

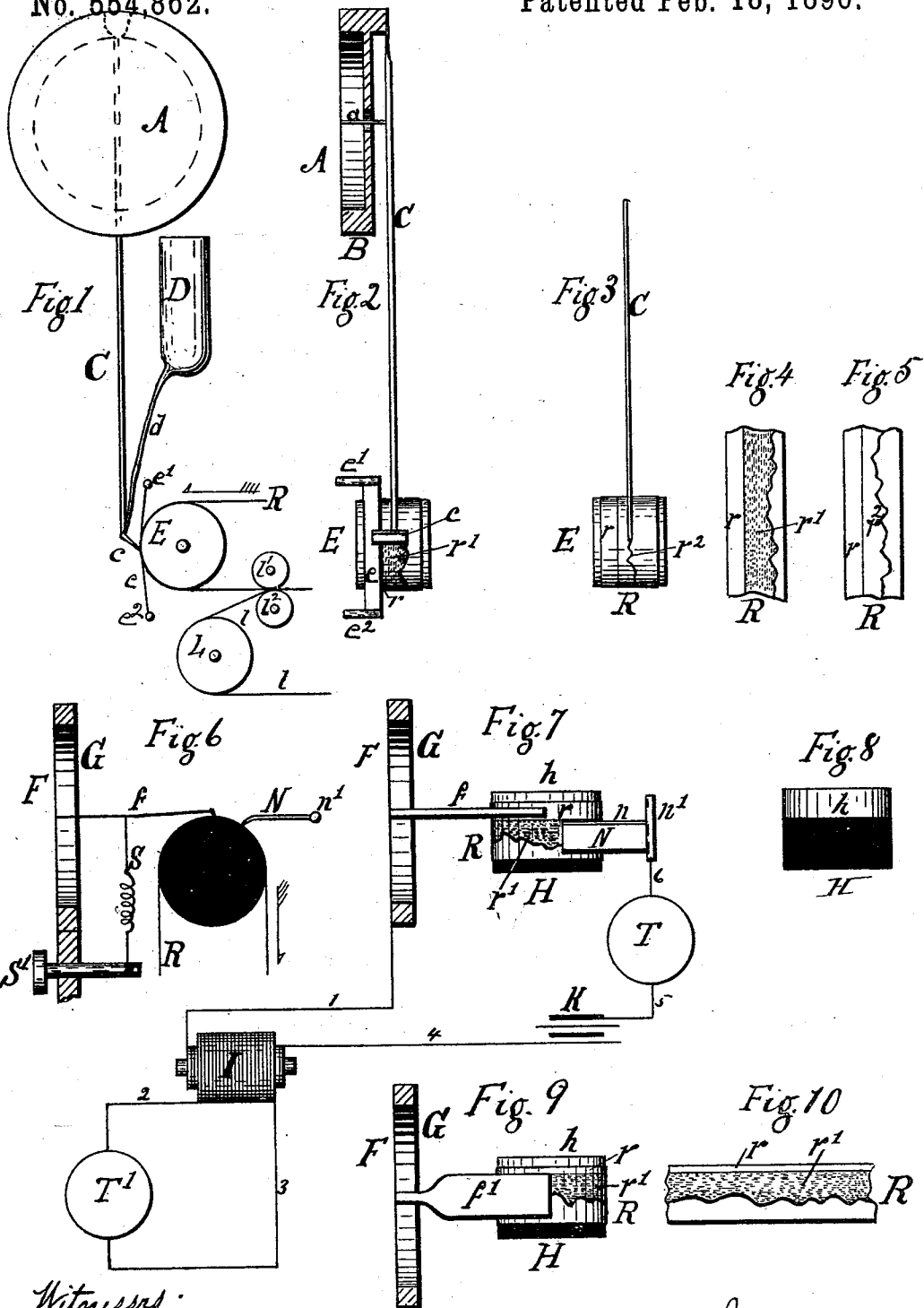
(No Model.)

W. H. COOLEY.

MEANS FOR RECORDING AND REPRODUCING IMPULSES.

No. 554,862.

Patented Feb. 18, 1896.



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MEANS FOR RECORDING AND REPRODUCING IMPULSES.

SPECIFICATION forming part of Letters Patent No. 554,862, dated February 18, 1896.

Application filed April 16, 1889. Serial No. 307,506. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. COOLEY, a citizen of the United States, residing at Brockport, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Means for Recording, Reproducing, and Telegraphing Impulses, of which the following is a specification.

The object of my invention is the recording of any impulses capable of producing vibrations in a diaphragm or other equivalent device in such a manner and upon such a recording-surface that such original impulses may be reproduced at any desired place and time or number of times and telegraphically transmitted between any two stations in telegraphic communication with each other. The nature of the record of such impulses consists in changing the conductivity of the recording-surface along the line or surface of the record effected thereon and also in changing the frictional resistance of such recording-surface with the record thereon in moving contact with another suitable bearing-surface or spring.

An important feature of my present invention consists in the combination, with such recording-surface and means for producing undulations in an electric current caused to pass therethrough, of a diaphragm and a spring connected therewith and pressing upon such moving recording-surface, with a record thereon of such a nature that the friction between such spring and moving surface shall be varied exactly according with such electric undulations, which are also caused to pass through such moving surface and spring.

The accompanying drawings represent such portions only of apparatus for recording, reproducing, and telegraphically transmitting impulses, according to my invention, as are necessary to illustrate the essential features thereof. They are as follows:

Figure 1 is a face view of my recording apparatus. Fig. 2 is a central vertical section of the same at right angles with the plane of Fig. 1. Fig. 3 shows a modified form of the stylus C and the record produced thereby in a view similar to that seen in Fig. 2. Figs. 4, 5, and 10 illustrate modified forms of my record. Fig. 6 is a side view, and Fig. 7 a

top view, of my apparatus for reproducing such impulses from such record, with the rim supporting the diaphragm in either figure shown in a central section taken parallel with the plane of such figure. Fig. 8 shows the pulley H of Figs. 6, 7, and 9 in a top or plan view. Fig. 9 shows, in similar view to Figs. 6 and 7, in a plan or top view a modification of my invention.

Similar letters refer to similar parts throughout the several figures.

Referring to Figs. 1 and 2 of the drawings, E is a roller, around which there is caused to pass continuously, by means of any suitable mechanism, (not shown,) a band or fillet of paper R. This fillet R may be of paper, and preferably should be glazed only on that side intended to receive the record, which may be effected by means of a suitable fluid contained in a vessel D and supplied by a suitable tube or capillary fiber *d* either to the point of stylus C or to a brush or pad *c* attached thereto. This stylus C is reduced in thickness at its upper end and secured, as seen in Fig. 2, to a projection on the upper edge of the annular seat B and actuated from a diaphragm A, secured to such seat B and by means of a rod *a* projecting axially from the center of the diaphragm A.

When the fluid from the vessel D is supplied directly to the point of such stylus, the record then, as seen at *r*² in Figs. 3 and 5, will be in the form of a sinuous line; but when such fluid is supplied to the brush or pad *c*, axially disposed with regard to roller E and with its sharp edge bearing against the fillet R thereon, then it is important that such fillet should be protected throughout its entire length, and over, say, about one-third of its width, as indicated in Figs. 3, 4, and 5, by the continuous straight unrecorded portion *r*. As indicated in Figs. 2 and 4, this may be effected by means of the thin protecting-strip *e*, supported from and secured to the pins *e'* and *e''*. This brush or pad *c* should be so adjusted that at all times during the vibration of stylus C some portion of its length shall bear against or rest upon the protecting-strip *e*. Thus it will be seen that the record in this case takes the form of a surface constantly varying in width, and with such

variations all on one side, the other side being straight. The fluid with which such record is written should consist of any suitable, but highly volatile insulating-varnish, and also one that is impervious to the action of the liquid with which such band or fillet is afterward to be saturated.

For a recording-surface any suitable thin and tough paper may be used, and for a recording fluid photographers' collodion or varnish may be used, or gutta-percha or india-rubber dissolved in chloroform, or a varnish of paraffine may be used. It is desirable that such record should lie wholly on the surface of such paper.

To aid in rapid recording and to prevent blurring or injury to the record, a secondary band or fillet *l* in passing over the roller *L*, as seen in Fig. 1, is immediately superimposed upon the recorded side of the band or fillet *R* by being passed together with it between the rollers *l'* and *l''*. This fillet *R*, after the record thereon has been effected in the manner described, when it is desired to reproduce and to telegraphically transmit such recorded impulses to any distant station, I saturate with any suitable conducting solution of such a nature that when such fillet is moved in contact with a suitable spring the amount of friction between such spring and fillet shall be varied by changes in the potential of an electric current caused to pass through such fillet and spring. For this purpose any suitable electrolytic or similarly operating material, as a solution of pyrogallie acid and chloride of sodium, may be used. This solution will be absorbed through such fillet except along the line or surface of the record thereon, and thus render such fillet a semiconductor of electricity except along such line or surface. The paper fillet, it will be understood, readily absorbs the electrolytic solution and becomes a conductor of electricity directly through it at all points from one side or surface to the other, except along the surface of the record in insulating-varnish. To reproduce and transmit the original impulses recorded on such fillet *R*, such fillet, after being treated in the manner just described, is caused, as seen in Figs. 6 and 7, by means of any suitable mechanism (not shown) to pass continuously over a roller *H* with the unrecorded side of such fillet next to such roller. This roller *H*, as will be seen by reference to Fig. 8, is formed of an insulating-cylinder *H* suitably secured to a platinum-faced conducting-cylinder *h*.

A spring *f* has its free end bearing upon the straight-edged unrecorded portion *r* of the fillet *R*, while the other end of this spring *f* is secured to the center of the diaphragm *F*, seated against the annular rim *G*. The initial pressure of the spring *f* upon the portion *r* of the fillet *R* is adjusted at pleasure in the manner indicated in Fig. 6 by means of the spiral spring *S* and the tension key or peg *S'*;

also pressing upon this band or fillet *R*, as seen in Figs. 6 and 7, is the spring *N*, composed of any suitable semiconducting material, having its bearing-surface reduced to a fine edge and also having secured thereto on one edge thereof the conductive strip *n*. The portions *N* and *n* are both secured to the metallic rod or pin *n'*. This spring *N* is arranged, as seen, to bear only upon that portion of the band or fillet *R* that is left free and unprotected to receive the record, and this band or fillet *R* in passing over the roller *H* should be so adjusted that a portion of the record *r'* at the straight edge thereof shall come over the conductive cylinder *h*.

For the semiconductive portion of the spring *N* compressed felt saturated with any suitable conducting liquid is preferable, although any suitable semiconducting substance may be used. Spring *f* should be of copper, with its bearing or wearing surface platinum-tipped.

The current from a battery *K*, as seen in Fig. 7, is caused, by means of wires 1, 4, 5 and 6, to traverse the primary of inductorium *I*, any suitable receiving-instrument *T*, rod *n'*, and varying lengths or distances through both the semiconductive medium *N* and the fillet *R*, (such varying distances according exactly, it will be seen, with the record *r'*,) thence through roller *h* and again through the portion *r* of the fillet *R* and through the spring *f* in contact therewith.

The varying distances which the battery *K* is caused to traverse through the semiconducting medium of which such fillet *R* is itself composed when saturated in the manner described, caused by the varying widths of the insulating-surface of the record on such fillet *R* causing the current to traverse varying widths of the semiconducting body of the fillet *R* in order to reach spring *N*, produce variations or undulations in the potential of such current, according exactly with the recorded impulses, which, it will of course be readily understood, will thereby be readily reproduced in any suitable receiving-instrument *T*, whether located at the same or any distant station. The variations or undulations in the potential of the current from battery *K* produced in the manner just above described are still further increased by the current of such battery having to pass varying distances through the semiconducting-spring *N* by reason of the varying widths of the insulating-record on fillet *R*, in order to pass from the conductive strip *n* to the semiconductive and unrecorded portion of fillet *R*, or such receiving instrument, instead of being located directly in the circuit of battery *K*, may be, as seen at *T'*, by means of wires 2 and 3 located in circuit with the secondary of inductorium *I*. Again, these variations in the potential of battery *K*, caused in the manner described, vary the friction between the spring *f* and the portion *r* of the fillet *R* in a manner

according exactly with the recorded impulses thus causing such diaphragm F to vibrate in a manner to reproduce such impulses. Thus it will be seen that the recorded impulses are re-
 5 produced in diaphragm F, and telegraphically transmitted and reproduced in either or both the receivers T and T'. When, however, it is not desired to telegraphically transmit such impulses, it is necessary then that the record
 10 r' should be of such a nature that the friction between such record r' and the spring bearing thereon should very materially differ from the friction between such spring and the unrecorded portion of such fillet R. In this case
 15 the protected portion of such fillet R may be greatly reduced in width, or entirely dispensed with, as seen in Figs. 9 and 10, while the spring f bearing on such fillet should be greatly increased in breadth and positioned
 20 as seen at f' in Fig. 9.

It will of course be readily seen that variations in the width of the record produce variations in the friction between spring f and the fillet R according exactly with the recorded
 25 impulses, which are thereby reproduced in vibration of the diaphragm F, added to and harmonizing with those produced in the manner already described and explained in connection with the description of Figs. 6 and 7.
 30 When it is desired to write such record in the form of a sinuous line rather than a surface varying in width, I coat over that side of the band or fillet intended to receive such record, except that portion thereof which is protected
 35 by the strip e , with collodion, and in this case the record is written with sulphuric acid diluted according to the texture of the paper and the thickness of the collodion coating. This kind of a record is seen in Figs. 3 and
 40 5, and is used in substantially the same way just described.

The band or fillet l above described, when used, should be so proportioned in width and should be so adjusted that the record r' shall
 45 always be entirely covered thereby, and also so that no portion of such band or fillet l shall ever come in contact with the protected portion r of the fillet R, and for this purpose it is even preferable that the extreme edge of
 50 the recorded portion r' at the straight side thereof should not be covered by this band or fillet l . If in place of a record of the form shown in Figs. 4 and 5 there be used a record consisting in a series of dots or disconnected
 55 lines or surfaces, it will readily be seen that the diaphragm F will receive impulses exactly according with such dots or disconnected lines or surfaces.

I would have it understood that I do not
 60 limit myself to the particular substances and material, a few only of which are herein described, nor to the special forms or arrangements, as their equivalents may be used in carrying out my invention.

65 What I claim is—

1. In combination with a recording-surface, having a record thereon, changing in conductivity along the line or surface of such record, means for passing an electric current transversely through such recording-surface
 70 at successive points therein, longitudinally of such record, and thereby opposing to such electric current varying resistances, by varying the lengths of the path traversed by such electric current through a resisting medium
 75 exactly according with such record.

2. In combination with a recording-surface consisting of a resisting medium having a record thereon, changing in conductivity along the line or surface of such record, means for
 80 passing an electric current transversely through such recording-surface at successive points therein, longitudinally of such record, and thereby opposing to such electric current varying resistances, by varying the length of
 85 the path which such current is caused to traverse through a resisting medium in or upon such recording-surface.

3. In combination with a recording-surface having a record thereon, changing in conductivity along the line or surface of such
 90 record, means for passing an electric current transversely through such recording-surface, and also through a resisting medium external thereto and in contact therewith at successive points longitudinally of such record, and thereby opposing to such electric current
 95 varying resistances, consisting in variations in the length of the path which such electric current is caused to traverse through such
 100 resisting medium exactly according with such record.

4. In combination with a recording-surface consisting of a resisting medium having a record thereon, changing in conductivity along
 105 the line or surface of such record, means for passing an electric current transversely through such recording-surface and through a resisting medium external thereto and in contact therewith at successive points longi-
 110 tudinally in such record, and for opposing to such electric current varying resistances, consisting in variations in the length of the path which such electric current is caused to traverse through a resisting medium in or upon
 115 such recording-surface and also a resisting medium external to such recording-surface.

5. In combination with a recording-surface consisting of a resisting medium having a record thereon, changing in conductivity along
 120 the line or surface of such record, means for passing an electric current transversely through such recording-surface and through a conductor in contact therewith, at successive points longitudinally of such record, and
 125 thereby opposing to such electric current varying resistances, consisting in variations in the length of the path which such electric current is caused to pass through a resisting medium, and also means for maintaining a
 130

frictional contact between such recording-surface and a conductor, such recording-surface consisting of or containing an electrolytic or other analogous material, such that
5 such friction between such recording-surface and conductor shall vary with changes in the potential of such current, produced by varia-

tions in the length of the path which such current is caused to traverse through a resisting medium.

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