I. KITSEE.

TELEGRAPHY.

APPLICATION FILED FEB. 20, 1906.

991,324.

Patented May 2, 1911.

2 SHEETS—SHEET 1.

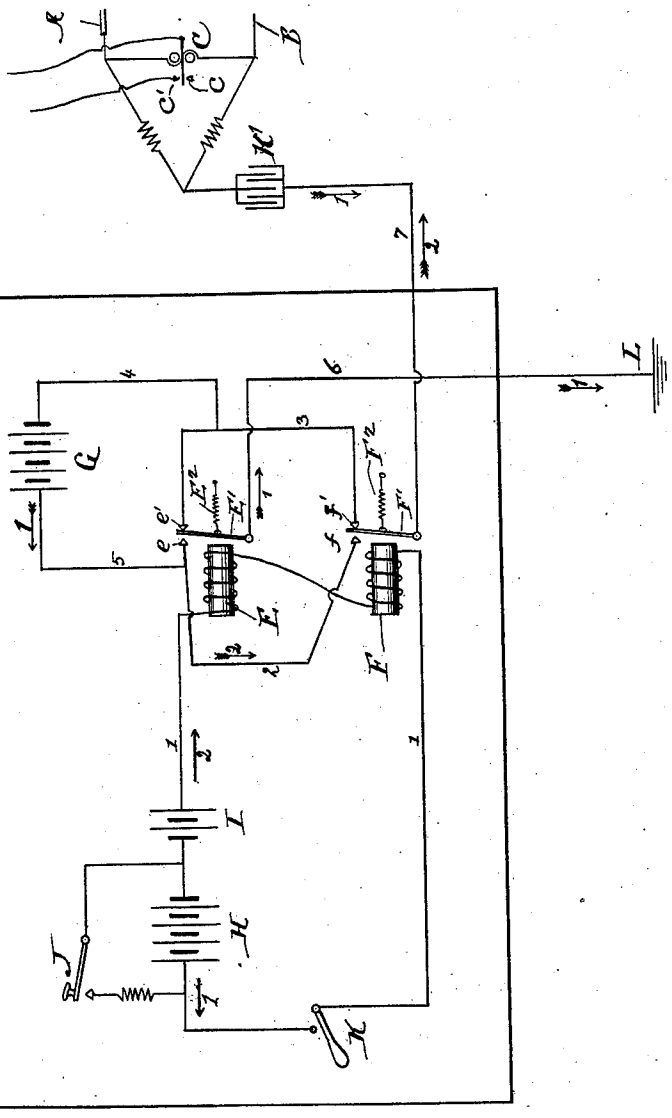

Fig. 1.

X

WITNESSES:

Mary C. Smith

Alvah Rittenhouse

INVENTOR

Isidor Kitsee

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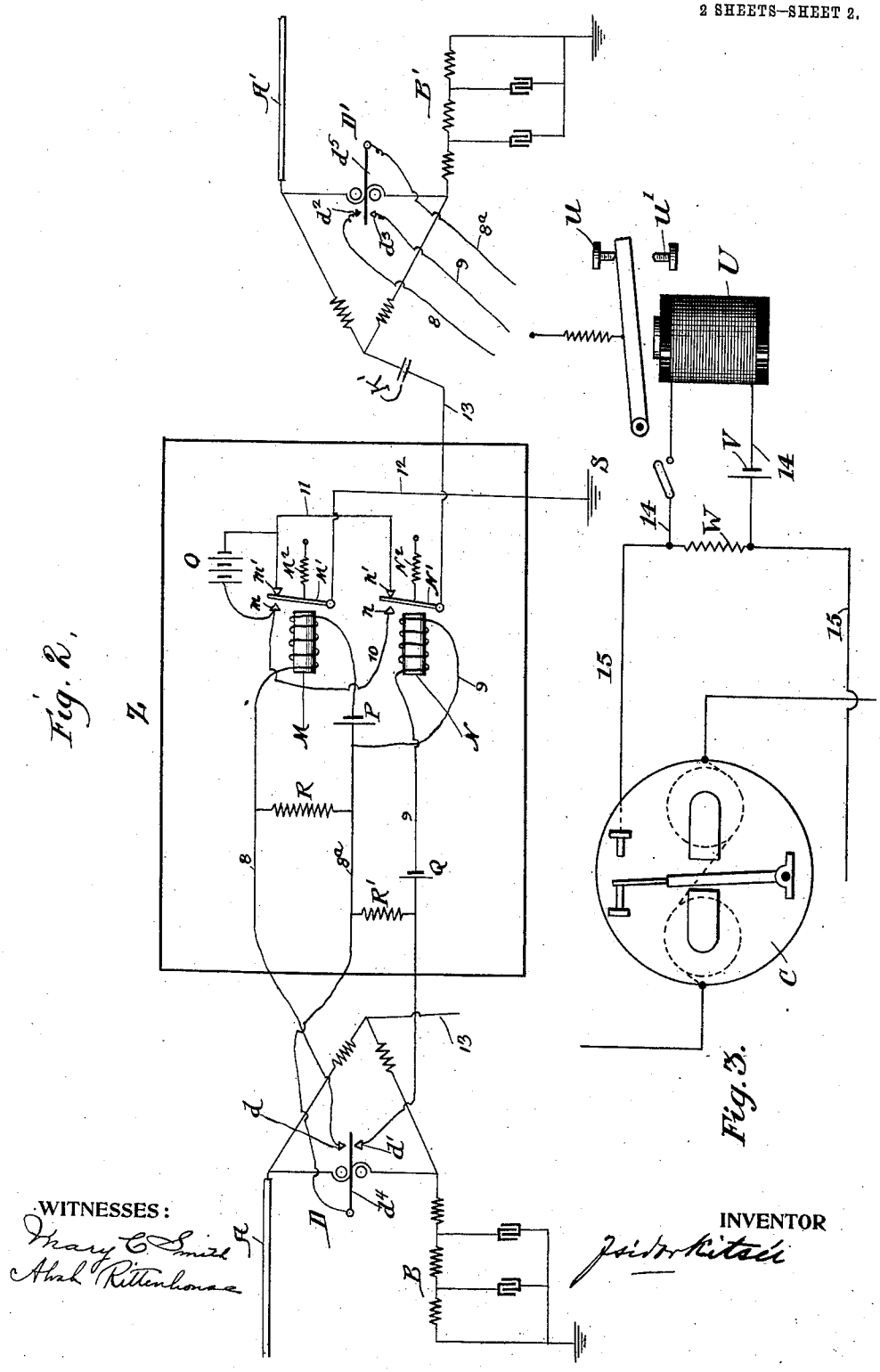

Fig. 2.

Fig. 3.

WITNESSES:

Mary C. Smith

Abel Rittenhouse

INVENTOR

Isidor Kitsee

UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO WILLIAM J. LATTA, OF PHILADELPHIA, PENNSYLVANIA.

TELEGRAPHY.

991,324. Specification of Letters Patent. Patented May 2, 1911.

Application filed February 20, 1906. Serial No. 302,039.

To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

My invention relates to an improvement in telegraphy. It has more special reference to submarine telegraphy and embraces that part, which relates to the telegraphing over such lines with true reversals and the automatic relaying from one of such lines to another.

It is well known that telegraphing over submarine cables is accomplished to-day with the aid of two keys, the depression of one key connecting the line with the positive pole of the battery and the depression of the second key connecting the line to the negative pole of the battery. In this system, one character of the Morse alphabet, say a dash, is symbolized by an impulse of one polarity, say a positive, and the dot of this alphabet is symbolized by a negative impulse. But as in the alphabet often two or more dashes or two or more dots have to follow each other, as for instance in the letter "H" which consists of four dots, or the letter "O" which consists of three dashes, a series of impulses of the same polarity have to follow each other. The speed of tranmission has, therefore, to be decreased, so as to give the cable time to discharge itself (even if only partially) between each impulse.

It was recognized that a system of telegraphy wherein true reversals are employed, (that is where impulses of the same intensity and duration, but alternately of opposite polarity, follow each other and are made to symbolize the characters transmitted) would greatly facilitate the telegraphing over lines with great capacity, such as submarine cables.

It is, as said above, the aim of my invention to enable persons to telegraph over such lines with true reversals and combined therewith the automatic transferring or relaying the transmitted impulses from one cable to the other cable or land line. In producing an arrangement of this kind, it was my aim not to disturb the present arrangement of such cables. The conditions and works on such lines, are of a nature, that even the slight innovation in the electrical condition of the cable proper (insertion of resistance or other devices in the direct path of the cable) as well, as the substitution of the existing arrangement or force of batteries are looked upon with misgiving, the fear of disturbing the electrical or mechanical conditions of the cable always being present. It was, therefore, expedient for me, to so arrange matters that the cable itself and the electrical source working the cable, as well as the manner of arranging this source as to the cable, should not be altered at all, and in describing and illustrating my invention I take, as an example, the lines of transmission of one of the existing companies, one terminal of which is located at New York. This line of transmission, called as a whole, the Trans-Atlantic cable comprises a transmitting station at New York in which one terminal—what is called the short cable—is located, the other terminal of this short cable is located at Canso. At Canso is also located one terminal of the cable crossing the ocean and terminating on the shore of Great Britain at "Penzance."

In the drawing, I have illustrated the devices necessary to transmit messages from one of the terminals that is "New York" or "Penzance". I have also illustrated the devices necessary to automatically relay from the short to the long cable or vice-versa and I have illustrated the system as a whole, showing the two terminal stations, the two cables and the relaying station equipped with automatic relaying between these two cables. As these cables are to-day worked on the duplex principle, I have illustrated my invention as applied to this principle.

New York is to-day, what is technically called the center of distribution for cable and other messages, but as in Great Britain, London is the center of distribution, I have illustrated in the drawing the means whereby the arrived message at "Penzance" may be automatically transmitted over a land line in accordance with the Morse system, using only impulses of one polarity to denote the dot as well as dash.

In this drawing, Figure 1 is a diagrammatic view illustrating one terminal equipped with a transmitting and receiving device. Fig. 2, is a diagrammatic view, illustrating parts of two cables and the devices to automatically relay the same. Fig.

3 is a diagrammatic view illustrating the connection of a line relay to a local circuit.

In Fig. 1, X designates the transmitting devices as an entirety; A the illustrated part of the cable; B the artificial cable and C the polarized relay or receiving device. This polarized relay may consist of any of the well known devices, but I had good results from a device embracing a stationary permanent magnet with stationary coils, an armature mounted on a metallic spring and adjustable pole pieces. This part of the arrangement does not form a particular part of this invention and needs, therefore, no detailed description. It suffices to say, that, with a light alteration, the siphon recorder can be made to accomplish the work necessary for this invention. The relay or receiving device C is placed between the two arms of the bridge, as is usually the case in duplexing submarine cables. In the drawing, to this device C are connected the terminals of a localized circuit, illustrating that these terminals can be connected or disconnected in accordance with the moving of the armature. The junction of the bridge is connected to wire 7, being the wire serving as part of the circuit for the battery to be connected to the cable. In so far the arrangement is entirely the same as in the cables of to-day. The transmitting device X embraces the following: a localized circuit 1, 1, a source of current H and a source of current I in this circuit. These sources are connected in opposition as to each other, the source H consisting of a greater number of cells than the source I, in the drawing shown as four cells against two. The source H is provided with a shunt and a transmitting key J to open and close this shunt. This key is of a construction known as a Morse transmitting key; the point of the key connected to one part of the shunt and the lever of the key connected to the other part of the shunt. When the lever of the key is depressed, the shunt around the battery H is established, and when the lever is released, the shunt of this source is opened. In this circuit are also connected the electromagnets E and F, which electromagnets may, in practice, form the two legs of one electromagnetic device, joined by a common pole piece. In the drawing, these coils are shown separately for the purpose of better understanding. Each of the electromagnets is provided with a polarized armature, designated in the drawing as E′ and F′, respectively; each of these armatures is kept in one position by the springs E^2 and F^2, respectively. Both of these armatures have the same polarity. The armature E′ has in juxtaposition to it, the contacts *e* and *e′* and the armature F′ has in juxtaposition the contacts *f* and *f′*. The wire 7 from the cable is connected to the armature F′ and the armature E′ is connected through wire 6 to the ground L. The contact *e′* of the armature E′ and the contact *f′* of the armature F′ are connected together through wire 3. The contact *e* of the armature E′ and the contact *f* of the armature F′ are connected through wire 2. The wire 2 is also connected through wire 5 with the positive pole of the battery G. The negative pole of this battery is connected through wire 4 to wire 3. In this circuit is also the switch K. In the wire 7, the wire connected to the cable proper, is inserted the condenser K′, thus for the purpose, so that no matter for how long a time the battery G may be connected with one or the other of the poles to this wire, only a momentary current, enough to charge this condenser K′, can be transmitted through it and can flow over the line. In other words, the condenser K′ is placed in the circuit, so as to limit the duration of the flow of the current independent of the connection of the battery to said wire. Normally, that is when no message is sent over the line the switch K is left open and both of the armatures E′ and F′ rest on their respective contacts *e′* and *f′*. A circuit is, therefore, established from the cable to the ground embracing the wire 7, condenser K′, armature F′ of the contact *f′*, wire 3, contact *e′* of the armature E′ and wire 6. When the operator desires to transmit messages in accordance with the Morse alphabet, he first of all, closes the switch K. Through the closing of this switch, a current will flow through the circuit 1, 1, in the direction of the unfeathered arrow 1, for the reason that the battery H consists of a larger number of cells than the battery I, and this current will energize one of the electromagnets E or F, in a manner, so that the respective armature will be drawn toward it. It is supposed that the current from H will energize the electromagnet E, so as to produce the desired polarity in same. The armature E′ will, therefore, leave the contact *e′* and will come to rest at the contact *e*. Through this movement a circuit will be established from 7 through F′, *f′*, wire 3, wire 4, battery G, wire 5, contact *e*, armature E′ and wire 6 to the ground L. A momentary impulse will, therefore, flow over the line in the direction of the feathered arrow 1. This impulse will cease as soon as the condenser K′ is fully charged or filled, as it is well known that such a device is a positive bar to the flow of the current in the same direction, as soon as it is raised to the potential of this current.

In transmitting a message, the operator manipulates his key in the same manner as the Morse operator manipulates his key on common land lines, that is, he closes his key for a short period to send a dot over

the line and for a long period to send a dash. He also allows his key to remain open for a short period between different characters, for a longer period to denote the space between the different letters and for a still longer period to denote the space between different words. When he closes his key the battery H is short circuited. An impulse will, therefore, flow over the localized circuit 1, 1, in the direction of the unfeathered arrow 2, that is, opposite from the flow of the first current and as the flow of the first current has energized the electromagnet E for the desired polarity, this opposite current will energize the electromagnet F, so as to produce in the same the polarity necessary to actuate the armature. As long, therefore, as the key J will be depressed, the current in the localized circuit will flow in the direction of arrow 2 and the armature F′ will be drawn by its electromagnet F away from contact *f′* and towards and in contact with *f*. This contact will be held there as long as the key is depressed. Through the movement of this armature a circuit will be established as follows: from wire 7, armature F′, contact *f*, wire 2, wire 5, battery G, wire 4, contact *e′*, armature E′ and wire 6 to the ground. The current, therefore, from the battery G will flow, as before, from the positive pole through wire 5 in the direction of the feathered arrow 1; but it will flow now, after it left the wire 5, through wire 2 in the direction of the feathered arrow 2 and will flow over the line in the same direction, as is indicated by feathered arrow 2. But as the condenser K′ is inserted in the wire 7, it is obvious that the flow of the current over the cable A will be only a momentary one and will cease as soon as this condenser is raised to the potential of the battery G. In the cable A is inserted a so-called polarized receiving device or relay and if this cable is duplexed, this polarized device designated as C, is inserted between the bridge-arms, as is illustrated in the drawing. This device has the well known quality, that when the armature is moved in one direction it requires an impulse of opposite polarity to move the armature in the opposite direction. When, therefore, the operator closes his switch K, the first impulse sent over the line in the direction of the feathered arrow 1, will move the armature to the stop *c*. This stop is not connected with any local circuit and is, therefore, called the dummy stop and this impulse is only for the purpose to clear the line; but when the key J is depressed, an impulse will flow over the line in the direction of the feathered arrow 2, which will send the armature of the device C toward and in contact with the stop *c′* and as this stop is in operative relation with the local circuit, this local circuit will be closed as soon as the armature reaches this contact *c′* and it will remain closed till an impulse of opposite polarity removes this armature from this contact and moves it to the opposite contact. The operator at X, therefore, in closing his key sends only a momentary impulse over the line, but this momentary impulse results in a longer or shorter closing of the local circuit connected to C, in accordance with the longer or shorter closing time of the transmitting key at X. It is supposed that the operator desires to transmit the letter "A". He, first of all, closes his switch, which sends a clearing impulse over the line. He then depresses the key for a short period which sends an opposite impulse over the line, resulting in the movement of the armature of the relay C inserted in the cable so as to close the local circuit. This local circuit will remain closed as long as the key at X remains closed, but as soon as the operator opens the key, the armature moves from its contact point and opens the local circuit. For the dash, the operator then closes the key for a longer period, which results in the closing of the relay circuit for a longer period and after opening the key, then a clearing impulse again opens this relay circuit. A translating device, such as a writer or sounder, will translate the opening and closing of the circuit into a record or sound and will produce for the first short closing of the key a dot and for the second long closing of the key a dash; thus informing the receiving operator that a dot and dash were transmitted.

In conformity with the example set forth at the beginning of this application, I have in Fig. 2 illustrated the near terminals of the two cables; one cable supposed to run from New York to Canso and one cable supposed to run from Canso to Cornwall and have illustrated in said figure the means, whereby messages from one of these cables can be automatically relayed to the second cable. I have only illustrated in detail the automatic relaying apparatus as connected to one of the cables, it being understood that the apparatus connected to the second cable is an exact duplicate, in all its parts, to the apparatus illustrated. In this figure, Z is the relaying apparatus as an entirety; A and A′ are the near parts of the two cables to be relayed together. In Fig. 1, I have designated the receiving device inserted in the cable by the letter C and in Fig. 2, I designate this device by the letters D and D′, so as to distinguish the device adapted to translate the messages and the device adapted to be used only for relaying purposes, from each other. The cable A embraces the artificial line B, the relaying device D provided with the armature d^4 and in juxtaposition thereto the contacts *d* and *d′*. The junction of the bridge of this

cable is connected to wire 13. This wire is here shown as to be broken off, but in reality this wire is connected just as the wire 13 of the cable A′ to one of the armatures of the receiving device as illustrated in Z. The armature d^4 is connected to the wire 8^a. The contact d is connected to wire 8 and the contact d' is connected to wire 9. Between the wires 8 and 8^a is inserted the resistance R and between the wires 8^a and 9 is inserted the resistance R′. The wires 8 and 8^a form a relaying circuit embracing the source of current P and the electromagnet M. The wires 8^a and 9 form a relaying circuit embracing the source Q and the electromagnet N. The electromagnet M is provided with the armature M′ and in juxtaposition to this armature with the stops m and m'. The armature is held normally by the spring M^2 in a position so as to contact with m'. The source O overbridges the contacts m and m'. The electromagnet N is provided with the armature N′ and in juxtaposition thereto with the stops n and n'. The spring N^2 keeping normally the armature in contact with n', the contact m of the electromagnet M is connected through wire 10 with the contact n of the electromagnet N and the contact m' of magnet M is connected through wire 11 with contact n' of magnet N. Wire 13 from cable A′ is connected to the armature N′ and the armature M′ is connected through wire 12 with the ground S. In the normal position, that is, in the position as illustrated in the drawing, the cable is connected through wire 13, armature N′, stop n', wire 11, stop m', armature M′, wire 12 direct to the ground S. When now, an impulse arrives over the cable A capable of moving the armature d^4 of the relay D inserted in said cable towards and in contact with d, then the circuit embracing the wires 8 and 8^a and the electromagnet M, will be closed and through this closing the source P will energize the electromagnet M and the armature M′ will be drawn away from the point m' and in contact with the point m. This movement changes the connection of the cable A′ as to the ground and the source O in the following manner: Whereas, the connection of the cable was formerly directly to the ground, now as the armature M′ has broken its contact with m' and made its contact with m, a circuit is established embracing the wire 13, armature N′, stop or contact n', wire 11, negative pole of source O, stop or contact m, armature M′, wire 12 and ground S. The closing of the circuit 8 and 8^a has, therefore, resulted in the connection of the battery O with the cable A′, in a manner, so that the negative pole of said battery is connected to the cable and the positive pole of this battery to the ground. This connection will remain till a second impulse over the cable A removes the armature d^4 in said cable from the contact d and brings this armature in contact with d'. Through this movement the electromagnet M becomes de-magnetized. The armature M′, therefore, will resume its normal position, that is, will be drawn by the spring M^2 towards and in contact with m'. But the contacting of d^4 with d' will close the circuit embracing the electromagnet N. This electromagnet will, therefore, be energized and the armature N′ will be drawn toward it away from contact n' and in contact with n. A circuit will, therefore, be established for wire 13 embracing the following: wire 13, armature N′, contact n, wire 10, positive pole of source O, negative pole of said source, contact m', armature M′, wire 12 and ground S. The battery O, therefore, which was formerly connected with the negative pole to the cable is now connected with the positive pole to the cable and this condition will remain till an impulse of opposite direction will again flow over the cable A and will remove the armature d^4 and d', bringing it again in contact with d. The relaying, therefore, of the cable A to the cable A′ is entirely automatic and as the cable A′ is provided with the duplicate of this arrangement, it is obvious that vice versa, the relaying of the cable A′ to the cable A is also automatic.

In Fig. 2, the second cable, that is, the cable A′ is provided with the relaying device similar to the relaying device of the cable A and the parts shown in connection with the cable A are designated as follows: the artificial cable as B′; the relay as D′; its armature as d^5; its two contacts as d^2 and d^3, respectively, and the wires connected to the armature and parts as 8, 8^a and 9, respectively.

In working the system, as described, means have to be provided whereby the so-called sparking or sticking on the relays inserted in the cable is prevented. In Fig. 2, I have illustrated an arrangement which was tried and found to work correctly for this purpose, and in Fig. 3, I have illustrated in detail this arrangement. In this figure, C is the relay proper, U a translating device, such as a sounder, provided with the two stops u and u'. This translating device is connected locally through the circuit 14 with the source of current V and in this circuit is connected the resistance W. To the terminals of this resistance is connected a circuit consisting of the wires 15; one of these wires is connected to the armature of the relay C and the other of these wires is connected to the contact point of the relay. The working of this arrangement is as follows: The force of the battery V would be sufficient to energize the coil of the device U for the purpose of drawing down the armature, but as the resistance W is inserted in

this circuit, the force of the battery V is lessened so much, that it is insufficient for the purpose of energizing the coil of the device U. The armature, therefore, will remain in the upward position as long as this resistance W will remain in the circuit, but as soon as through the movement of the armature of the device C, a shunt is established around this resistance consisting of the wire 15 and the stop and armature of the relay, then the current from the battery V is sufficient to energize the coil of U and thereby bring down the armature to the lower stop u', and if, as said above, this device U is a sounder, the operator will readily distinguish the received impulse if such be a dot or a dash, for the reason that C being a polarized relay, it requires an impulse of opposite polarity to remove the armature from one stop to the other stop. The arrangement, as described, was tried in conjunction with a polarized relay and having in series with its circuit a Thomson's reflecting galvanometer and the force going through this circuit was only equal to $\frac{2}{10}$ of a M. F. raised to one volt. The galvanometer gave only a deflection of five degrees and the instrument, worked by a common key, answered perfectly and no sticking or sparking was ascertainable.

Such in broad lines is the character of my invention, but it is obvious that the arrangement of part of the same may be altered, without departing from the scope of same.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In cable telegraphy, means to automatically repeat impulses transmitted over one cable to a second cable, said means comprising for the cable to be relayed an electromagnetic device and two contacts for the movable parts of said device, two electromagnets, one terminal of each of said electro-magnets connected to one of said contacts, the second terminal of each of said electro-magnets connected to the movable part of the electro-magnetic device with the interposition of a source of current, an armature for each of said electro-magnets, the armature of one of said electro-magnets grounded, the armature of the second of said electro-magnets connected to the second cable; a source of current and means to connect said source with one pole to the ground and with the second pole to the second cable, or vice versa, through the operation of one or the other of the armatures of said electro-magnets.

2. In the automatic repeating of messages from one cable to a second cable, two electromagnets connected each with one terminal to the forward point of a relay inserted in the relaying cable and connected both with the other terminal to the movable part of said relay, a source of current for each of said electro-magnets, the armature of each electro-magnet normally resting on a contact point, both contact points connected together through an electric circuit, one armature grounded and the second armature in electrical connection with the second cable; a source of current normally connected to the circuit of the contacts, an additional contact for each armature, both additional contacts electrically connected with each other and with a second pole of the source of current, the armature of each electro-magnet adapted to make contact through its operation with one of the additional contacts.

3. In combination, two submarine cables, a polarized relay for one terminal of each of said cables; the polarized relay of one cable provided with means to impress upon the second cable impulses of positive and negative polarity and the polarized relay of the second cable provided with means to impress upon the first cable impulses of positive and negative polarity.

In testimony whereof I affix my signature in presence of two witnesses.

ISIDOR KITSEE.

Witnesses:
MARY C. SMITH,
ALVAH RITTENHOUSE.