(No Model.)

L. I. BLAKE.

SUBMARINE SIGNALING.

No. 526,609. Patented Sept. 25, 1894.

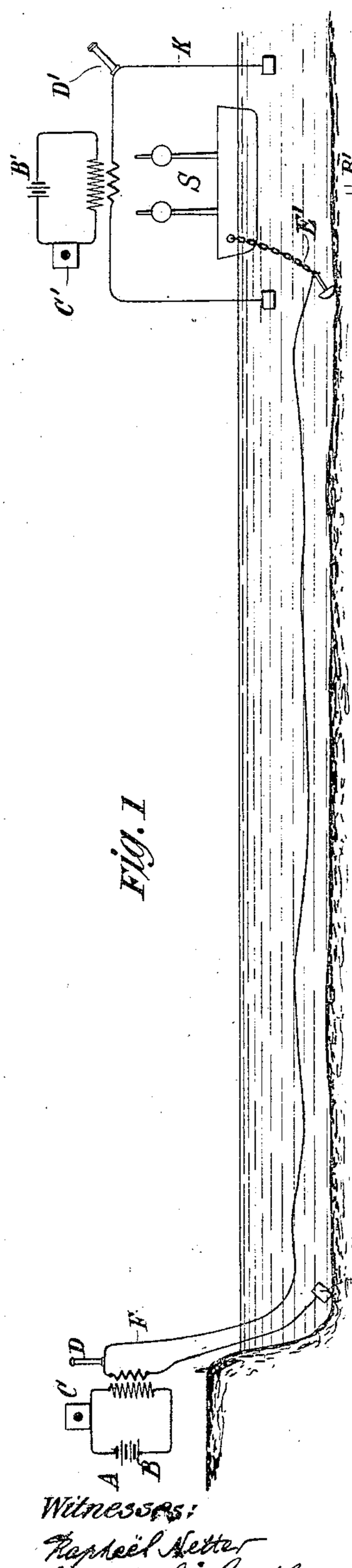

Fig. 1

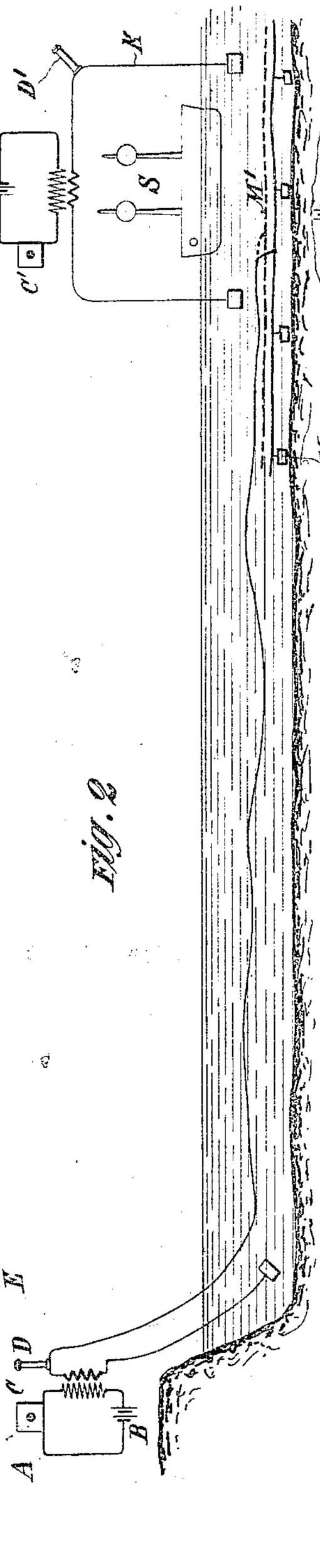

Fig. 2

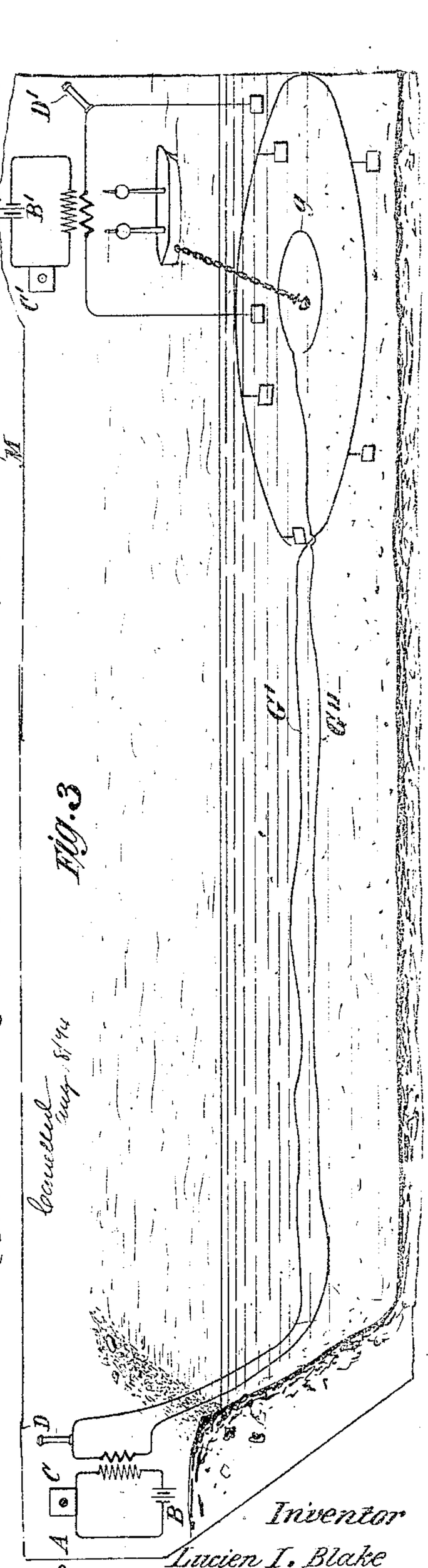

Fig. 3

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UNITED STATES PATENT OFFICE.

LUCIEN I. BLAKE, OF LAWRENCE, KANSAS.

SUBMARINE SIGNALING.

SPECIFICATION forming part of Letters Patent No. 526,609, dated September 25, 1894.

Application filed July 6, 1894. Serial No. 516,749. (No model.)

To all whom it may concern:

Be it known that I, LUCIEN I. BLAKE, a citizen of the United States, residing at Lawrence, in the county of Douglas and State of Kansas, have invented certain new and useful Improvements in Submarine Signaling, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

It was well known prior to my invention that electric currents suitable for operating sensitive signaling instruments could be transmitted through an insulated metallic conductor submerged in the water or buried in the earth, even though the conductor contained a break, the continuity of the conducting path for a short distance being preserved by the water or the moist earth between the terminals of the conductor at the break. It has moreover been proposed to take advantage of this fact in systems of electric signaling between the shore and lightships or isolated lighthouses by running from a shore station two insulated cables forming the lead and return of a signaling circuit, leaving their exposed ends near the ship and on opposite sides of the same and partially bridging said ends by a conductor carried by the ship and including a signaling instrument. In this and similar cases the object in view was to so far complete the metallic circuit that although a portion of the current would pass between the terminals of the insulated conductor through the water, a sufficient amount would pass through the bridging conductor to effect a delicate signaling instrument connected therewith. So far as I am aware, no practically successful results have been secured by the systems of this nature heretofore proposed, nor has the transmission of articulate speech under such conditions ever been accomplished. It is also a recognized fact, in science if the two terminals of an electric circuit from a source of current be immersed in a body of water that between said terminals or around each of them for a certain small distance an electrified or active region will be established in which there will exist a difference of potential between different points but the information with regard to this phenomenon has not, so far as I am aware, been sufficient to lead to or even suggest the possibility of taking advantage of it in any system for the practical transmission between two points of intelligible signals, or at least of articulate speech. I have however, discovered a practical method of transmitting intelligible signals and articulate speec. on this principle which I apply to communicating between a shore station and a lightship or any other vessel, by establishing under and around the ship a large electrified region between the different parts of which there exists a siutable difference of potential, and providing a metallic conductor to be carried by the ship and the ends of which may be immersed in such region to connect two points therein between which such difference of potential exists. I have found when the conditions hereinafter stated are properly observed, that a suitable telephone included in the circuit of the conductor carried by the ship will respond to variations of potential between any two points in the electrified region, and that when such variations are caused by the voice of a person speaking into a suitable telephonic transmitter the words may be clearly reproduced. Further, I have proven by experiment that it is possible to greatly extend this electrified region and to obtain it in different forms suitable for special purposes as will be hereinafter described.

In order to describe in detail the manner in which I have carried out my invention I now refer to the accompanying drawings, in which—

Figure 1 is a diagram of the general plan of carrying out the invention. Fig. 2 is a similar diagram of a modification of the same.

In Fig. 1 which illustrates the general plan which I have followed in practicing the invention, A designates a shore station, and S a station more or less remote therefrom, and which is or may be a light ship, or any other vessel or the like. At the station A, is a battery B, a telephonic transmitter C, and a receiver D. The batteries and telephones may be and in the present case are shown as connected up in a local circuit, the line being a secondary or induced circuit through the secondary F of a suitable stepdown induction coil or one in which a current of high potential in the primary is converted to a current of lower potential in the secondary. In the claims hereto annexed although these trans-

formers are not specified as an element, it will be understood that they are to be considered as included where their presence, by reason of the length of cable or insulated line, or the extent of the region of communication is rendered desirable or necessary. It will also be understood that the said transformers may be located at any proper point in the circuit to produce the desired effects.

The line is an insulated cable or conductor G grounded at E at or near the shore station A, and extended out as indicated to the desired location of the electric region to a submerged plate or conducting body, which in the present instance is shown as the anchor E′ of the vessel S.

It appears with the arrangement illustrated, and when electric impulses are transmitted over the circuit, that an active or electrified region, which may be designated the region of communication, is established in the water, around each terminal plate, and extending between them, if they are not too widely separated, and that a difference of potential exists between any two points therein at unequal distances from either terminal plate. The two immersed terminals of the cable may be at a very considerable distance apart even to many miles and wholly independent of each other, so that no current actually flows from one to the other, but if from any vessel as S lying at any point in this region of communication the ends of a conductor K be let down into the water so that it connects two points at unequal distances from either terminal E and E′, electric impulses will pass in said conductor corresponding to those transmitted through the cable from the shore station A. A telephonic receiver in the conductor K will reproduce the signals or speech thus transmitted.

Instead of including the transmitter on the ship directly in the conductor K, it is desirable to employ a transmitter C′ and a battery B′ in a local circuit including the primary coil of an induction coil, the coil of low resistance of which is in the circuit of conductor K. I have found it necessary, however, in order to transmit speech in this way to employ telephonic receivers specially constructed of exceedingly low resistance, in comparison with ordinary telephones, and determined for each case in every special feature by the size of the terminal plates of the conductor K, and the specific conductivity of the medium in which they are immersed. It is not only possible to transmit in this way signals from the shore to a ship, but also from the ship to the shore.

The region of communication may be greatly extended and directed by exposing the conductor of the insulated cable at suitable intervals or providing local terminal plates M at intervals along its course as shown in Fig. 2 or employing a bare conductor M′ in lieu of the plates. In this case each plate or exposed portion of the conductor serves as a terminal or point from which the electrical influence is diffused.

In practice I have found that with a bare copper wire of suitable low resistance, I could develop the region of communication for about a mile or more along the direction of the wire and for several hundred feet all around it, and obtain in a telephonic receiver D′ clearly audible speech when the ends of a short conductor K, including the same were immersed at any two points in the body of water unequally distant from the wire and within the above limits. I have also found that with a few cells of low resistance battery, I could prolong the region of communication between the two terminal plates E and E′ of the cable G at least two thousand feet and receive speech successfully anywhere intermediate to the plates.

The length of the conductor K may be very short compared with the total distance between the terminals of the cable, and the length of an ordinary ship is ample to secure good results.

The utility of my discovery is apparent, for not only does it afford a practical means of maintaining communication with isolated light houses, or permanently anchored light ships, but with any incoming or outgoing vessel which may be equipped with the necessary apparatus, and while within the limits of a region of communication. These regions may for convenience be indicated by buoys or the like, and may be located many miles out at sea.

Having now described my invention, what I claim is—

1. The combination with a source of current, and transmitting instruments at a shore station and an insulated submarine conductor or cable, bared or exposed to the water at two or more points so as to establish an electrified region of communication, of a conductor having its ends immersed at two points of different potential in said area and a telephone of low resistance in circuit therewith, said telephone and conductor being carried by a lightship or other vessel, as set forth.

2. The combination with a source of current and signaling instruments located at a shore station, and a submerged cable or insulated conductor extending from such station and grounded or exposed to the water at said station and at intervals along its course, of a conductor having its ends immersed at two points unequally distant from any one of the points at which the cable is exposed, and signaling instruments connected with said conductor, the said instruments and conductor being carried by a lightship or other vessel, as set forth.

LUCIEN I. BLAKE.

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