(No Model.)

C. SELDEN.

TELEGRAPH RECEIVER.

No. 382,195. Patented May 1, 1888.

Fig. 1.

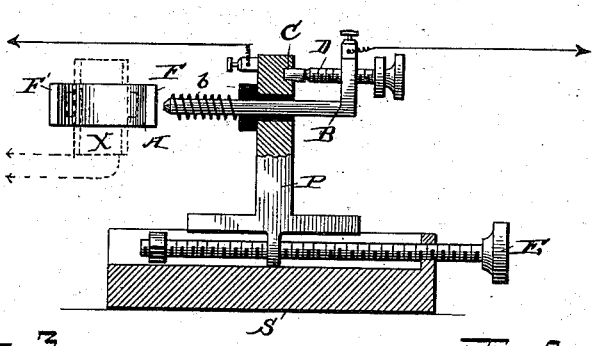


Fig. 3.

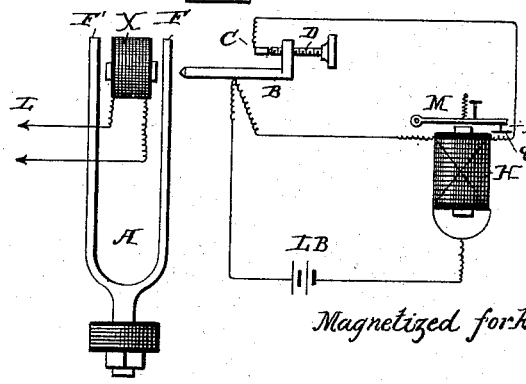


Fig. 4.

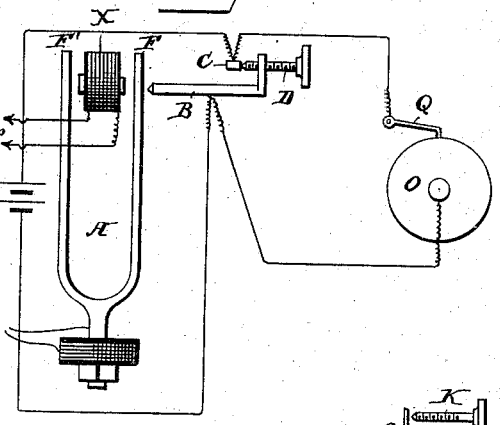


Fig. 5.

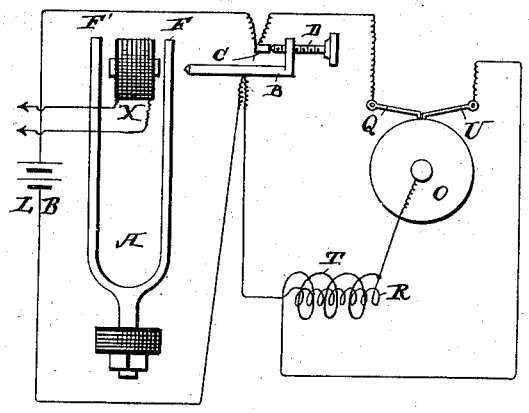


Fig. 2.

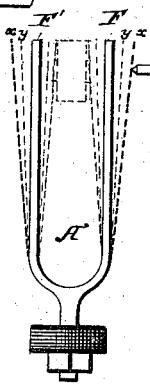


Fig. 6.

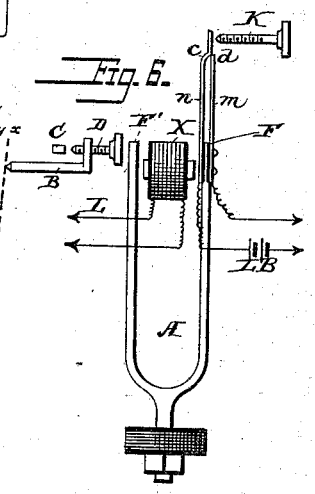
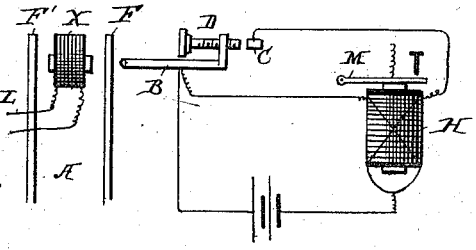


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES SELDEN, OF BALTIMORE, MARYLAND.

TELEGRAPH-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 382,195, dated May 1, 1888.

Application filed November 15, 1887. Serial No. 255,247. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SELDEN, a citizen of the United States, and a resident of the city of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Telegraph-Receivers, of which the following is a specification.

My invention relates to tone or harmonic telegraphy, and more particularly to the manner of receiving the tones or signals adapted for use in such systems; and it has for its object to so improve such systems and provide such receiving-instruments that a large number of separate messages may be transmitted and received upon a single wire without interference with each other and without danger of disturbance from induction or other causes; and my invention consists more particularly in the receiving-instruments constructed and arranged substantially as hereinafter described, and in the application and adaptation of such instruments for various kinds of telegraphy. It is well understood in this class of telegraphy that a series of transmitters are suitably connected and arranged to throw or superpose upon the main line independent series of impulses varying in rate or number for each transmitter, and I have not deemed it necessary to show or describe any particular form of transmitter in this case, as my present invention relates more particularly to the receiving apparatus.

I am aware that many forms of receiving-instruments have been proposed for separating and receiving the different series of impulses or variations of potential on the line and transforming them into audible or other signals, so that they can readily be understood by the receiving-operator; and I am also aware that the use of tuning-forks or equivalent instruments have been proposed, which forks have been tuned to vibrate at some certain rate corresponding with the number of impulses sent upon the line by the particular transmitter to which the tuned fork is intended to respond.

In the present instance I make use of a tuning-fork, and preferably one that is permanently magnetized; and I operate this tuning-fork so as to produce vibrations in the ends of the tines thereof electrically by means of a magnet or other device connected in the main line. It is well known that a tuning-fork tuned, for instance, to vibrate at a rate of three hundred and sixty vibrations a second will respond not only to impulses at that rate, but also at any rate which is about an exact divider of the former—that is to say, that a tuning-fork the fundamental tone of which is three hundred and sixty vibrations will also respond to one hundred and eighty, ninety, sixty, or even forty-five vibrations to the second. It is equally well known that a transmitter giving forty-five impulses only, or any other number than the fundamental tone of the tuning-fork, will not act as efficiently thereon and produce vibrations in the tuning-fork of as great an amplitude as a transmitter giving the fundamental number of vibrations, or three hundred and sixty pulsations per second; but still the influence of the transmitter producing forty-five, sixty, or ninety vibrations is sufficiently great to produce more or less motion in the tines of the fork, which is liable to cause false signals or to break up the true signals, especially when transmitting over long distances. These effects have been found to be of great importance in the use of the tuning-fork as a receiver in tone or harmonic telegraphs, especially when it is desired to send a large number of messages over a single wire, and various efforts have been made to overcome these objections; and one of the features of my invention consists in providing means for overcoming these objections, and in the application of such means to operate various forms of receiving-instruments, the practical operation of which depends upon the accurate operation of the primary receiver.

In order to more clearly illustrate my invention, reference is made to the accompanying drawings, in which—

Figure 1 represents an embodiment of my invention, the drawing being partially in section. Fig. 2 is a diagrammatic representation showing the effects of the various rates of vibration of the tines of the fork upon the receiver. Fig. 3 is a diagrammatic representation showing the receiver connected with an ordinary differential sounder. Fig. 4 is a similar diagram showing the application of the receiver to an automatic or fac-simile telegraph. Fig. 5 is a similar diagram. Fig. 6

represents a modified form of receiver, and Fig. 7 represents an arrangement embodying my invention with the contacts normally separated.

In the drawings, A represents a tuning-fork, which may be suitably mounted upon any proper base, which is not shown, and which is operated by a magnet, X, connected in the line-circuit L, over which are sent impulses of a certain definite rate, which operate to produce a similar rate of vibrations in the tines F F′ of the fork. This fork, which may be of any suitable construction, is tuned to have a certain fundamental rate of vibration—for instance, three hundred and sixty vibrations a second—corresponding with the impulses produced by the particular transmitter connected in the main line to which it is adapted to respond.

Upon a suitable base, S, is mounted a standard, P, which is made so as to be adjustable longitudinally in the base by means of the adjusting-screw E. Mounted in the standard P, but insulated therefrom, is a rod, B, upon one end of which is placed a coiled spring, *b*, the other end being preferably bent at right angles and carrying an adjusting-screw, D, which forms one of the contact-points, and which normally rests in contact with the point C, fixed in the pillar, the contact being maintained by the spring *b*. Suitable binding-posts are attached to the pillar and to the rod B, as indicated.

This apparatus is shown connected for operation in the diagram, Fig. 3, of the drawings, in which L B is a local battery, H a differential sounder, and M the armature thereof. Normally the contact-points C D are in contact and included in one branch of the local circuit surrounding the differential magnet of the sounder, and the armature is unaffected by the magnet. When, however, the tuning-fork A is operated by means of the impulses over the main line L, one of the tines, F, vibrates sufficiently to impinge upon the end of the rod B and to break the contact between the points C D, when the equilibrium of the differential magnet is disturbed, and the armature M is attracted and operates to produce the proper signal.

It will be understood that the vibrations of the tines of the tuning-fork are comparatively rapid, and while the tendency of the spring *b* is to close the contact between the points C D immediately after the impact of the tine or arm F against the rod B is broken the action of the spring is not sufficiently rapid to completely close the contacts and to establish the circuit of the local battery through those points, so as to disturb the balance of the magnet sufficiently to release the armature; or it may be that the core of the magnet is of such material and proportion as to have a comparatively sluggish action, so that if perchance the contacts C D do actually impinge the momentary current that might flow through that branch of the local circuit is not sufficient to demagnetize the magnet of the sounder and disturb the armature, and the result is that as long as the tuning-fork is vibrating at the proper rate of speed the armature is held down to make the signal, and as soon as the fork stops the contact-points are operated to complete the balance of the magnet and to release the armature. Such is the operation of the tuning-fork and receiver when the proper number of impulses are being transmitted over the main line L to produce the fundamental tone of the tuning-fork A. As before stated, however, other rates of impulses have more or less effect upon the tuning-fork, as, for instance, one hundred and eighty vibrations, or half of the fundamental tone; or it has been found that even if the number of vibrations is three hundred and fifty perhaps, or some other number very nearly approximating the fundamental tone of the fork, the result of the influence of these varying rates of vibrations is to produce false signals. It is understood, however, that the full effect or vibration of the arms of the tuning-fork will not be produced unless the normal or fundamental number of impulses are transmitted to it, and in Fig. 2 I have illustrated, on an exaggerated scale, the position of the tines of the fork under these varying influences. When the proper rate of vibrations or impulses is sent over the line corresponding to the fundamental tone of the fork, the tines will vibrate to the extent shown by the heavy dotted lines *x x*, and the result will be that one of the tines will impinge upon the rod B and break the contact between C and D of the receiving-instrument as the tines then vibrate to their full amplitude; but when impulses of other rates are received which affect the fork the vibration of the tines F F′ will not be so great and will only have an amplitude indicated by the dotted lines *y y*, and by means of the adjustments in my receiving device the rod B is so arranged that the contact-points C D will not be affected under these conditions. Another important feature results from this mode of adjusting the receiving-instrument. It is well known that induction, which may result from various causes, has an influence upon the receiving-instrument and produces vibrations to a greater or less extent in the receiving-fork; but as these vibrations are not those corresponding to the fundamental of the tuning-fork the rod B can be adjusted over these vibrations, so that the contact-points will not be affected and the disturbing influences will not be liable to produce false signals.

From the above the importance of my invention will be readily understood, as it will be seen that the instrument can be so delicately adjusted that the receiver will not respond to vibrations unless the proper rate is being transmitted and affects the fork so as to produce the full amplitude of its vibrations, and it therefore results that a large number of receiving-instruments may be placed in a single line over which are sent varying series of

impulses and each receiver will only respond to its predetermined number of impulses and will not be affected by induction and other disturbing causes.

This receiver may be applied not only to a sounder, differential or otherwise, as shown in Fig. 3, but is specially applicable to an automatic or autographic receiver, as illustrated in Fig. 4, in which the cylinder O or other device carrying, for instance, a chemically-prepared paper, is connected in one branch of the local circuit with a point or style, as Q, resting thereon, and the contact-points C D are so arranged as to normally short-circuit the local battery L B. When, however, the fork is vibrated to its fullest extent, its arm or tine F impinges upon the rod B and breaks the local circuit at the contact-points C D, and the current from the local battery is caused to flow through the cylinder or plate O and its superposed paper or other receiving device, and the current passing through the same causes a record to be produced in the well-known way. In place of using the chemically-prepared paper, as indicated in Fig. 4, it is evident that the armature M, as shown in Fig. 3, may be provided with a pin or pencil, *p*, which may be brought to bear upon a strip of paper or other material, *q*, which may be caused to travel in a well-known way underneath said pin whenever the contact at the points C D is broken and the balance of the differential magnet is disturbed.

When the apparatus is used in making facsimile or other records, it is desirable that the point or style Q should remain in absolute contact with the chemically-prepared paper throughout the whole time that the signal is being transmitted, and as I have found for the reasons before stated that sometimes the circuit at the contact-points C D may be momentarily established, so that the result would be that the signal produced on the traveling paper would be broken or even in the form of continuous dots or dashes instead of a continuous line; and in order to remedy this and to enable me to produce a perfect facsimile I employ an arrangement whereby the circuit may be momentarily broken at the points C D, and still the record would be made as a continuous line, and this is illustrated in Fig. 5, in which the contact-points C D are included in a branch of the local battery L B, which branch forms the primary R of an induction-coil, the secondary T of which includes a second stylus, U, which is arranged in close proximity to the first stylus, Q, on the paper, and the operation will be readily understood to be that should there be makes or breaks at the contact-points in the circuit when the primary pulsations begin or cease the secondary currents set up by such action in the coil T would pass through the stylus U and supplement the dots or dashes made by the style Q, so as to fill the interstices or spaces between them and produce a continuous line, and thus by the use of the two styluses, one connected in the primary and the other in the secondary thereof, a record-line that is continuous will be produced.

While I have thus described the construction of my device, so that contacts C D are normally closed, it is evident that it may be constructed and arranged so that the contacts would be normally open and the contact completed by the vibrations of the tuning-fork, and this is illustrated in Fig. 7, in which like parts are lettered as in the former figures, and which require no specific construction.

A modified form of my invention is illustrated in Fig. 6, in which the tuning-fork is provided with an extension, *m*, secured, for instance, upon one side of the arm or tine F, while upon the other side of the same arm, but insulated therefrom, is secured a bent spring-arm, *n*, each of which arms are included in the local circuit L, and the contact is normally completed at the points *c d*, while suitably supported in relation thereto is the screw K, which is so adjusted that when the fork is vibrated to its full amplitude the extension of the spring *n* impinges upon the end of the screw K, breaking the local circuit at the contact-points *c d*, producing the results above described in any receiving-instrument connected in the local circuit.

It will thus be seen that the principle of my invention may be embodied in various forms of devices by those skilled in the art, and I therefore do not wish to limit my invention to the precise construction and arrangement shown in the drawings.

What I claim is—

1. In a tone or harmonic telegraph, the combination, with a tuning-fork operated by the main current, of an independent set of contacts in a local circuit, a support for the contacts and adjusting devices for said support, substantially as described.

2. In a tone or harmonic telegraph, the combination, with a tuning-fork operated by the main current, of a support carrying a fixed contact-piece, a movable contact-piece also mounted in the support, a local circuit including the contacts, and adjusting-screws for the contacts, substantially as described.

3. In a tone or harmonic telegraph, the combination, with a tuning-fork operated by the main-line current, of an independent set of adjustable contacts included in a local circuit, and a signal-receiving instrument in the circuit, substantially as described.

4. In a tone or harmonic telegraph, the combination, with a tuning-fork and an independent set of contacts operated thereby, of a local circuit including the contacts in one branch, and an automatic receiving-instrument in another branch, substantially as described.

5. In a tone or harmonic telegraph, the combination of a tuning-fork operated by the main-line currents, a set of contacts in a local circuit operated by the fork, an automatic re-

ceiving style or finger in the local circuit, and a second style or finger in a secondary circuit to the primary, substantially as described.

6. In a tone or harmonic telegraph, the combination, with a tuning-fork having a certain rate of vibration and controlled by the main-line currents, of an independent set of contact devices controlling the local receiving-instruments and adjusting devices whereby the contacts may be arranged so as to be operated only when the fork vibrates normally, substantially as described.

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

CHARLES SELDEN.

Witnesses:
N. C. GRISWOLD,
EDGAR W. DAY.