No. 667,454. Patented Feb. 5, 1901.

A. POLLÁK.

FACSIMILE TELEGRAPH.

(Application filed Feb. 17, 1899.)

(No Model.) 2 Sheets—Sheet 1.

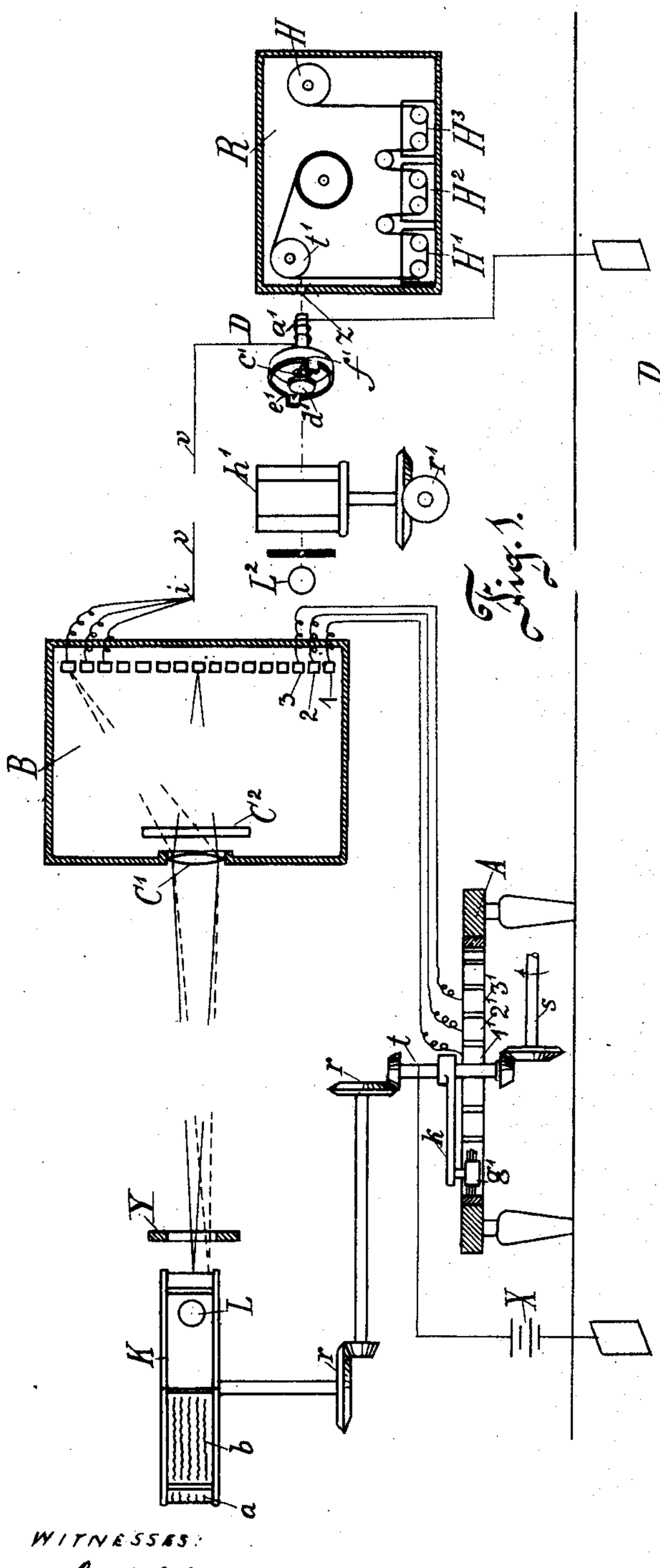

Fig. 1.

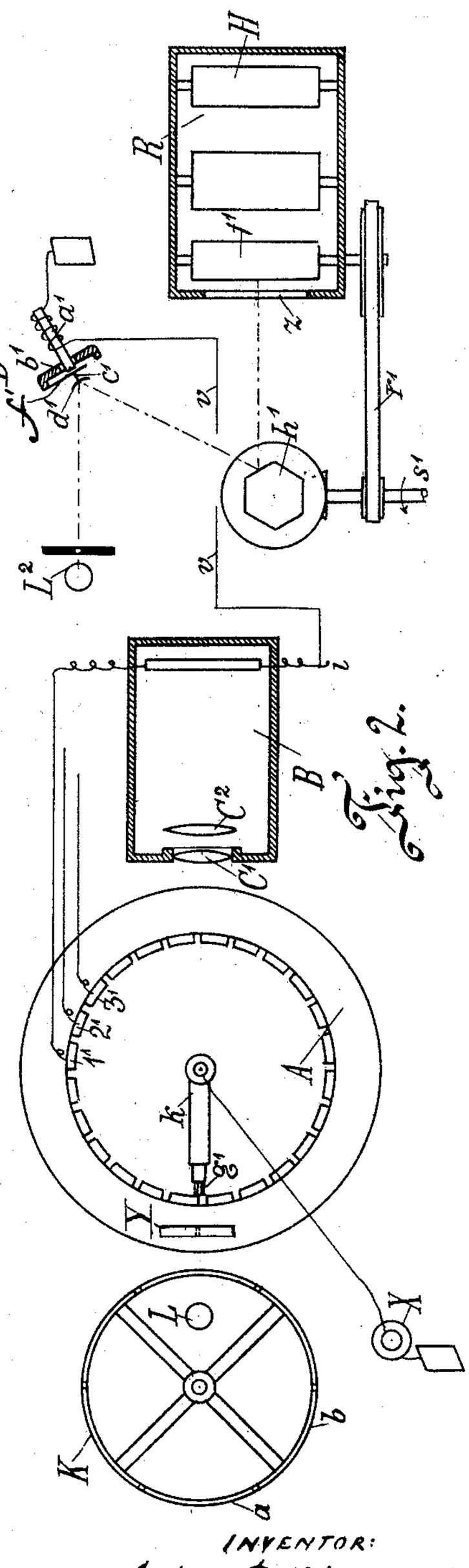

Fig. 2.

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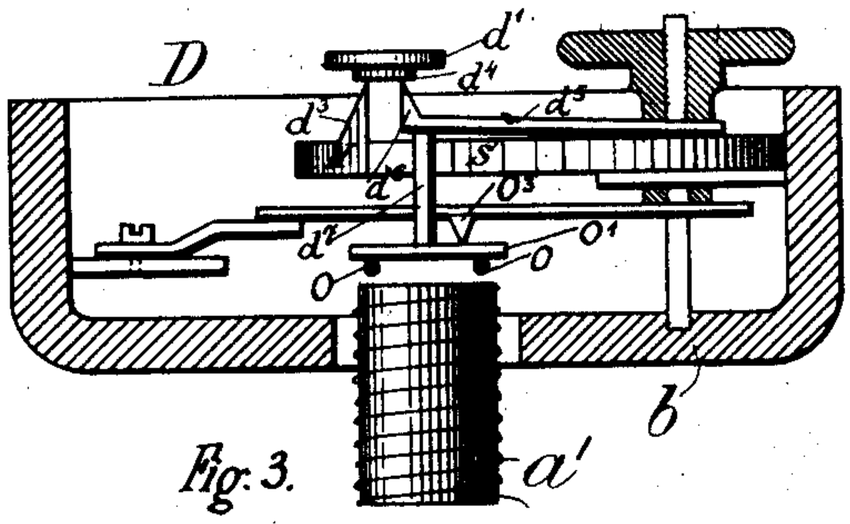


Fig. 3.

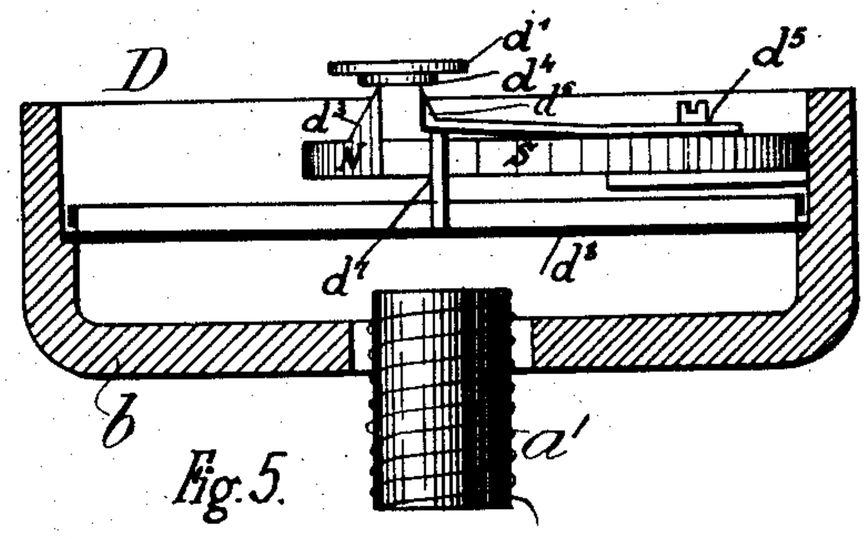


Fig. 5.

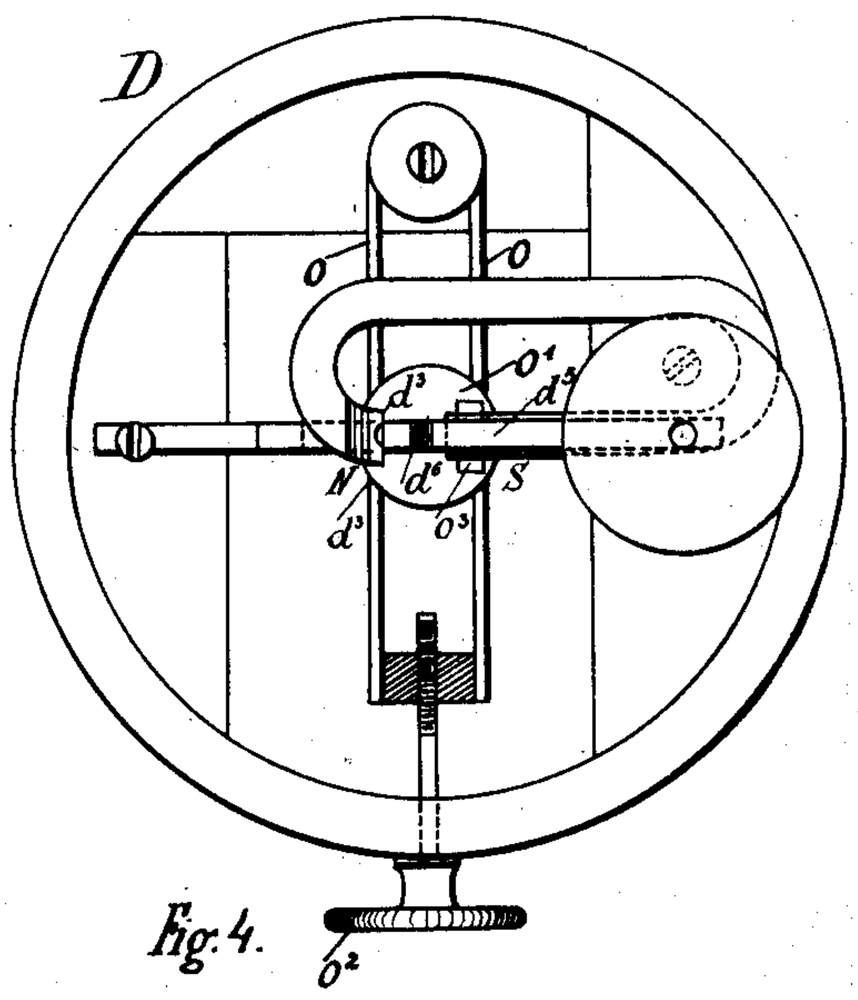


Fig. 4.

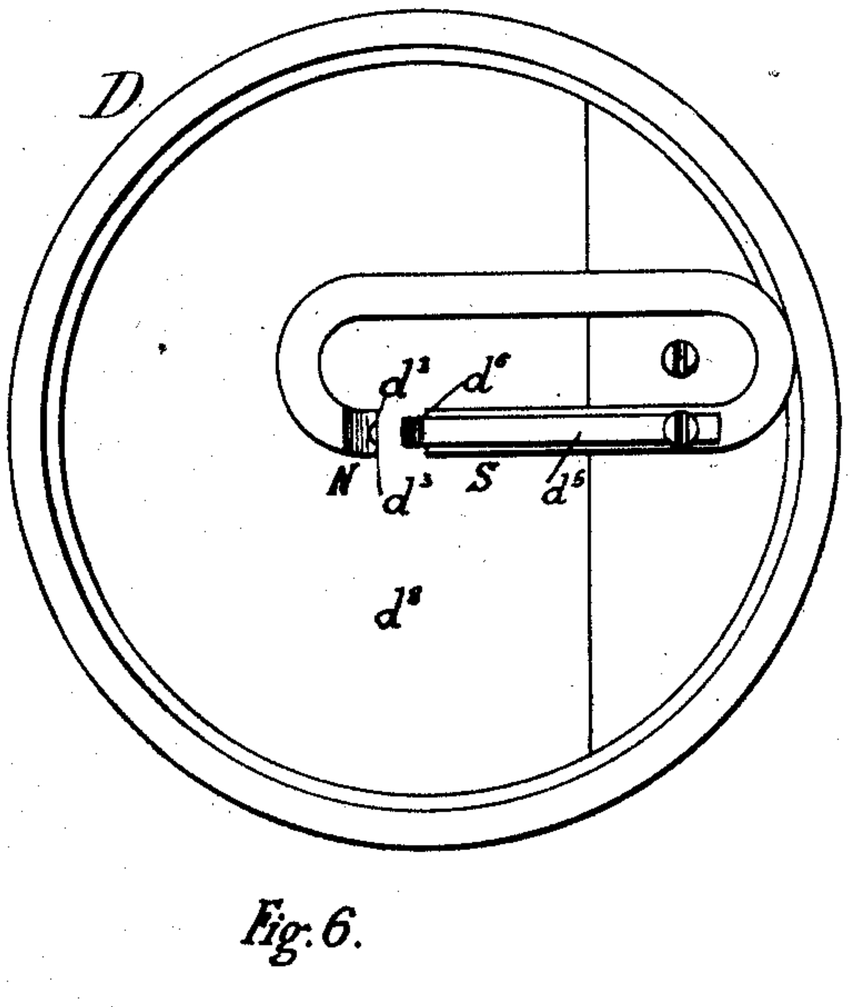
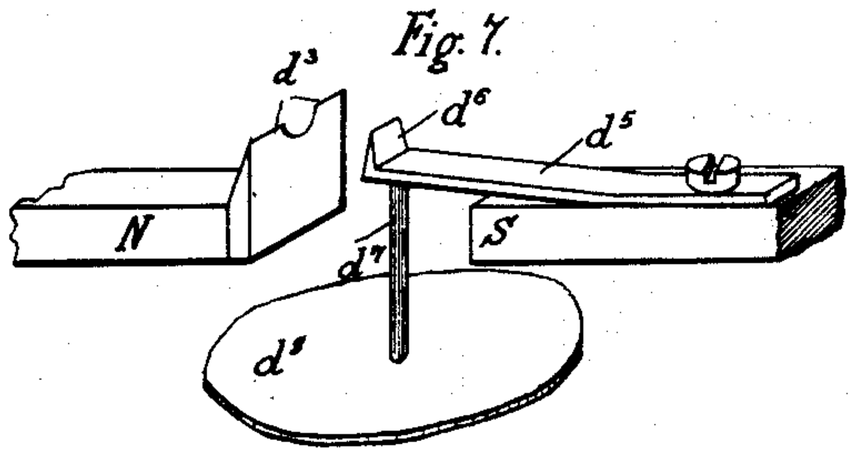


Fig. 6.

Fig. 7.



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FACSIMILE-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 667,454, dated February 5, 1901.

Application filed February 17, 1899. Serial No. 705,771. (No model.)

To all whom it may concern:

Be it known that I, ANTON POLLÁK, a citizen of Austria-Hungary, residing at Szentes, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Facsimile-Telegraphs, of which the following is a specification.

In my application, Serial No. 681,729, filed May 25, 1898, I described a facsimile-telegraph, the object of that invention being to reproduce telegraphic messages in a form exactly corresponding with the original.

My present invention comprises an improved construction of the telephone apparatus set forth in said application and aims to prevent the after-vibrations of the telephone-diaphragm and to obtain an increased sensibility of the apparatus.

In the accompanying drawings, Figure 1 is a sectional elevation, and Fig. 2 a plan, partly in section, of a form of apparatus shown in my said application. Fig. 3 is a vertical mid-section of a telephone apparatus embodying my present invention. Fig. 4 is a plan view thereof. Fig. 5 is a vertical mid-section showing one feature of my improvements. Fig. 6 is a plan view thereof with the reflector removed, and Fig. 7 is a perspective view of a detail.

I will first briefly describe the apparatus set forth in my said application and its mode of operation with reference to Figs. 1 and 2.

The message *a b* to be sent is written, for example, upon transparent paper and mounted upon a carrier K, within which is arranged a source of light L. In front of the carrier K is placed a screen Y, having a narrow vertical slit, preferably one-third of a millimeter in width. The image of a narrow section of the message is thus projected through the screen. A chamber B is arranged so as to receive this image and has at its rear a series of selenium cells 1 2 3, &c., the height and breadth of the image being increased by the lenses C′ C², so that each dot of the message substantially covers a cell. Such of the cells are illuminated as receive the rays of light passing through the transparent paper, while those corresponding to the opaque lines of the message are darkened. The cells 1 2 3, &c., are electrically connected to a corresponding series of contacts 1′ 2′ 3′, &c., upon a commutator A. A brush *g′*, carried by an arm *k*, is rotated by a shaft *t* around the series of contacts, and thus sends an electric current from a battery X through each of the cells successively. Each of the cells is connected at *i* to a common line-wire *v*, which leads to the receiving-station. The current passes into an electromagnet *a′* of a telephone-like receiver D and attracts a diaphragm *f′*. A small reflector *d′* is pivotally connected to the frame of the telephone by an arm *e′* and is connected to the diaphragm by a rod *c′*. Normally when the diaphragm is held strongly attracted the reflector is tilted, for example, downwardly, and when the attraction is decreased the reflector tilts upwardly. Thus a ray of light from the source L² is moved vertically upon one side of a rotary polygonal mirror *h′*, which in its rotation reflects it along a slit *z*, formed in a chamber R, in which latter is moved a photosensitive strip, which receives such of the rays of light as are projected through the slit *z*. The transmitting and receiving apparatus are preferably so synchronized that the brush *g′* of the commutator makes a complete revolution around its contacts while the rotary mirror *h′* is directing the beam of light once across the chamber R. When the current is passing through any one of the cells 1 2 3, &c., which is illuminated, the reflector is held deflected by the attraction of the diaphragm to the magnet, so that the ray of light is directed across the chamber R below the slit *z*. When a dark cell is in circuit, the increased resistance of the selenium cell causes a diminution of the current passing over the line-wire, and the magnet thus attracts its diaphragm less strongly, and the latter moves outwardly, with the effect of tilting the mirror upwardly. This elevates the ray of light so that it rises and enters the slit *z*, thus making a dot on the photosensitive surface at a position which corresponds to that of the darkened cell in the chamber B, and hence to the position of the dot on the message which affected such cell.

The ray of light enters the slit *z* as many times during its passage along the slit as there are darkened cells in the transmitting device, and therefore reproduces upon the photosensitive surface each of the dots in the section of the message in their correct

positions. As the wheel K rotates one-third of a millimeter to transmit the next succeeding section of the message, the photosensitive surface also moves the same distance to receive such section. The succeeding sections follow one another closely, and thus effect a substantially continuous reproduction of the message.

While the foregoing explanation correctly states the theoretical operation of this system, it is found in practice that this operation is modified by the circumstance that the telephone-diaphragm by reason of its own natural rate of vibration tends to impart oscillations to the reflector between those imparted by the separate current impulses sent from the transmitter. Accordingly it is necessary to bring these vibrations into unison with the number of current impulses and to weaken or diminish the supplemental vibrations, so as, in effect, to suppress them, to the end that the separate impulses transmitted can unimpairedly follow one another.

The vibrations of the diaphragm may be brought into unison with the number of the impulses either by employing a diaphragm of suitable strength and size or by making the apparatus synchronizing. The suppression of the after-vibrations of the telephone may also be effected by mechanical means adapted to prevent the vibrations of the diaphragm in an opposite direction to the impulses. My present invention provides means for thus suppressing such supplemental vibrations.

I will first describe the means for so synchronizing the natural rate of vibration of the diaphragm of the receiving apparatus with the current impulses that practically no supplemental or after vibrations occur. By this means the successive current impulses act upon the diaphragm at approximately the same point in each vibration, so that each vibration occurs coincidently with the reception of a current impulse, and when the impulses are of the same strength the vibrations are approximately of the same amplitude. When a darkened cell is in circuit, the degree of movement of the diaphragm is less than when a light cell is in circuit; but such smaller vibration is of a duration substantially equal to the longer vibrations produced when the light cells are in circuit, and hence the synchronism is not affected. By this means the speed of transmission may be increased, as each impulse is substantially unaffected by the preceding ones, and hence the impulses may follow one another rapidly. I prefer to effect this synchronism by varying the period of vibration of the diaphragm so that it accords with the speed of transmission of the impulses.

In Figs. 3 and 4 of the drawings I have shown means for carrying out this phase of my invention, in which D indicates a telephone, b its shell, and a' its magnet. Across the shell b are stretched two wires o, the tension of which is adjustable by means of a thumb-screw o^2. A small iron plate or disk o' is suitably fixed to the wires o and with said wires forms a vibrating member, which corresponds to a telephone-diaphragm. The plate o' is attracted and released by the magnet a' under the influence of the electric impulses from the transmitting-station, which follow one another at regular intervals. Hence the plate o' if brought into synchronism with such impulses will vibrate regularly in unison or harmony with the impulses, and no deleterious after-vibrations of consequence will occur. To effect this, the tension of the wires o is adjusted until the rate of vibration of the diaphragm is synchronized to the speed of transmission. The synchronism thus obtained is not affected by the fact that the diaphragm vibrates with greater amplitude under the influence of an impulse through a light cell than through a dark cell. The suppression of the supplemental vibrations may also be effected by a contact o^3, which bears with more or less pressure against the plate o', the tension upon which is adjusted by a thumb-screw, as shown. The contact o^3 serves as a mechanical obstruction, opposing the movement of the diaphragm outwardly by its own vibrations, while allowing it to be freely movable toward the magnet under the attraction of the latter, and thus brings the diaphragm substantially to a state of rest after each vibration.

It will be understood that the movements of the diaphragm are very minute, and it is important that the reflector d', which reflects the ray of light, should be deflected to as great an extent as possible in order that sufficient amplitude may be given to the movements of the ray of light. My invention provides means for accomplishing this result, and in Figs. 3 to 7 I have shown this feature of my invention as applied to a telephone having an unadjustable diaphragm. By this feature of my invention I mount the reflector to oscillate upon a sharp point or edge and cause the movements of the diaphragm to be communicated to it through a second edge at a point in close proximity to its axis of oscillation. I am enabled to do this by causing the reflector to be held in place by magnetic attraction. To this end a magnet N S, which is preferably permanent, is fixed to the telephone-shell, being bent so that its ends lie in close proximity to each other, as shown. One of the poles, as N, carries a sharp edge or point d^3, and the other pole S carries a light spring d^5, which is formed at its outer end with an edge or point d^6, through the medium of which the movements of the diaphragm are transmitted to the reflector by a light rod d^7, interposed between the spring and the diaphragm. The reflector d' has fixed at its rear a small iron plate d^4, which, being in the field of the magnet, holds the reflector firmly in position upon the points d^3 and d^6. The reflector thus oscillates about the axis formed by the point d^3 with no appreciable friction,

and as the edge d^6 acts against the reflector at a point close to its axis the minute movements of the diaphragm cause comparatively great movements of the reflector. The movements of the ray of light reflected by the reflector are thus greatly amplified.

I do not claim, broadly, herein the means thus described for mounting the reflector for general purposes, as this forms the subject-matter of a divisional application filed December 18, 1899, Serial No. 740,638, but restrict myself in the present application to its use for a facsimile telegraph.

My invention is not limited to the particular means set forth herein for effecting the synchronism described, as it is obvious that such synchronism may be obtained in other and equivalent ways. For example, with a given rate of transmission of the current impulses the diaphragm may be made of such weight, stiffness, and dimensions that its natural rate of vibration will correspond to such speed of transmission. For convenience, however, I prefer the construction shown, in which the rate of vibration of the diaphragm is easily adjustable to correspond to the speed of transmission.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. A facsimile-telegraph comprising a transmitting device having a series of selenium cells, means for varying the illumination of such cells in accordance with the message, and means for sending current impulses through such cells successively, whereby such impulses individually correspond with the successive points of the message, a receiving device having a vibrating member adapted to respond to such impulses to reproduce such successive points of the message, and means for so suppressing the after-vibrations of such vibratory member that its response to the current impulses may be substantially unaffected by such after-vibrations.

2. A facsimile-telegraph comprising a transmitting device having a series of selenium cells, means for varying the illumination of such cells in accordance with the message, and means for sending current impulses through such cells successively, whereby such impulses individually correspond with the successive points of the message, and vary in intensity in accordance with the illumination of such cells, and a receiving device having a vibrating member adapted to respond to such impulses to reproduce such successive points of the message, said transmitting and receiving devices being so synchronized that the current impulses occur in unison with the vibrations of the vibrating member, so that the effect of the after-vibrations is substantially eliminated, and a sharp reproduction of the message is obtained.

3. A facsimile-telegraph comprising a transmitting device having a series of selenium cells, means for varying the illumination of such cells in accordance with the message, and means for sending current impulses through such cells successively, whereby such impulses individually correspond with the successive points of the message, and vary in intensity in accordance with the illumination of such cells, and a receiving device having a vibrating member adapted to respond to such impulses to reproduce such successive points of the message, and means for so synchronizing said transmitting and receiving devices that the current impulses occur in unison with the vibrations of the vibrating member, so that the effect of the after-vibrations is substantially eliminated, and a sharp reproduction of the message is obtained.

4. A facsimile-telegraph comprising a transmitting device having a series of selenium cells, means for varying the illumination of such cells in accordance with the message, and means for sending current impulses through such cells successively, whereby such impulses individually correspond with the successive points of the message, and vary in intensity in accordance with the illumination of such cells, and a receiving device having a vibrating member adapted to respond to such impulses to reproduce such successive points of the message, and means for varying the rate of vibration of the vibratory member to bring such vibrations into unison with the successive current impulses, so that the effect of the after-vibrations is substantially eliminated and a sharp reproduction of the message is obtained.

5. A facsimile-telegraph comprising a transmitting device having a series of selenium cells, means for varying the illumination of such cells in accordance with the message, means for sending current impulses through such cells successively, whereby such current impulses individually correspond with the successive points of the message, and a receiving device comprising an electromagnet influenced by the individual current impulses to reproduce the message, a vibratory member vibrated by said magnet, and means for adjusting said member to vary its rate of vibration.

6. A facsimile-telegraph comprising a transmitting device having a series of selenium cells, means for projecting an image of the message upon said cells, and thereby varying their degree of illumination, means for sending current impulses through said cells in succession, a receiving device comprising a vibrating member affected by the varying strengths of the current impulses and influencing a ray of light in accordance with such variations, means for recording such variations photographically, and means for synchronizing the transmitting and receiving devices so that the vibrations of the vibrating member occur in unison with the current impulses.

7. A facsimile-telegraph comprising a transmitting device, having a series of selenium

cells, means for projecting an image of the message upon said cells and thereby varying their degree of illumination, means for sending current impulses through said cells in succession, a receiving device comprising a vibrating member affected by the varying strengths of the current impulses and influencing a ray of light in accordance with such variations, a chamber having a slit, a photosensitive surface moving past said slit, said vibratory member effecting the passage of said ray of light into and out of said slit in accordance with the varying strengths of the current impulses, and means for synchronizing the vibrations of said vibratory member, so that they occur in unison with the current impulses.

8. The combination with a transmitting device having a means for sending current impulses which correspond with the individual points of the message, of a receiving device comprising a vibratory member, a reflector moved by said vibratory member, points upon which said reflector oscillates, and means for generating a magnetic field adapted to hold the reflector against such points.

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

ANTON POLLÁK.

Witnesses:
SIGMUND BERNANDT,
E. MYERS.