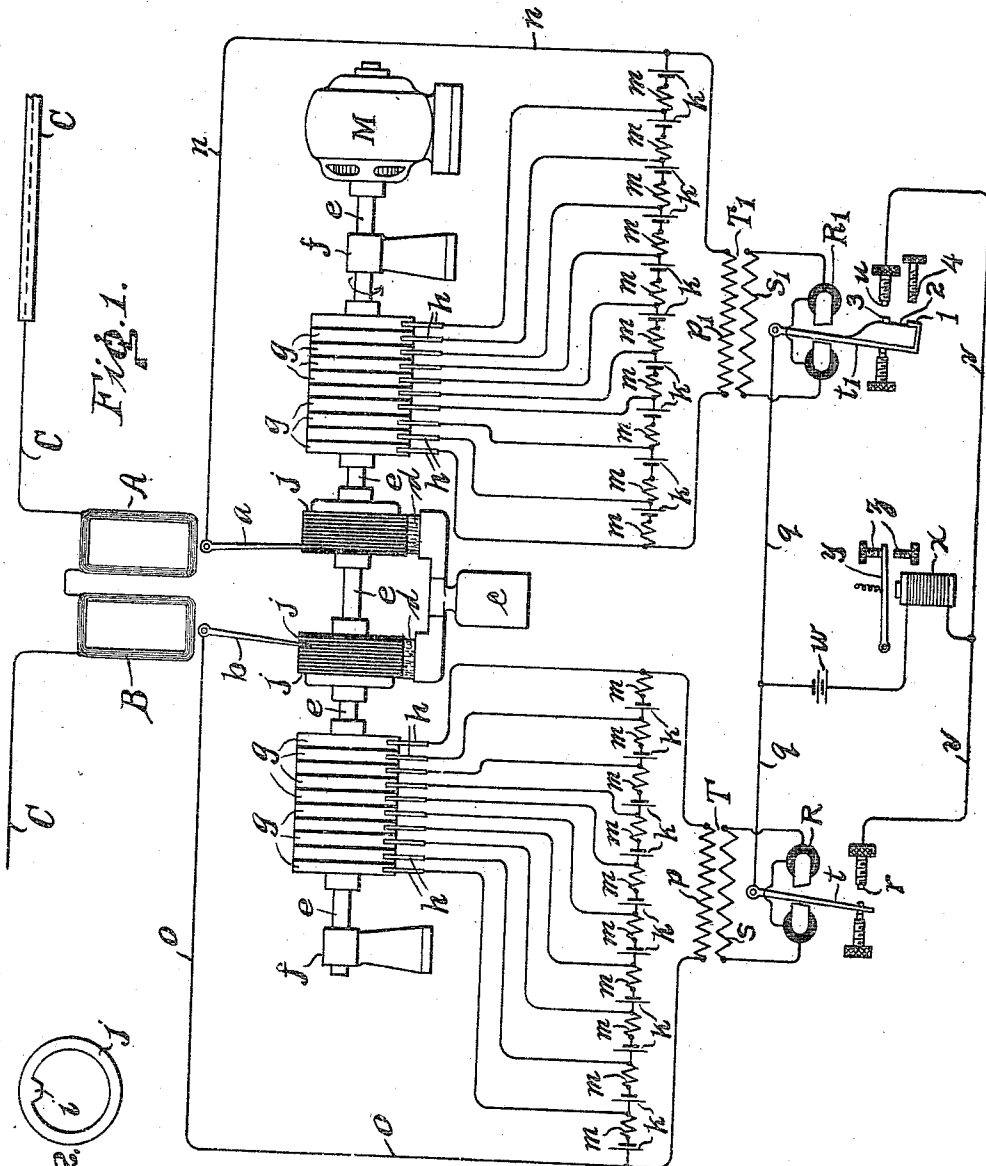


I. KITSEE.
CABLE TELEGRAPH APPARATUS.
APPLICATION FILED MAY 21, 1909.

986,396.

Patented Mar. 7, 1911.
2 SHEETS—SHEET 1.



Witnesses
Daniel Webster, Jr.
A. E. Stenbock

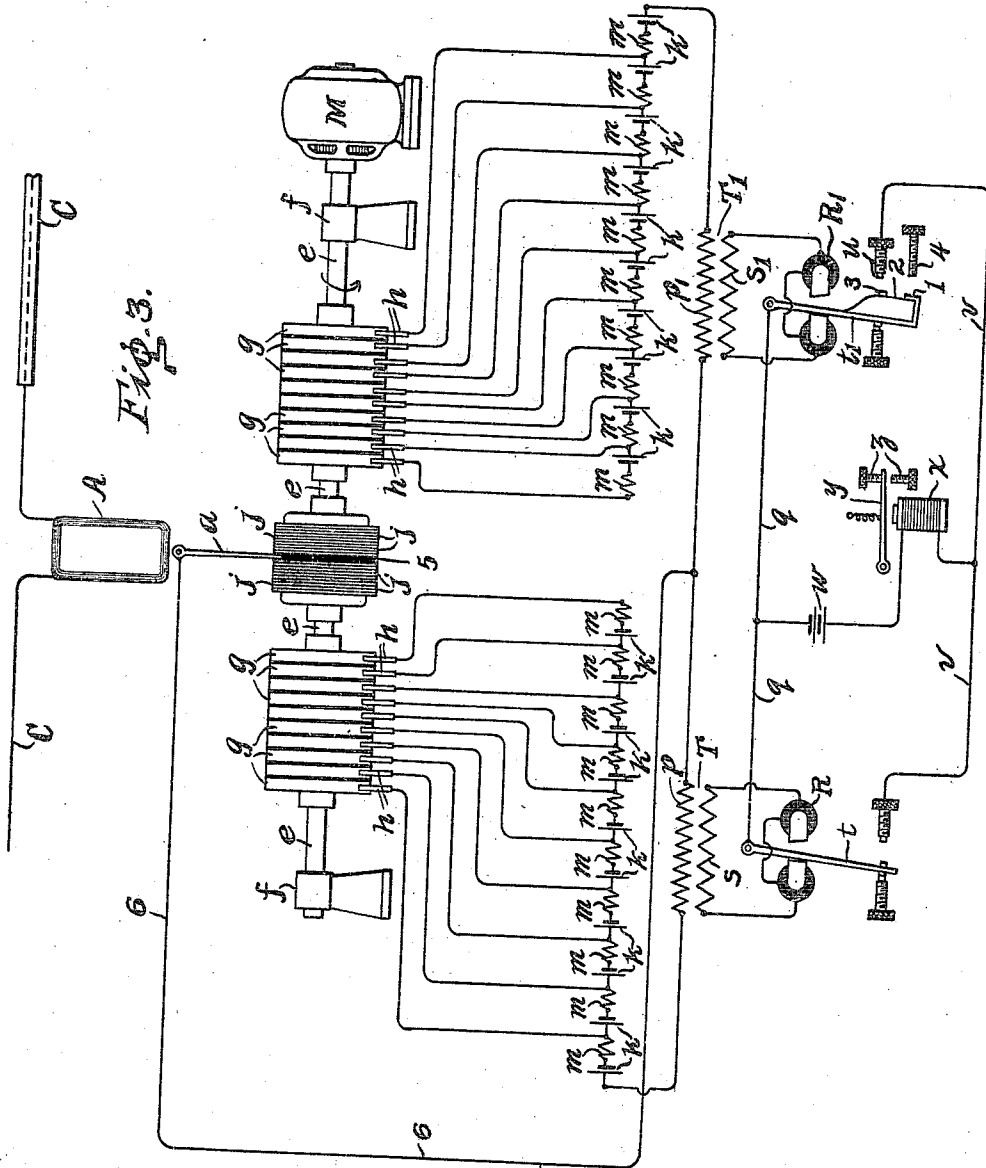
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UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF PHILADELPHIA, PENNSYLVANIA.

CABLE-TELEGRAPH APPARATUS.

986,396.

Specification of Letters Patent.

Patented Mar. 7, 1911.

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To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Cable-Telegraph Apparatus, of which the following is a specification.

My invention relates to telegraph apparatus, and particularly to telegraph receiving apparatus to be employed in connection with a long line or submarine cable, or any line or cable having relatively great capacity, or, in fact, any line or cable in which the "shifting zero" effect occurs.

It is the object of my invention to provide receiving apparatus to be used in connection with a line or cable on which a shifting zero effect occurs whereby definite powerful and clear signals, visual, audible, or otherwise, may be produced in response to the feeble line or cable impulses and irrespective of the shifting zero. To this end I employ an instrument similar to a siphon recorder, the movable coil serving to move a delicate contact over a plurality of contacts controlling a plurality of sources of energy, the movement of the contact controlled by the coil causing reproductions of clear signals irrespective of the zero or shifted zero position.

My invention resides in the features hereinafter described and claimed.

For an illustration of some of the forms my invention may take, reference is to be had to the accompanying drawings, in which:

Figure 1 is a diagrammatic view of receiving apparatus employing two movable coils each controlling a movable contact. Fig. 2 is a detail plan view of a contact ring. Fig. 3 is a diagrammatic view of a modified arrangement of the receiving apparatus employing one movable coil.

Referring to Fig. 1, C represents a line or cable, such as a submarine cable, or any conductor having great capacity, but more particularly a conductor in which a shifting zero effect occurs. Either in series or multiple with each other in the line or cable C are connected the two coils A and B, like the coils of siphon recorders suspended in intense magnetic fields. Actuated by the coil A is a movable contact member *a*, and

b is a similar contact member actuated by the coil B. These contact members *a* and *b* are actuated by any suitable connection with their operating coils, the mode of operating a siphon in a siphon recorder being suitable. The coils A and B are torsionally mounted, as usual in siphon recorders.

M is an electric or any other suitable motor for continuously and substantially uniformly rotating the shaft *e*, having substantially no end play, supported by the bearings *f*. Secured on and rotated by the shaft *e* are two series of slip rings *g*, shown, by way of example, to be ten in number. These slip rings are insulated from each other and upon each bears a brush *h*. Each of the slip rings *g* of the series shown to the right is connected with a contact ring *j*, shown in plan in Fig. 2, of the right hand series of contact rings. The number of contact rings *j* is the same as the number of slip rings *g*, the slip ring *g* at the extreme right being connected to the contact ring *j* at the extreme right of its series and so on, the similarly positioned slip rings being connected to similarly positioned contact rings. These contact rings may be made of silver or any other suitable metal and preferably extremely thin, as, for example, one-hundredth of an inch. They are insulated from each other, the insulation also being very thin. On the inner side of each contact ring *j* is a lug *i* to which to solder or otherwise connect a wire leading to a correspondingly positioned slip ring *g*, these connecting wires being omitted from the drawings for the purpose of clearness. With the right hand series of contact rings *j* engages the contact member *a* actuated by the coil A. And with the left hand series of contact rings engages the contact member *b* actuated by the coil B. In the drawing these series of contact rings *j* are exaggerated as to thickness of the rings and the intervening insulation, for the sake of clearness.

The contact members *a* and *b* may be ordinary siphon tubes having a fine wire extending through them and projecting so as to contact with the edges of the rotating rings *j*, or the contact members *a* and *b* may be thin tubular aluminum or other metallic needles or members having an iridium, platinum-iridium, or other suitable hard conducting point.

The direction of rotation of shaft e should preferably be such as to rotate the contact rings j away from the contact members a and b ; and for the case shown in the drawings this direction of rotation would be counter-clockwise as viewed when looking at the right hand end of the shaft e .

It will be found that moistening the edges of the contact rings j will greatly reduce friction and improve smoothness of operation. Any suitable non-conducting or high resistance liquid may be used for this purpose, and I have found that alcohol with a small amount of ether added thereto serves excellently. For this purpose a jar or receptacle c containing the liquid is provided, wicks d, d , communicating with the liquid in jar c and touching the contact rings j .

Between neighboring brushes h , bearing upon the slip rings g , are connected the sources of energy k and resistances m . Taking the right hand series of slip rings g , for example, these resistances m and sources k are serially connected with each other and the primary p^1 of a preferably step-down transformer T^1 , which may be of the open or closed magnetic circuit type. The movable contact member a is connected by conductor n with the terminal of the series of sources k and resistances m and one terminal of the primary p^1 . Similarly, the movable contact member b is connected by conductor o with one terminal of the other series of sources k and resistances m and with one terminal of the primary p of the transformer T , similar to the transformer T^1 . The secondary s of the step-down transformer T is connected with the winding of the unbiased polarized relay R . And the secondary s^1 of the transformer T^1 is connected with the winding of the unbiased polarized relay R^1 . The relay tongues t and t^1 are connected together by conductor q , and the stationary relay contacts r and u are connected together by the conductor v . Between the conductors q and v are connected the source of energy w and the winding of the sounder, recorder, relay, or other magnet x having the spring retracted armature y playing between the stops or contacts z .

The tongue t^1 of the relay R^1 has the hook end 1 against the inner side of which normally engages the spring 2 carrying the contact 3 adapted to engage the contact u and the hook end 1 is limited in its movement by the stop 4.

The operation is as follows: The operator at the distant end of the line or cable C transmits to line positive and negative impulses, a positive impulse representing, for example, a dot, while a negative impulse represents a dash. Assuming a positive impulse or dot to be transmitted over the line

or cable C , the arriving current passes through both the coils A and B . The coil B then deflects in such direction as to move the contact member b toward the left as viewed in Fig. 1 across the edges of the contact rings j . In this movement across the contact rings j , the contact member b cuts into the circuit of the primary p one source k and its resistance m after another thus increasing, for example, the potential at the terminals of the primary p . This causes an impulse in a given direction in the secondary s , the current being in such direction as to cause the tongue t of the relay R to engage contact r , thus energizing the winding of the instrument x and causing the armature y to engage the lower stop z in opposition to the spring. As the coil B returns toward normal, the contact member b is moved again toward the right thus cutting out more sources k and reducing the potential at the terminals of the primary p with resultant induced current in the secondary in opposite direction, bringing the tongue t again to normal position shown, and deenergizing the instrument x and causing the armature y to return to the position shown. The instrument x has then reproduced or relayed a dot. If a negative impulse or dash is transmitted over the line or cable the coil A deflects in such direction as to move the contact member a toward the right over the edges of the contact rings j of the right hand series. This, likewise, shunts in sources k and increases the potential at the terminals of the primary p^1 causing an impulse in the secondary s^1 in such direction as to cause the tongue t^1 of the relay R^1 to move toward the right. The contacts 3 and u first engage thus energizing the instrument x . As the motion continues, the spring 2 yields, maintaining contact between 3 and u , and the hook end 1 engages the stop 4. By this time the cable impulse has ceased and the contact member a returns toward normal, thus again reducing the potential at the terminals of the primary p^1 energizing the relay R^1 in opposite direction to move the tongue t^1 to normal position as shown. This maintained or prolonged contact between 3 and u has, however, caused a dash to be reproduced or relayed by the instrument x .

If a shifting zero effect is present on the cable and a plurality of positive or a plurality of negative impulses succeed each other, the movable contact members a and b will not return to the normal zero but only toward it, but in so doing will cause the relay energizing impulses in the transformer secondary. It follows, therefore, that for the operation of the apparatus shown the contact members need not return to true zero but that for every line impulse, and without regard to the true zero, they sweep across a

plurality of contact rings j and thus increase or decrease the potential at the terminals of the primaries, with resultant relay energizing impulses. The instrument is, therefore, quite independent of shifting zero effect.

In Fig. 3, the arrangement is similar. One coil A only is connected in the line or cable and the movable contact member a is adapted to sweep across both series of contact rings j ; the two series being in this case juxtaposed. The insulating material 5 between the two series of contact rings is shown exaggerated in Fig. 3 for the purpose of clearness. In practice, the two series are very close together with relatively narrow insulation between them. The slip rings, brushes, sources of energy and resistances are similar to those shown in Fig. 1. The movement of the member a to the right or left, however, does not perform a shunting action as in Fig. 1, but actually cuts in or out more or less of the sources k . For example, when the member a is in engagement with the left hand series of contact rings j , more or less of the sources of energy are cut into or out of series circuit with the primary p of the transformer T, the conductor 6 joining the member a and the end terminal of the two primaries p and p^1 , the latter of the transformer T¹. The remainder of the apparatus is the same as shown in Fig. 1. Thus, the coil A responds to both positive and negative impulses to move the contact over either the left or right series of contact rings j to energize the polarized relay R to cause the reproduction of a dot by the relay R or a dash by the relay R¹.

Practice has taught that in such a delicately poised instrument as I contemplate using, it is not practicable to restrict the movement of the movable contact member by stationary stops, and that it is better to restrict the movement of the movable coil itself, if such is required, by suitable means.

What I claim is:

1. The combination with a line, of a contact movable in response to line current, a series of contacts adapted to be swept over by said movable contact, a plurality of sources of energy controlled by said contacts, and means responsive to the change in relation of said sources for reproducing a signal.

2. The combination with a line, of a contact movable in response to line current, a series of rotating contacts adapted to be swept over by said movable contact, a plurality of sources of energy controlled by said contacts, and means responsive to the change in relation of said sources for reproducing a signal.

3. The combination with a line, of a contact movable in response to current transmitted over said line, a series of cooperating contacts engaged by said movable contact, a

plurality of sources of energy controlled by said contacts, a transformer primary associated with said sources of energy, and a signal translating instrument controlled by the transformer secondary.

4. The combination with a line, of a contact movable in response to current transmitted over said line, a series of cooperating contact rings presenting their edges to said movable contact member, sources of energy controlled by said series of contacts, and means for translating a signal in response to the passage of said movable contact member across said contact rings.

5. The combination with a line, of a contact movable in response to current transmitted over said line, a series of cooperating rotating contact rings presenting their edges to said movable contact member, sources of energy controlled by said series of contacts, and means for translating a signal in response to the passage of said movable contact member across said contact rings.

6. A telegraphic relay having a movable member, a local circuit, means controlled by the movement of said movable member for changing the potential in said local circuit, and means for generating induced current in response to the potential changes in said local circuit.

7. A telegraphic relay having a movable member, and electro-magnetic means for translating the movement of said member in a direction away from the normal zero as the beginning of a telegraphic character and translating the movement in the direction of the normal zero as the ending of said telegraphic character, irrespective of whether or not said movable relay member has reached the normal zero.

8. A telegraphic relay having a movable member with electro-magnetic means for translating the movement of said member in a direction away from its normal zero as the beginning of a telegraphic character, irrespective of whether or not said movement has commenced at the normal zero.

9. A telegraphic relay having a movable member, and electro-magnetic means for translating the movement of said member in a direction toward the normal zero as the ending of a telegraphic character, irrespective of whether or not said movable member has reached the normal zero.

10. In a telegraphic relay, a series of sources of current, and means for rendering operative a greater or lesser number of said sources in accordance with a greater or lesser movement of the movable member of said relay.

11. In a telegraphic relay, a series of contacts to be engaged by the movable member of said relay, a series of sources of current for said contacts, and means for rendering operative a greater or lesser number of said

sources in accordance with the greater or lesser swing of the movable member of said relay.

12. In a telegraphic relay, a series of contacts engaged by the movable member of said relay in its movements to right or left, a series of sources of current for said contacts, and means for rendering operative a greater or lesser number of said sources in accordance with the greater or lesser swing of said movable member of said relay, and means for translating each swing away from the zero position as the beginning and each swing toward the zero position as the termination of a telegraphic character.

13. The method of overcoming the shifting zero effect in a cable relay, which consists in causing the movable member of the relay to contact with a greater or lesser number of contacts for each swing in accordance with the amplitude of said swing, and causing each swing from the zero position to be translated as the commencement and each swing toward the zero position to be translated as the ending of one telegraphic character.

14. The method of overcoming the shifting zero effect in a cable relay, which consists in causing the movable member of the relay to make operative a greater or lesser number of electro-motive forces by each swing in accordance with the amplitude of said swing, and causing the different swings of the movable member of said relay to be translated into readable characters.

15. The method of overcoming the shifting zero effect in a cable relay, which consists in causing the movement of the movable member of the relay in a direction away from the zero to generate one induced impulse and causing the movement of the movable member of said relay toward the zero to generate a second induced impulse, irrespective of whether or not said movements reach the normal zero.

16. The method of overcoming the shifting zero effect in a cable relay, which consists in causing for each movement of the movable member of said relay one induced impulse, and causing two of said impulses to be translated into one telegraphic character, independent of the amplitude of movement of the movable member of said relay.

17. In a telegraphic relay, a freely moving movable member, a series of contacts to one side of the normal position of said movable member, a circuit for each series of contacts, a converter for each circuit, and a translating device for each converter.

18. In a telegraphic relay, a freely swinging movable member, a series of contacts cooperating therewith, each contact controlling a source of current, and means responsive to the strength of received impulses for

rendering operative by each movement of said movable member a greater or lesser number of said sources of current.

19. In a telegraphic relay, a movable member unrestricted in its movement, means for rendering operative a higher or lower electro-motive force for each swing of said movable member in accordance with the amplitude of said swing, and means for rendering operative a translating device in response to said swings, independent of the magnitude of the electro-motive force made operative.

20. In a telegraphic relay, means for rendering operative a greater or lesser number of sources of current in accordance with a greater or lesser movement of the movable member of said relay.

21. In a telegraphic relay, a freely moving contacting member and a series of contacts to be engaged thereby, said contacts each provided with a source of current, and said freely moving contacting member cooperating with said contacts to render operative a greater or lesser number of said sources through each movement toward or away from the normal zero.

22. In a telegraphic relay, a freely moving movable contact member, a series of contacts cooperating with said contact member, each of said series of contacts provided with a source of current, a converter, the primary thereof operatively related with the circuit including said contacts, and the secondary of said converter operatively related with a translating circuit.

23. In a cable relay, a freely moving movable contact member, a series of contacts adapted to be engaged thereby, a series of sources of current, a circuit for said sources, a converter for said circuit, and a translating device controlled by the secondary circuit of said converter.

24. In a cable relay, means for overcoming the shifting zero effect comprising a freely swinging member adapted to move a greater or less distance in response to received impulses, and a series of contacts engaged by said movable member, each of said series of contacts controlling a separate source of current.

25. In a cable relay, means for overcoming the shifting zero effect comprising a freely swinging member adapted to be moved a greater or less distance in response to received impulses, a series of contacts engaged by said movable member, and each of said series of contacts provided with a source of current and a resistance.

26. In a cable relay, a freely swinging contact member, a series of contacts engaged thereby, neighboring contacts being connected with each other through sources of current.

27. In cable telegraphy, the method of re-

ceiving signals independently of the shifting zero effect which consists in causing the movable member of a relay to render operative a greater or lesser number of sources of current in accordance with the amplitude of movement of said movable member, and causing each movement of said movable member away from the zero to be translated as the beginning and each movement of said movable member toward the zero to be translated as the termination of a telegraphic character.

28. As means for overcoming the shifting zero effect in a cable relay, a series of contacts in operative relation to the movable member of said relay, and a series of sources

of current connecting said contacts, the movable member of said relay adapted to render operative a greater or lesser number of said sources for each movement, and means for translating each double movement as a telegraphic character irrespective of the number of sources rendered operative through said double movement.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

ISIDOR KITSEE.

Witnesses:

ELEANOR T. McCALL,

A. E. STEINBOCK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
