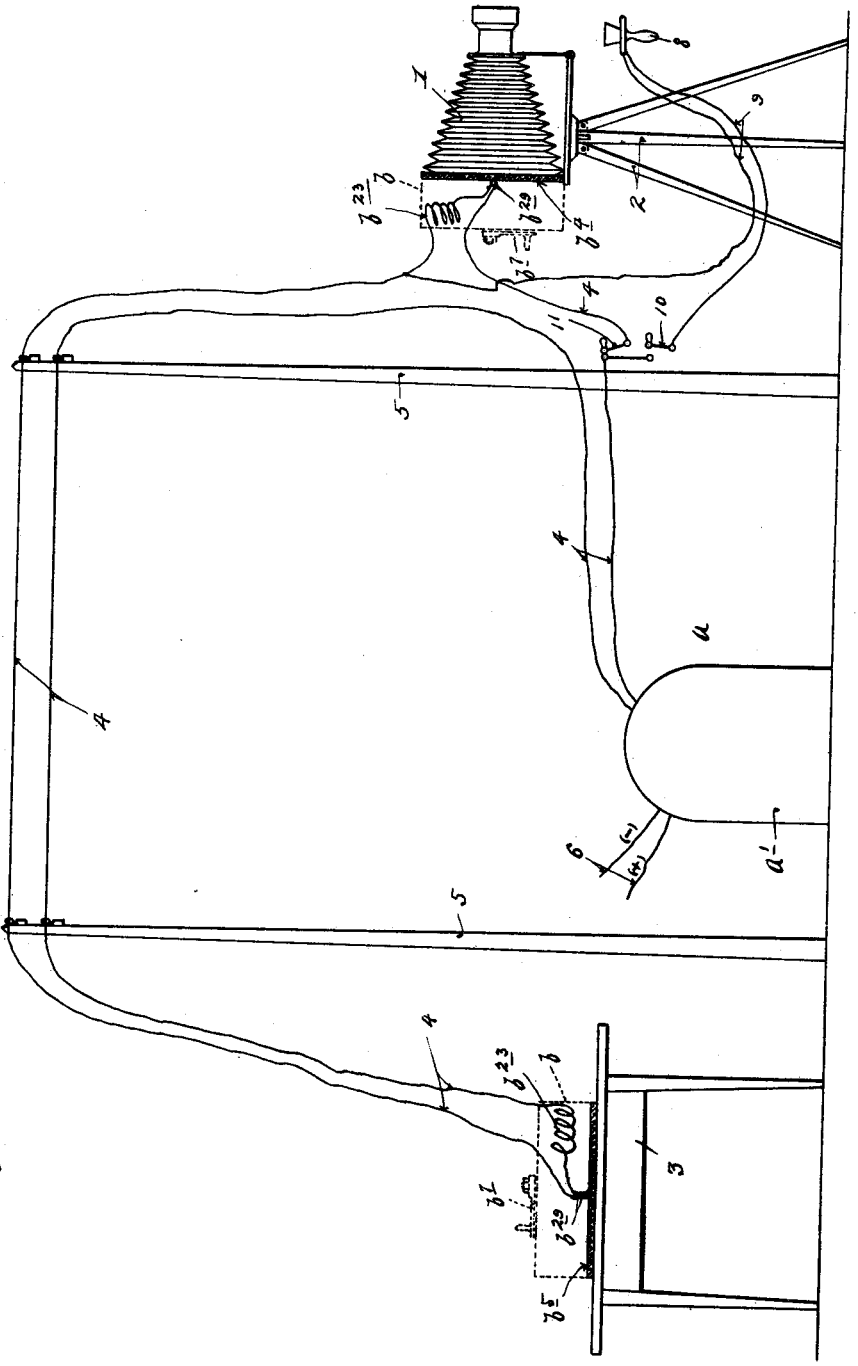


Fig. 1.

Witnesses.
Harry Kilgore,
P. D. Merchant.

Inventor
Michael Beck.
By his Attorney,
Jas. F. Williamson

No. 675,878. Patented June 11, 1901.

M. BECK.

ELECTROGRAPH.

(Application filed Aug. 8, 1899.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

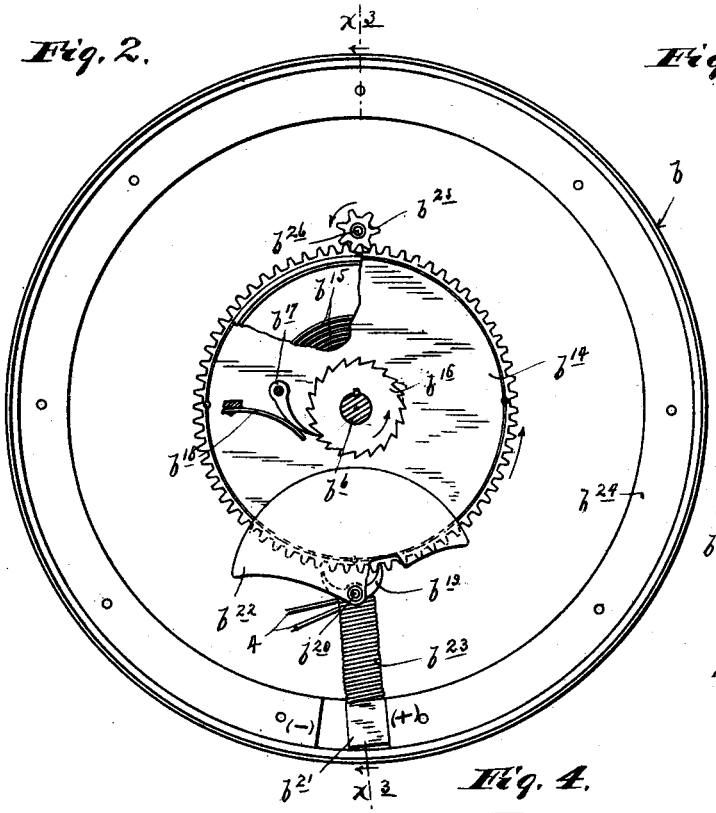


Fig. 3.

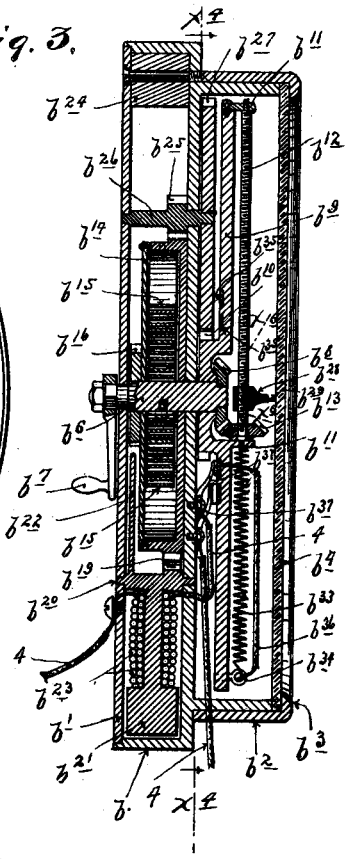
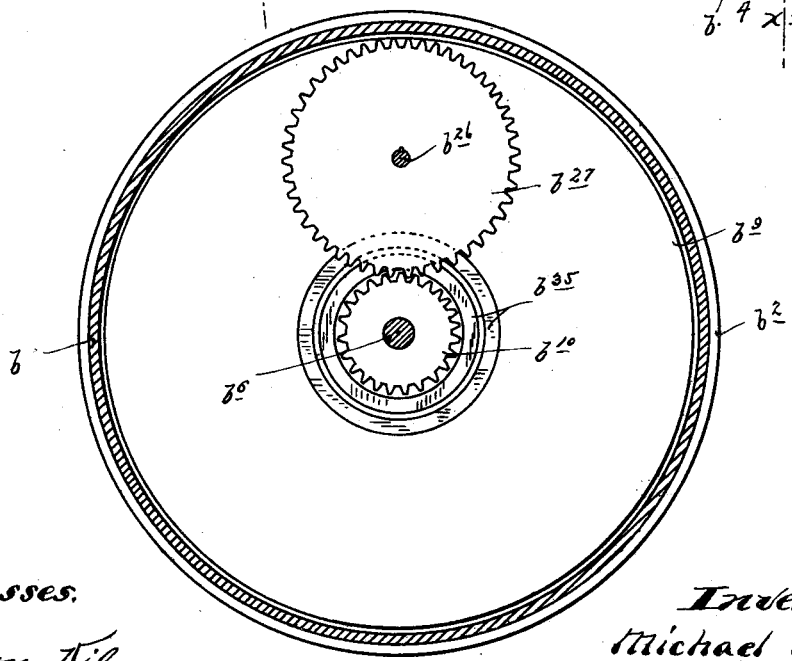


Fig. 4.



Witnesses:
Harry Kilgore,
F. X. Merchant.

Inventor:
Michael Beck.
By his Attorney,
Jas F. Williamson

No. 675,878. Patented June 11, 1901.

M. BECK.

ELECTROGRAPH.

(No Model.) (Application filed Aug. 8, 1899.) 4 Sheets—Sheet 3.

Fig. 5.

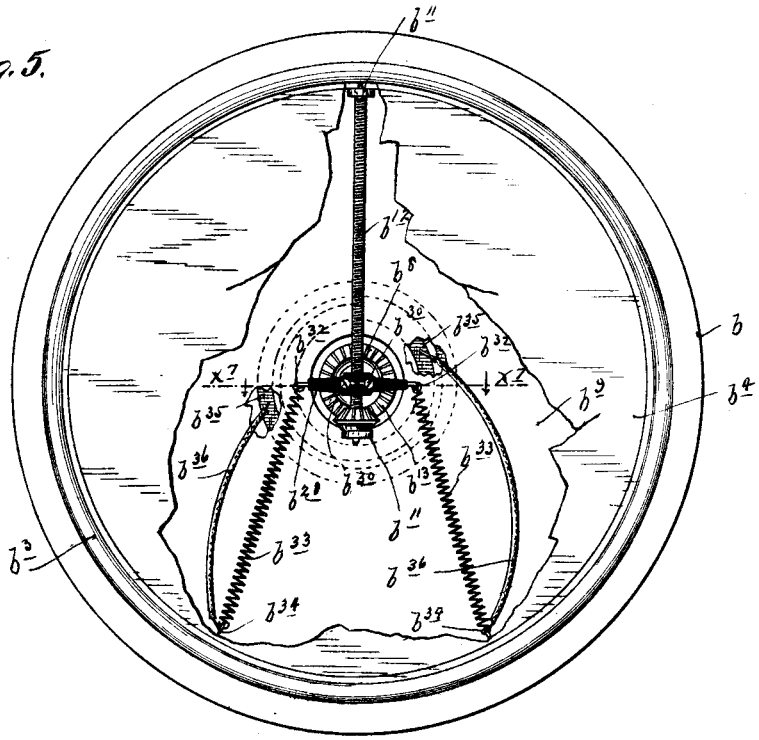


Fig. 6.

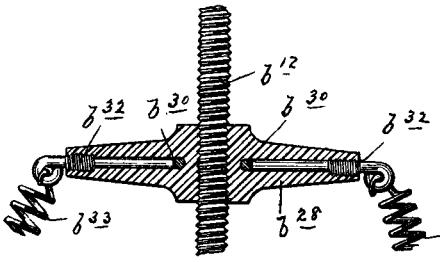
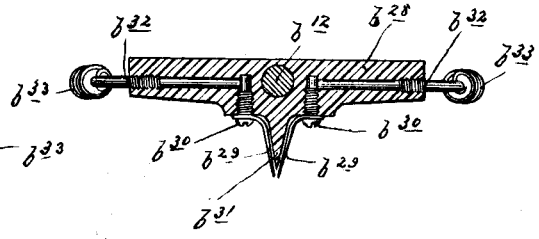


Fig. 7.



Witnesses.
Nancy Kilgore.
F. D. Merchant.

Inventor.
Michael Beck.
By his Attorney.
Jas. R. Williamson.

No. 675,878.

Patented June 11, 1901.

M. BECK.

ELECTROGRAPH.

(Application filed Aug. 8, 1899.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 8.

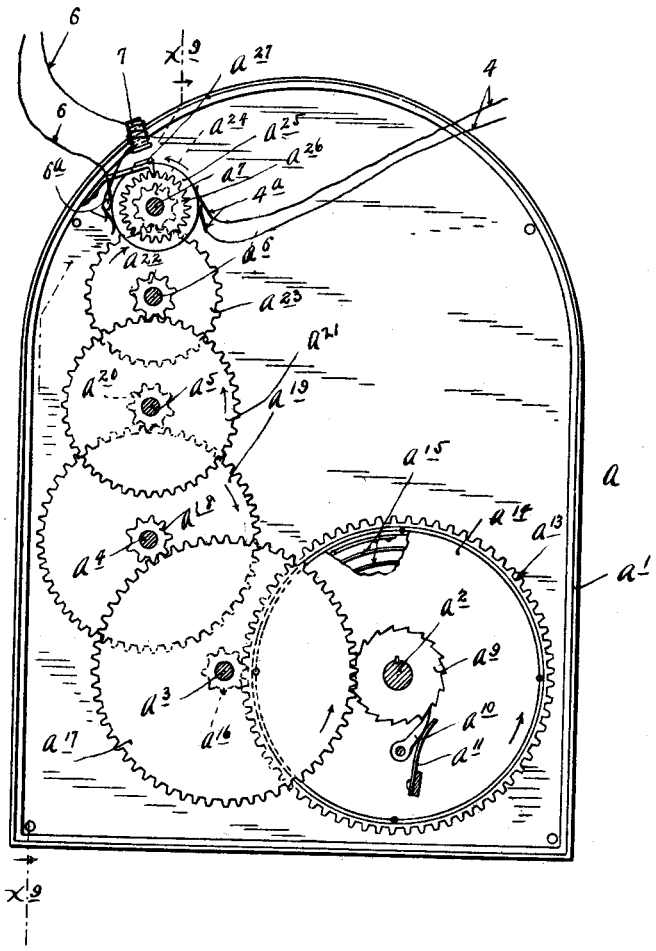
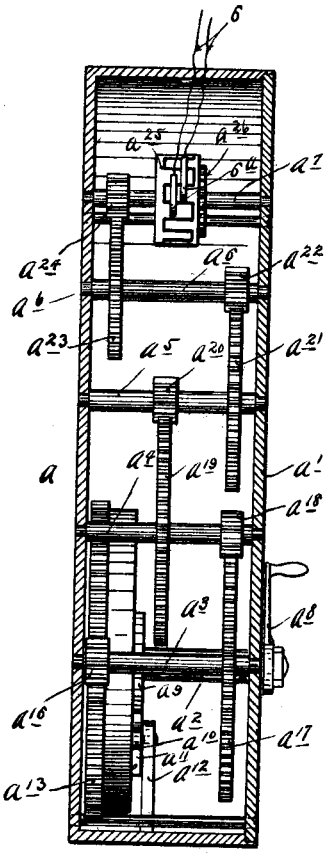


Fig. 9.



Witnesses.
Harry Kilgore,
P. D. Merchant.

Inventor:
Michael Beck,
By his Attorney,
Jas F. Williamson

UNITED STATES PATENT OFFICE.

MICHAEL BECK, OF MINNEAPOLIS, MINNESOTA.

ELECTROGRAPH.

SPECIFICATION forming part of Letters Patent No. 675,878, dated June 11, 1901.

Application filed August 8, 1899. Serial No. 726,521. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL BECK, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Electrographs; 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.

My present invention is in the nature of what may be well termed a "photoelectrograph," and has for its object to provide an improved and efficient device for reproducing by electrical phenomena pictures or images of objects which are located at a distant point or points.

To the above ends my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a diagram view illustrating in a general way the relation of the parts of the system. Fig. 2 is a plan view, with some parts removed, of a device which may be assumed to be either the transmitting or the receiving instrument. Fig. 3 is a vertical section taken on the line $x^3\,x^3$ of Fig. 2. Fig. 4 is a section on the line $x^4\,x^4$ of Fig. 3. Fig. 5 is a bottom plan view of the instrument shown in Fig. 3. Fig. 6 is a detail in section taken approximately on the line $x^6\,x^6$ of Fig. 3. Fig. 7 is a detail taken approximately on the line $x^7\,x^7$ of Fig. 5. Fig. 8 is a side elevation with some parts removed, showing the rotary converter and actuating mechanism therefor, which parts are preferably employed in my present invention and form important elements thereof; and Fig. 9 is a transverse vertical section taken on the line $x^9\,x^9$ of Fig. 8.

In the illustration given in Fig. 1 the numeral 1 indicates a camera or similar instrument, which is shown as supported by a tripod 2.

The numeral 3 indicates a table or other support located at an indefinitely distant point from the camera and serving in this instance to support the receiving instrument. The transmitting instrument is connected as part of the camera 1, and the receiving and transmitting instruments, to be presently described, are connected in circuit by circuit-wires 4, which, as shown, are supported by poles 5. A rotary converter (indicated as an entirety by the letter *a*) is connected into the circuit 4, as hereinafter described.

The so-called "transmitter" or transmitting instrument and the so-called "receiver" or receiving instrument may be and preferably are substantially identical in construction, and hence the instrument illustrated in Figs. 2 to 7, inclusive, may be assumed to illustrate either and both of the said instruments. As illustrated, it comprises as follows: b indicates the flanged disk-like body of an annular case, the same having a removable face-plate b' and a removable plate-retaining ring or collar b^2. When used as the transmitter, the flange b^3 of the retaining-collar b^2 will engage and hold in place a transparent or translucent image-disk b^4, while, on the other hand, when the instrument is used as the receiver the said flange b^3 will clamp and hold in position an impression plate or disk b^5.

Mounted in the case $b\,b'$, at the axis thereof, is a short shaft b^6, provided at its outer end with a hand-crank, by means of which it may be turned. On its extreme inner end the shaft b^6 is provided with a bevel-gear b^8, and just inward of this bevel-gear a large rotary disk b^9 is loosely mounted, the same being provided on its hub with a spur-gear b^{10}. Extended radially of and mounted in suitable bearings b^{11} on the rotary disk b^9 is a screw-threaded shaft b^{12}, which has rigidly secured to its inner end a bevel-pinion b^{13}, that meshes with the bevel-gear b^8.

Loosely mounted on the shaft b^6 is an escapement-wheel b^{14}, which, as shown, is provided with laterally-spaced sides, one of which is removable to permit a coiled spring b^{15} to be placed in working position. This coiled spring b^{15}, when placed in working position, is secured at one end to the shaft b^6 and at its other end to the escapement-wheel b^{14}. When wound, the spring b^{15} tends to move the escapement-wheel b^{14} in the direction indicated by the arrow marked on Fig. 2. Near its crank end, but within the case

b, the shaft b^6 is provided with a ratchet-wheel b^{16}, which is normally held from being turned by the tension of the spring b^{15} by means of a spring-pressed retaining-pawl b^{17}, which is pivoted to the removable side b of the case. Attention is here called to the fact that in Fig. 2 the said pawl b^{17} and its spring b^{18} are shown as detached from the removable side b' of the case, but are not secured to the removable side of the escapement-wheel b^{14}, as might be thought by a casual glance at the said view.

The escapement-wheel is permitted to move with a step-by-step action under the tension of the spring b^{15}, its movements being controlled by an escapement b^{19}, which, as shown, is pivoted at b^{20} and is provided with an extended armature b^{21} and with a counterbalance-segment b^{22}.

At each instrument the line-wire 4 is wound around the pole-piece b^{21} in the form of a coil b^{23}, as best shown in Figs. 2 and 3. Suitably secured within the case b for coöperation with the free end of the pole-piece b^{21} is an annular permanent magnet b^{24}. The poles of this magnet b^{24} are spaced apart far enough to permit sufficient vibration of the pole-piece b^{21} to permit the proper escapement movements of the escapement b^{19}. The manner in which this escapement is operated will be more fully considered later on.

The same teeth on the escapement-wheel b^{14} which are engaged by the escapement b^{19} mesh with a pinion b^{25} on a small counter-shaft b^{26}, which counter-shaft is provided at one end with a large gear b^{27}, which gear in turn meshes with the teeth b^{10} on the hub of the rotary disk b^9.

Working with screw-threaded engagement on the screw-rod b^{12} is a cross-head b^{28}, which carries a pair of tracing-fingers or electrodes b^{29}, which are held thereto by screws b^{30}. The points of these fingers or electrodes b^{29} terminate very close together, and preferably the cross-head b^{28} is provided with a wedge-shaped partition b^{31}, located between said fingers. Long screw-eyes b^{32}, which have contact with the inner ends of the screws b^{30}, project from the ends of the cross-head b^{28}. Coiled springs b^{33} connect the outer ends of the screw-eyes b^{32} with contact-posts b^{34} on the face of the rotary disk b^9. In the inner face of the disk b^9 is a pair of contact-rings b^{35}, which are connected one with each of the contact-posts b^{34} by short wires or conductors b^{36}. A pair of contact springs or brushes b^{37} have contact one with each of the contact-rings b^{35} throughout the rotation of the disk b^9. These brushes b^{37}, it will be noted, are connected one in each main branch of the circuit 4, and it will be further noted that the above-noted parts b^{29}, b^{30}, b^{32}, b^{33}, b^{36}, b^{35}, and b^{37} all serve as a part of the said main circuit 4.

The points of the tracing-fingers or electrodes are so mounted that as they are revolved around the axis of the shaft b^6 and fed radially outward they will travel with a light frictional contact with the inner face of the image-plate b^4 or impression-plate b^5, as the case may be. The face of the image-plate or disk b^4 is coated with selenium or other material having similar properties. It is of course a known fact that selenium has the property of a decreasing electrical resistance with increasing light, and vice versa.

The face of the impression plate or disk b^5 is covered or coated with a thin film of sensitive preparation, such as used in taking photographs. Such a film or material will under the action of electrolysis be variably acted upon by an electric current of varying intensity.

Directing attention now to the construction of the converter a, which is illustrated in detail in Figs. 8 and 9, a' indicates a suitable case in which is mounted a plurality of short counter-shafts a^2, a^3, a^4, a^5, a^6, and a^7. The shaft a^2 is provided at its outer end with a small hand-crank a^8, by means of which it may be turned in one direction, it being held against movement in the other direction by a ratchet-wheel a^9 on the said shaft, and a coöperating retaining-pawl a^{10}, subject to a spring a^{11}, both of which parts a^{10} and a^{11} are mounted on the bracket a^{12}, projected upward from the bottom of the case a'. Loosely mounted on the shaft a^2, within the case a', is a large driving-gear a^{13}, which is shown as formed hollow and provided with a removable side a^{14}. A spring a^{15}, coiled within the gear a^{13} and secured at one end to the said gear and at its other end to the shaft a^2, tends to move the said gear a^{13} in the direction indicated by the arrow marked on Fig. 8. The gear a^{13} meshes with a pinion a^{16} on the shaft a^3, and a large gear a^{17} on said shaft a^3 meshes with a pinion a^{18} on the shaft a^4, which shaft a^4 has a large gear a^{19}, which in turn meshes with a pinion a^{20} on the shaft a^5. Again, a large gear a^{21} on the shaft a^5 meshes with the pinion a^{22} on the shaft a^6, and a gear a^{23} on said shaft a^6 meshes with a pinion a^{24} on the converter-shaft a^7. The said shaft a^7 carries a rotary converter a^{25}, and it is also provided with a lock-gear a^{26}, with which a spring-pawl a^{27} normally engages to lock the converter against movement.

A pair of brushes 4^a in the main circuit 4 work on one side of the converter, and another pair of brushes 6^a of a supply-circuit 6 work on the other side of the said converter. The supply-circuit 6 is wound around a suitable core 7 to form a trip-magnet, which trip-magnet is located for action upon the free end of the lock-pawl a^{27}.

A battery or a direct-current dynamo will be connected in the supply-circuit 6, and hence, of course, a direct current will be produced in said supply-circuit 6. When the magnet 7 is energized, it will raise the lock-dog a^{27} and permit the converter a^{25} to be run under the action of the spring a^{15}. An alternating current of slow step will be transmitted through the circuit 4.

Operation: Assuming that both the transmitting and the receiving instruments are wound up and the tracers or fingers b^{29} are located at the axis of the shaft b^6 or, as shown in Fig. 3, a person or object to be properly positioned in front of the camera 1 and the alternating current to be produced in the circuit 4, the resulting action will be substantially as follows: The alternations of the current will continually change the polarity of the free end of the vibrating armature or core b^{21}, and as the polarity of the magnet b^{24} is permanent the action of attraction and repulsion between the said polarized parts will rapidly vibrate the said armature b^{21}, thereby vibrating the escapement b^{19} and permitting the spring b^{15} to become operative and through the intermediate gears to rotate the disk b^9 with a step-by-step action. Simultaneous and identical movements will take place in both the receiving and the transmitting instruments. As the disk b^9 is rotated the gear b^{13} is revolved around the coöperating gear b^8, which latter is at this time held stationary, and thus said gear b^{13}, together with its screw-shaft b^{12}, is slowly rotated on the axis of the said shaft b^{12}. Thus a compound movement is given to the tracing-fingers or electrodes b^{29}—that is, they are gradually moved outward toward the periphery of the disk b^9 and at the same time are revolved around the axis of the shaft b^6 and are caused to move spirally over the face of the coöperating adjacent image-plate b^4 or impression-plate b^5, according to which instrument is considered. The reflection of the image on the selenium coating of the image-plate b^4 will of course give lines and shades of varying lightness or darkness, and since the said selenium coating has the property above indicated of giving a variable electrical resistance under varying degrees of light and darkness it of course follows that the flow of the current through the circuit 4 will be correspondingly varied. This variation in the current flow in the circuit 4, acting through the tracing-fingers or electrodes b^{29} of the receiving instrument and upon the prepared surface or coating of the impression-plate b^5, will reproduce on the said impression-plate the lines and shades of the image which is thrown upon the image-plate b^4. The receiving and the transmitting instruments being connected as above described will operate in synchronism and step, and hence will run down at the same time. When they are run down, the complete image has been traced and reproduced, and the electrical supply, either in the supply-circuit or in the circuit 4, being first cut off both of the instruments may be readily rewound by means of their cranks b^{16}. The movements necessary to wind up the springs b^{15} will return the cross-heads b^{28} and their tracing-fingers b^{29} to their normal positions, as indicated in Fig. 3. It will be understood that as the tracing-fingers b^{29} are moved outward toward the periphery of the disk b^9 they will be given steps of movement of increasing length, and hence if the alternating current be kept at a constant rate of vibration or step the said tracing-fingers would be moved faster and faster as they are moved outward. It is to overcome this objectionable action that I employ the device illustrated in Figs. 8 and 9. With this device, the spring a^{15} being wound up and permitted to unwind simultaneously with the unwinding of the springs b^{15} of the receiving and transmitting instrument, it is evident that as the said spring a^{15} runs down or unwinds the converter a^{25} will be run slower and slower. By the proper calculation the device may be so set that the converter will decrease in speed at such a rate that it will approximately offset the increasing step movements which are given to the tracing-fingers b^{29}, so that the said tracing-fingers will be caused to travel at approximately a constant speed.

In the diagram view, Fig. 1, I have shown an ordinary telephone-transmitter 8, which, by wires 9 and a switch 10, may be connected in circuit with the main circuit 4. When the transmitter 8 is connected with the circuit 4, the camera 1 should be cut out by opening a switch 11. When this is done, a person may talk into the transmitter 8, and thereby cause photographs or impressions indicating the characteristics of the voice to be produced on the impression-plate b^5.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In an apparatus of the character described, the combination with an electric circuit and means for interrupting the flow therethrough, to produce a succession of impulses, of a receiver and a transmitter in said circuit, which transmitter involves an impression-plate coated with a substance, the electrical resistance of which is affected by varying shades of light, and said receiver involving an impression-plate having a coating or covering variably affected by the electric current of varying intensity, said transmitter and receiver each further comprising tracers and means for moving the same in synchronism over their respective impression-plates.

2. In an instrument of the character described, the combination with an impression plate or dial covered or coated with selenium or similar material, of an electric circuit involving a pair of tracers or electrodes, and means for moving the said tracers or electrodes over the coated surface of said image-plate, substantially as described.

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

MICHAEL BECK.

Witnesses:
HARRY KILGORE,
F. D. MERCHANT.