

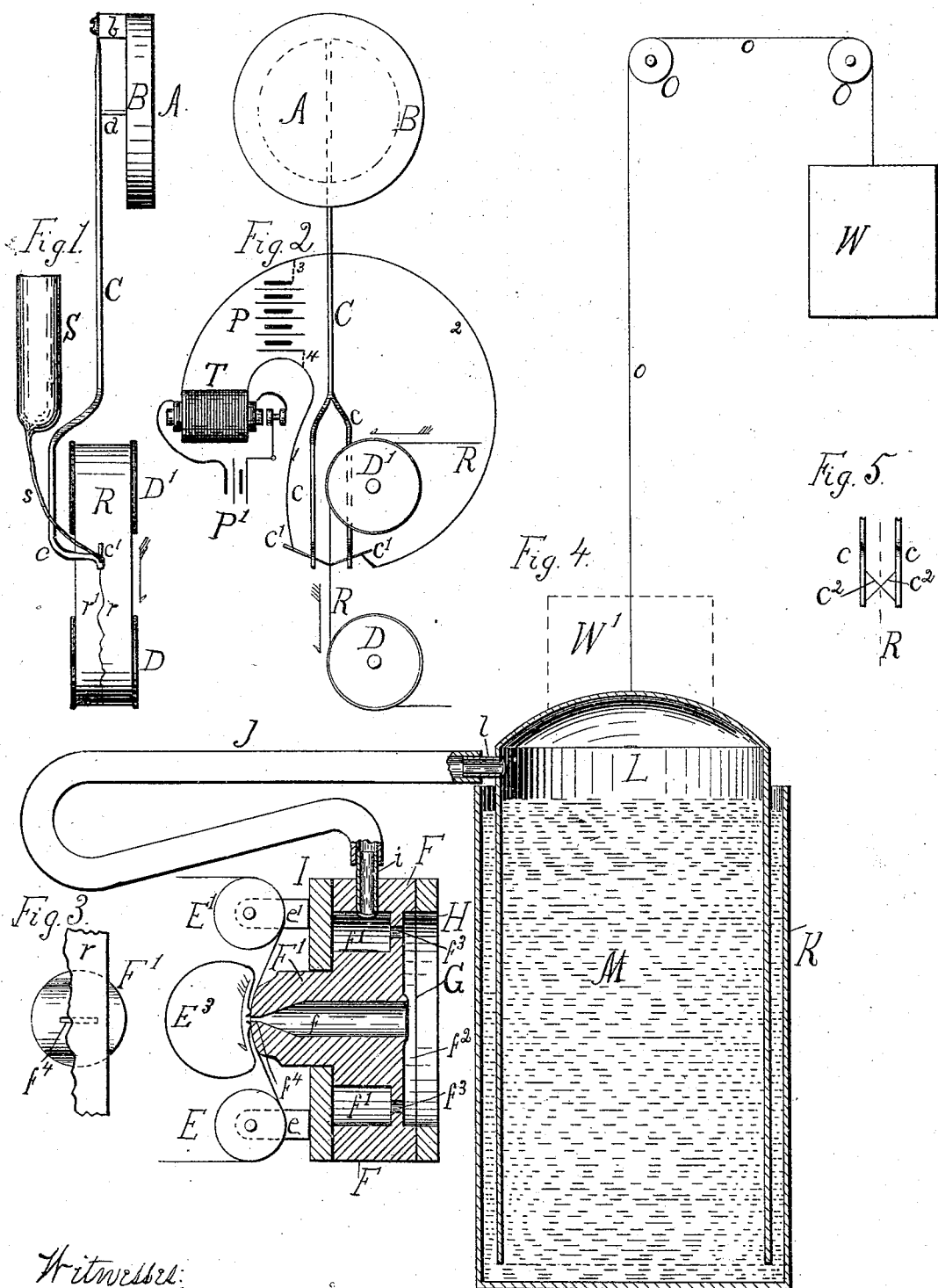
(No Model.)

W. H. COOLEY.

ART OF RECORDING AND REPRODUCING IMPULSES.

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ART OF RECORDING AND REPRODUCING IMPULSES.

SPECIFICATION forming part of Letters Patent No. 551,946, dated December 24, 1895.

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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 the Art of Recording and Reproducing Impulses, of which the following is a specification.

The object of my invention is the recording of impulses capable of actuating a diaphragm and recording-stylus, or equivalent device, in such a manner that such impulses may, at any desired place and time or number of times, be reproduced from such record.

The essential feature of my record consists in changing the form of the substance upon which such record is written in such a manner that such substance shall present a contour varying exactly according with such original impulses. In reproducing such original impulses I cause such record to more or less nearly close an orifice through which a suitable fluid is allowed to pass under pressure in such a manner as to create varying pressures upon a diaphragm or other equivalent device, which is thus caused to vibrate in a manner to reproduce such original impulses. Such a record may more or less nearly close such an orifice through the medium of a stylus or lever or small rod actuating a valve located in such orifice, and caused to vibrate by the varying contour of such record, when moved before and in contact with such stylus or lever or rod; but it is preferred, when practicable, that such record should of itself, by being passed over or before such orifice, vary, according to the contour of such record, the amount of free opening in such orifice.

It will obviously be seen that without departing from the spirit of my invention very many modifications may be made therein, as well as also in the means for carrying the same into operation.

One of the simpler methods of and means for carrying such invention into operation is illustrated in the accompanying drawings, representing only such portions of my apparatus as are necessary to illustrate this invention. They are as follows:

Figure 1 is a side, and Fig. 2 a face, view of my recording apparatus. Fig. 4 shows in

vertical central section my apparatus for reproducing impulses from such record. Fig. 3 shows in rear end view a portion of such apparatus as will be explained. Fig. 5 shows in face view a modified form of a part of my apparatus for recording.

Similar letters and numerals refer to similar parts throughout the several figures.

Referring to Figs. 1 and 2, for effecting such record I employ a diaphragm or other equivalent device A, capable of vibrating in response to such impulses, and suitably secured to an annular seat or rim B. The vibrations of diaphragm A, by means of a rod *a* projecting axially from the center thereof, are conveyed to a stylus or other equivalent device C, having its upper end reduced in thickness, and secured by a screw, as indicated, to a projection *b* located on the upper edge of rim B, as seen in Fig. 1. This stylus C is bifurcated at its lower end, being formed into two curved arms *c*, extending downward to the rear, and on either side of that portion of the fillet R extending between the rollers D and D', around which such fillet is caused continuously to pass in the direction indicated by the arrows, and with a uniform motion, by means of any suitable devices. (Not shown.) The lower end of each of these arms *c*, as seen, are so curved as to be opposite each other, and a little to the rear of the center in width of the fillet R. Passing through the lower ends of these arms *c*, and firmly secured therein, are seen the two fine-pointed needles *c'* so formed and positioned, as indicated, that when such fillet R is moved in the manner indicated it shall be severed longitudinally into two portions—a forward one *r* and a rear one *r'*—as indicated in Fig. 1.

When the diaphragm A is in a state of rest it will readily be seen that this line of severance will be a straight one; but when such diaphragm is vibrated, it will be seen that such line of severance will present a tracing or marking of the impulses actuating the diaphragm A, thereby producing two fillets—one *r* and one *r'*—each presenting a contour the counterpart of that of the other, and according with the vibrations of diaphragm A. This fillet R may be of thin tough paper or other analogous substance.

Instead of severing the fillet R, the needles

c' may be caused to mark or trace a record of the impulses on fillet R, which may be cut along such line at any time by means of a knife, or otherwise, care being necessary to follow closely the record or tracing; or, in place of the needles c' , there may be used fine wires c^2 crossing each other at their centers, as seen in Fig. 5, showing only the lower portion of these arms c , which in this case are elongated downward; or either of these wires may be used singly, according to the tension put upon fillet R in passing over the rollers D and D'.

I will state that any one of the different methods of and means for dividing the fillet R may be used according to the texture, quality and weight of such fillet, which of course should be varied according to the amount and nature of usage it is intended to receive.

Referring to Fig. 4, F is a cylinder of vulcanite or wood connected by a thin web-like partition with a central portion F' somewhat conical in form. Between the forward end of the cylinder F and a rim H of the same material is clamped the diaphragm G of any suitably flexible and elastic substance, thus inclosing a cylindrical chamber f^2 . Between this cylinder F and the central portion F' is seen the annular chamber f' , inclosed on the rear by the tightly-fitting washer-like cap-piece I, also of wood or vulcanite. Projecting to the rear from this cap-piece I are seen two arms e and e' , in which are located bearings respectively for the rollers E and E', around which, in the direction indicated by the arrows, and by means of any suitable devices, (not shown,) there is caused to pass either portion of this fillet R, but preferably the wider portion r , as indicated in Fig. 3.

In passing from the roller E' to the roller E this fillet r passes across the rear end of the central portion F', more or less covering or closing the horizontally-longitudinal opening or slot f^4 therein, as seen also in Fig. 3, showing a rear view of this central portion F' and a portion of this fillet r passing across the end of same. This slot f^4 opens into the tubular chamber f terminating at its forward end in the cylindrical chamber f^2 , which in turn is connected with the annular chamber f' by the circular openings f^3 —of which there may be any desired number—through the web-like partition connecting the cylinder F and the central portion F'. Through the upper end of this cylinder F is inserted a tube i opening into the annular chamber f' .

K is a cylindrical vessel, which may be of glass, and containing water or other suitable liquid M, in which there is inserted the cylinder L, which may also be of glass, open at its lower end and closed at its upper end, as seen. At the upper end of this cylinder L there is inserted the tube l , between which and the tube i connections are made as nearly airtight as may be by means of a flexible tube J of rubber or other suitable material. This

cylinder L is suspended by means of a cord o passing over pulleys O and O, which may be supported in any suitable manner (not shown) and secured to the weight W. This weight W should be sufficient to raise the cylinder L and thus create a suction through the slot f^4 , tubular opening f , chamber f^2 , openings f^3 , annular chamber f' , tube i , rubber tube or hose J, tube l , and into the cylinder L. The amount of such suction may be varied as desired by increasing or decreasing the weight W, and in this way also the initial inward pressure upon diaphragm G may be regulated as desired. When this fillet r is caused to pass around the rollers E and E' in the manner described, thereby varying the amount of free opening of the slot f^4 , this diaphragm G, it will be seen, will be caused to vibrate by aerial impulses directed against the center thereof through the tubular opening f and slot f^4 . These impulses, it will of course be understood, exactly accord with the contour of the fillet r , whereby such diaphragm G is caused to vibrate in a manner to reproduce such original impulses of which this fillet r presents in its contour a record.

By dispensing with weight W and locating instead thereof a weight as indicated in dotted lines at W' directly on top of cylinder L and starting with the cylinder L at the top of its course, which it should be stated is as high as it can be with the lower edge thereof dipping slightly beneath the surface of the liquid M, then it will be seen that there is created a current exactly the opposite in direction to that just described, and producing an outward or forward pressure upon diaphragm G. Such initial pressure may be varied as desired by changing the amount of weight W'. In this case also diaphragm G is caused to vibrate in a manner to reproduce such original impulses by having such pressure relieved in degrees constantly varying exactly according to the contour of the fillet r . In this case it is preferable that, as an aid in holding the fillet r in place against the rear end of the central portion F', there be used the double spring E³, formed as seen in Fig. 4, and equal in width with the widest portion of fillet r , and properly held in position by means of a bracket or arm. (Not shown.) The cylinder L may be guided in its course by means of any suitable devices. (Not shown.)

In place of vessels K L, liquid M, weights W or W', cord o , and pulleys O and O, it is preferable that there be employed any suitable mechanism or devices, which may be actuated by the same power that causes the fillet r to move in the manner described, producing a continuous suction, pressure or current, rather than, as in the case just described, a device capable of operating continuously over a period of time proportionate to its size.

It will of course be understood that better results are obtained—i. e., a more faithful reproduction of the recorded impulses—when

the width of the slot f^4 is small compared with the wave length of the shorter undulation in the contour of fillet r .

To aid in effecting a record in the manner described there may be fed to the recording-points c' , in the manner indicated in Fig. 1, any suitable corroding liquid, supplied by means of a suitable capillary tube s from a reservoir S ; or, as seen in Fig. 2, these recording-points c' may by means of wires 1 and 2 be made the terminals of the secondary of an induction-coil T , actuated in the manner indicated from the battery P' ; or, again, in place of the induction-coil T and battery P' , there may be used a battery P or other suitable source of electric energy of high potential, connections being made in this case such as indicated by dotted lines 3 and 4. This band or fillet R may be made of metal; and in this connection I will mention that such a band or fillet, when composed of brass or copper foil, very readily separates along the line written thereon by means of a solution of mercury in nitric acid.

What I claim is—

1. The within described method of recording impulses, consisting in dividing or severing a recording surface of any suitable substance or material into two mechanically separate and distinct parts or portions in such a manner that each part shall be the counterpart of the other and that each part shall present a contour exactly according with such impulses.

2. The within described method of recording impulses consisting in dividing or severing a band or fillet of any suitable substance or material into two mechanically separate and distinct parts or portions, each the counterpart of the other and each varying in width at different points along its length, exactly according with such impulses.

3. A recording surface or substance consisting in a band or fillet of suitable material, a stylus to be actuated by impulses to be recorded, and means for causing such stylus to so divide or sever such band or fillet into two mechanically separate and distinct parts or portions that each part or portion thereof shall present on one of its sides a contour exactly according with such impulses.

4. A recording surface or substance consist-

ing in a band or fillet of suitable material and means for dividing or severing such band or fillet into two mechanically distinct and separate portions along a sinuous line according exactly with the vibrations or impulses imparted to such diaphragm.

5. A recording surface consisting in a fillet of any suitable material and means for dividing the same into two mechanically separate and distinct portions along a line, normally straight, and for varying such line of division exactly according with the impulses to be recorded.

6. A diaphragm or equivalent device, means for subjecting the same upon either side thereof to the pressure of a fluid under motion, means for passing such fluid under pressure through a narrow orifice, elongated in one direction only, means for passing before such orifice, in a manner to more or less close the same, a band or fillet of any suitable material varying in width at successive points longitudinally thereof, exactly according with the impulses to be reproduced.

7. A diaphragm or equivalent device, means for subjecting the same to the pressure of a fluid under motion, means for passing such fluid under pressure through a narrow, elongated orifice, means for causing vibrations in such diaphragm, consisting in a band or fillet of suitable material, varying in width at successive points along its length, exactly according with the vibrations to be reproduced in such diaphragm, and means for passing such band or fillet before such elongated orifice in a manner to more or less close the same.

8. The within described method of and means for recording and reproducing impulses, which consists in dividing or severing a band or fillet of suitable material into two mechanical separate and distinct portions along a line according exactly with such impulses, and then passing either portion of such band or fillet, so divided, before an elongated orifice, in a manner to more or less nearly close the same, and admitting through such orifice, under pressure, a fluid acting upon a suitable diaphragm.

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Witnesses:

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