I. KITSEE.

TELEGRAPH SYSTEM.

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983,240. Patented Jan. 31, 1911.

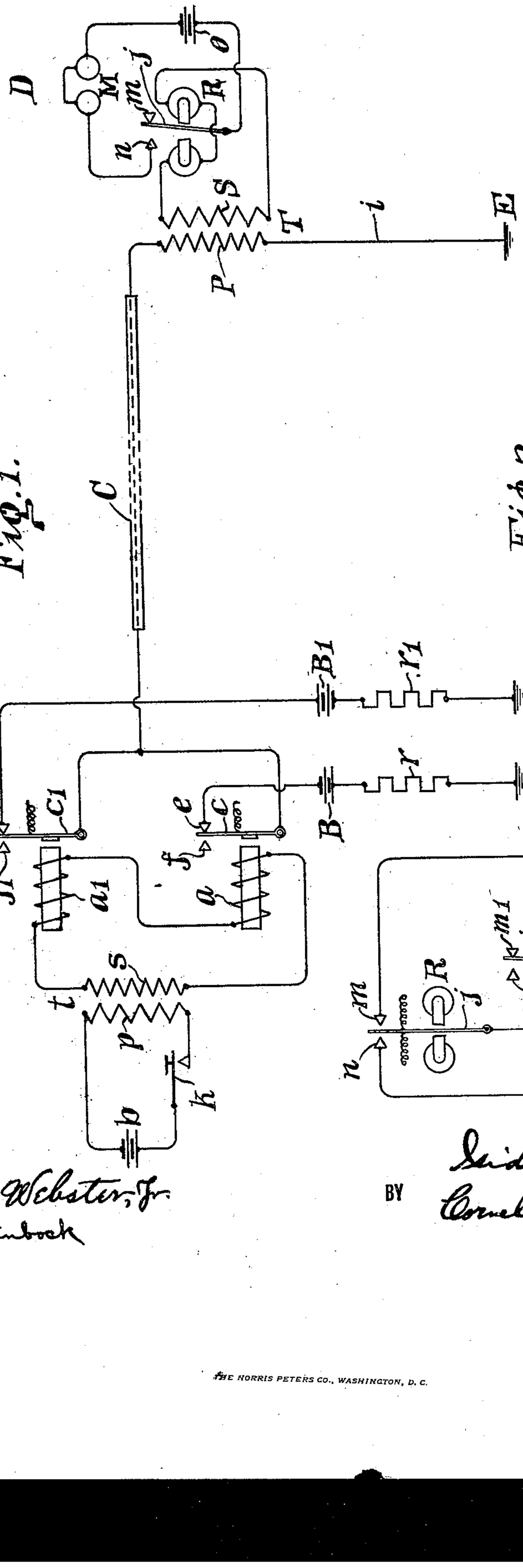

Fig. 1.

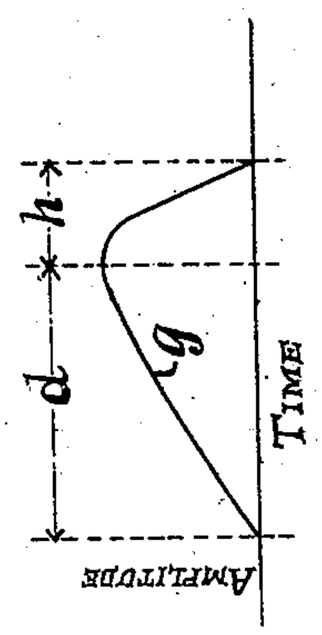

Fig. 2.

Fig. 3.

WITNESSES

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TELEGRAPH SYSTEM.

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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 certain new and useful Improvement in Telegraph Systems, of which the following is a specification.

My invention relates to a system of telegraphy, and relates particularly, though not exclusively, to telegraphy over a long line or cable, or any circuit or conductor having great capacity.

My invention resides in a telegraph system wherein the received impulses are powerful, of relatively short duration, and sharply defined, particularly when transmitted over a line or cable having great capacity.

My invention resides in a system in which positive and negative impulses are transmitted over the line or cable in such manner that at the receiving end of the line or cable the received impulses are relatively powerful, sharply defined, and of relatively short duration, such impulses being employed to affect or control a suitable signaling instrument or translating device.

My invention resides in a telegraph system wherein positive and negative impulses are transmitted over the line or cable in such manner that either the ascending or descending portion of a current wave is relatively steep; that is to say, in such manner that either the increasing or decreasing portion of a received current wave shall increase or decrease relatively sharply or suddenly. And at the receiving end I employ in connection with the line or cable a converter or transformer in whose secondary circuit there is induced by the sharply rising or sharply falling portion of a received current wave, a relatively powerful and sharply defined impulse, so powerful, in fact, as to be capable of efficiently and satisfactorily affecting or controlling a relay, whereby a siphon recorder, and kindred apparatus may be dispensed with.

By the system herein described, positive and negative impulses succeed each other on the line or cable and at the receiving end a current wave dies away or decreases very rapidly, and particularly so as compared with the building up or increase of the current wave. Each portion of each current wave causes an impulse in the secondary of the transformer, the impulse in the secondary corresponding to the slowly rising part of the current wave, being relatively weak, while the impulse corresponding with the rapid dying away of the impulse is relatively powerful and sharply defined and of opposite direction. It follows, therefore, that for both a positive and negative current wave impressed upon the line or cable there are produced in the transformer secondary first, a weak impulse, followed by a strong sharply defined impulse of opposite direction. And when considering a line impulse of one polarity followed by an impulse of the other polarity, there are produced in the transformer secondary four impulses, the first and third being weak, while the second and fourth are powerful and sharply defined, the first and fourth being of one direction, and the second and third of opposite direction.

My invention resides also in an improvement in the art of transmitting intelligence telegraphically, which consists in impressing impulses upon a line or cable in such manner that at the receiving end there shall be produced powerful and sharply defined impulses capable of affecting or controlling a relay or other suitable device.

For an illustration of one of the forms my invention may take, and of means for carrying out my improved method, reference is to be had to the accompanying drawing, in which:

Figure 1 is a diagrammatic view of circuits and apparatus involving my invention and for carrying out my improved method. Fig. 2 is a graphic illustration, by way of example only, of a received line or cable impulse. Fig. 3 is a diagrammatic view of a modification of relay and connections.

In the drawing, A and D represent separated transmitting and receiving stations connected by a submarine or other cable C, or by any other suitable circuit or conductor.

At the transmitting station A, *k* is an operator's key connected in circuit with the source of energy *b* and the primary *p* of a transformer *t* whose secondary winding *s* is included in circuit with the windings *a* and a^1 of polarized relays or polarized electromagnetic switches whose tongues or armatures *c* and c^1 are electrically connected together and connected with the line or cable C. The tongues or armatures *c*, c^1 are normally spring retracted into engagement with the contacts *e* and e^1, respectively. *f* and f^1

are suitable stops, the length and time of travel of the tongues c, c^1 being made as long or short as desired to control the impulses impressed upon the line or cable in desired manner. Between the contact e and the earth E are connected the source of energy B and the resistance r; and, similarly, between the contact e^1 and earth E are connected the source of energy B^1 and the resistance r^1, the sources B and B^1 being oppositely connected.

When the operator depresses his key k, an impulse is induced in the secondary s causing the tongue or armature c, for example, to be retracted; the relays or electro-magnetic switches being polarized, the other tongue or armature c^1 is not attracted. The tongue c being separated from the contact e, the source B is isolated from the line or cable C and the source B^1 accordingly impresses current upon the line or cable. The current in the secondary s is momentary only, however, and the tongue c immediately returns into engagement with e with the result that the line or cable is again subjected also to the source B.

When the operator opens the key k, a second impulse, but in opposite direction, traverses the windings a and a^1, and this time the tongue c^1 is attracted, while c remains in contact with e. In consequence, the source B^1 is isolated from the cable C and current from source B is impressed upon the line or cable. The tongue c^1 immediately returns into engagement with the contact e^1, however, and the line or cable is then again subjected also to the source B^1. With this transmitting apparatus, or transmitting apparatus producing a like result, there is normally no current on the line or cable. When one of the tongues c or c^1 is attracted the line or cable is subjected to a source of energy with a resultant flow of current over the line or cable and at the receiving end the potential or current rises relatively slowly as illustrated, by way of example merely, by Fig. 2, where the portion d of the current wave g increases relatively gradually. Upon restoration of the tongue to normal, however, the cable is again subjected to both sources B and B^1 and the current instead of dying away gradually dies away sharply or quickly, as represented by the portion h of the current curve g. Then, when the operator's key k is opened, an impulse of opposite direction is impressed upon the cable and at the receiving end a second current wave, but of opposite polarity, gradually rises and quickly diminishes as in the case illustrated in Fig. 2.

It is to be understood that Fig. 2 is illustrative only and that I do not wish to be limited in any manner thereby or by the theory of action or operation advanced.

It would seem that upon the return of a relay tongue to its contact, thus throwing the cable into communication with both sources B and B^1, that the rapid dying away of the cable impulse may be considered to be a rapid discharge of the cable, such discharge being accelerated by the second source of energy which, being of opposite polarity, may be considered to draw or suck the cable charge from the cable, thus making the impulse fall rapidly.

At the receiving station D, the received line or cable impulses traverse the primary P of a transformer T, such primary P having conductive connection to earth E, through conductor i. The tranformer T is preferably a step-down transformer, that is, the secondary S has fewer convolutions or turns than the primary P. In circuit with the secondary S is a polarized relay R, shown unbiased, or may be any other suitable translating device or instrument.

The slowly rising portion d of a curve such as g, of Fig. 2, causes in the secondary S a relatively weak impulse of current, since the time required to rise to a given amplitude is relatively great. When the cable charge falls, however, as represented by the portion h, it falls rapidly as indicated and causes a powerful impulse in the secondary S, such impulse being sharply defined and of relatively shorter duration, and of opposite direction to the earlier and weaker impulse. Then, when the key k is opened at the distant transmitting station, an impulse of opposite polarity is impressed upon the cable and the slowly rising part d of that impulse of opposite polarity causes a weak and relatively long impulse in the secondary S and of a polarity or direction the same as the preceding short and powerful secondary impulse. Then, the succeeding rapidly diminishing portion h causes a short powerful impulse in opposite direction in the secondary S. In other words, for each complete operation of the key k (closure and opening) there are four impulses produced in the secondary S of the receiving transformer, the first impulse relatively long and weak; the second impulse relatively short and powerful and of opposite polarity; the third impulse relatively long and weak and of the same polarity as the second impulse; and the fourth impulse short and powerful, and of a polarity opposite to the third impulse.

Assuming the relay R to be unbiased as shown, and its tongue or armature j normally in engagement with the stop m, the first impulse, long and weak, may be of such polarity as to only hold the tongue j more firmly in contact with the stop m. The succeeding powerful impulse of opposite polarity, however, will attract the tongue j into engagement with the contact n, where it will remain. This closes the circuit including the source of energy o and the sounder,

recording device, relay, or any other suitable instrument M. The third secondary impulse is of the same polarity as its predecessor and merely holds the tongue *j* the more firmly against the contact *m*. The fourth impulse is powerful, however, and of opposite polarity and causes the tongue *j* to return to stop *m*. Thus, the tongue *j* follows the movements of the key *k* and dots and dashes may be produced by the instrument M.

If the relay R is unbiased, as shown, the instrument M may be either biased or unbiased; and if the relay R is biased, the relay or device M in the local circuit is polarized and unbiased.

In Fig. 3, the relay R is assumed to be connected in circuit with the secondary S as shown in Fig. 1. Here, the relay R is a biased relay, the tongue *j* being biased to a position midway between the contacts *m* and *n*. The tongue *j* is connected through the winding of the second relay R^1 to a point between the sources of energy *v* and *w*, the source *v* being connected to the contact *n*, while the source *w* is connected to the contact *m*. The tongue j^1 of the relay R^1 is unbiased and rests normally against the contact m^1. In this case, the weak secondary impulses do not move the tongue *j* of the relay R into engagement with either of the contacts *m* or *n*. The powerful secondary impulses, however, cause the relay tongue *j* to engage the contacts *m* and *n* alternately. This causes momentary energizations of the relay R^1 causing its tongue to move into engagement with the contacts m^1 and n^1, and to remain in contact with the one or the other until a succeeding impulse of opposite polarity. The tongue j^1 and one of the contacts m^1 or n^1 then control a local circuit such as shown in Fig. 1.

While I have shown a local circuit controlled by the relay R in Fig. 1, it is to be understood that such local circuit may be omitted and the reproduction of audible, visible or other signals may be made directly by the tongue *j* or otherwise used to control their production. And while I have shown the transmitting apparatus as involving a transformer *t* with a key *k* in the primary, it is to be understood that any other suitable arrangement may be employed for energizing the windings *a* and a^1 for short intervals, or to cause the sources B and B^1 to be controlled as described.

By the system hereinbefore described, it is possible to secure an abruptly changing current at the receiving end of the line or cable though subjecting the line or cable to a relatively low electro-motive force. This is particularly advantageous in the case of submarine or other cable telegraphy where, to secure a correspondingly abruptly changing current at the receiving end, would require that the cable be subjected at the transmitting end to a very high electro-motive force, indeed higher than cable practice permits, because of dangers of puncture or breakdown of insulation or other effects following the use of high electro-motive forces.

What I claim is:

1. As an improvement in the art of electrically transmitting intelligence, the method which consists in impressing a current upon a line, causing said current to gradually rise, causing said current to diminish rapidly, and deriving from said line current a signal reproducing current.

2. As an improvement in the art of electrically transmitting intelligence over a line or cable having great capacity, the method which consists in impressing current upon the line or cable, allowing the current to gradually rise, causing said current to diminish rapidly, and deriving from said current signal reproducing current.

3. As an improvement in the art of electrically transmitting intelligence over a line or cable having great capacity, the method which consists in impressing current upon said line or cable, allowing said current to gradually rise, causing said current to rapidly diminish, and inductively deriving from said current signal reproducing current.

4. In a telegraph system, the combination with a line conductor having great capacity, of means for impressing upon said linea current gradually rising at the receiving end, means for rapidly diminishing said current, a gradually rising and rapidly diminishing impulse representing a character, and a signal reproducing instrument controlled by said received current.

5. In a telegraph system, the combination with a line conductor having great capacity, of means for impressing upon said line a current gradually rising at the receiving end, means for rapidly diminishing the received current, a gradually rising and rapidly diminishing impulse representing a character, and a signal translating instrument controlled by the received current.

6. In a telegraph system, the combination with a line conductor having great capacity, of means for impressing upon said line a current gradually rising at the receiving end, means at the transmitting end for rapidly diminishing said received current, a gradually rising and rapidly diminishing impulse representing a character, and a signal translating instrument controlled by said received current.

7. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line a current impulse increasing and diminishing at widely different rates at the receiving end, said impulse representing a character, and a signal translating

instrument controlled by the received current.

8. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor a current increasing and diminishing at the receiving end at widely different rates, a signal translating instrument, and means for inductively impressing energy of the received current upon said signal translating instrument.

9. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor a current increasing and diminishing at widely different rates at the receiving end, a relay, and means for inductively impressing the received current upon said relay.

10. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor current gradually increasing and rapidly diminishing at the receiving end, a relay, and means for inductively impressing the received current upon said relay.

11. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable a current impulse increasing and diminishing at widely different rates at the receiving end of said line or cable, said impulse representing a character, and a signal translating instrument controlled by the received current.

12. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current increasing and diminishing at widely different rates at the receiving end of said line or cable, a signal translating instrument, and an inductive connection between said line or cable and said signal translating instrument.

13. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable a current impulse increasing and diminishing at widely different rates at the receiving end of said line or cable, said impulse representing a character, and a relay controlled by the received current.

14. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current increasing and diminishing at widely different rates at the receiving end of said line or cable, a relay, and an inductive connection between said line or cable and said relay.

15. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable a current impulse gradually increasing and rapidly diminishing at the receiving end of said line or cable, said impulse representing a character, and a signal translating instrument controlled by the received current.

16. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current gradually increasing and rapidly diminishing at the receiving end of said line or cable, said current representing a character, and a relay controlled by the received current.

17. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current gradually increasing and rapidly diminishing at the receiving end of said line or cable, a signal translating instrument, and an inductive connection between said line or cable and said signal translating instrument.

18. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current gradually increasing and rapidly diminishing at the receiving end of said lime or cable, a relay, and an inductive connection between said line or cable and said relay.

19. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current increasing and diminishing at widely different rates at the receiving end of said line or cable, said current representing a character, a conductive connection from said line or cable to earth at the receiving end, and a signal translating instrument controlled by the received current.

20. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current increasing and diminishing at widely different rates at the receiving end of said line or cable, said current representing a character, a conductive connection from said line or cable to earth at the receiving end, and a relay controlled by the received current.

21. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable current increasing and diminishing at widely different rates at the receiving end of said line or cable, a conductive connection from said line or cable to earth at the receiving end, a signal translating instrument, and an inductive connection between said line or cable and said signal translating instrument.

22. In a telegraph system, the combination with a line or cable having great capac-

ity, of transmitting apparatus for impressing upon said line or cable current increasing and diminishing at widely different rates at the receiving end of said line or cable, a conductive connection from said line or cable to earth at the receiving end, a relay, and an inductive connection between said line or cable and said relay.

23. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable a current gradually rising and rapidly diminishing at the receiving end of said line or cable, a conductive connection from said line or cable to earth at the receiving end, a signal translating instrument, and an inductive connection between said line or cable and said signal translating instrument.

24. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus for impressing upon said line or cable a current gradually rising and rapidly diminishing at the receiving end of said line or cable, a conductive connection from said line or cable to earth at the receiving end, a relay, and an inductive connection between said line or cable and said relay.

25. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line a current increasing and diminishing at widely different rates at the receiving end, a signal translating instrument, and means for deriving from a received current impulse a plurality of impulses to control said signal translating instrument.

26. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line a current gradually increasing and rapidly diminishing at the receiving end, a signal translating instrument, and means for deriving from said received current a plurality of impulses for controlling said signal translating instrument.

27. In a telegraph system, the combination with a line conductor having great capacity, of a transmitting apparatus for impressing upon said line a current gradually increasing and rapidly diminishing at the receiving end, a relay, and means for deriving from said received current a plurality of impulses for controlling said relay.

28. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor positive and negative impulses, each impulse increasing and diminishing at widely different rates at the receiving end, and a signal translating instrument controlled by the received impulses.

29. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor positive and negative impulses, each impulse increasing and diminishing at widely different rates at the receiving end, and a relay controlled by the received impulses.

30. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor positive and negative impulses, each impulse gradually increasing and rapidly diminishing at the receiving end, and a signal translating instrument controlled by the received impulses.

31. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor positive and negative impulses, each impulse gradually increasing and rapidly diminishing at the receiving end, and a relay controlled by the received impulses.

32. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor positive and negative impulses, each impulse gradually increasing and rapidly diminishing at the receiving end, a signal translating instrument, and an inductive connection between said line conductor and said signal translating instrument, whereby said signal translating instrument is subjected to two weak and to two powerful impulses for a pair of positive and negative line impulses.

33. In a telegraph system, the combination with a line conductor having great capacity, of transmitting apparatus for impressing upon said line conductor positive and negative impulses, each impulse gradually increasing and rapidly diminishing at the receiving end, a relay, and an inductive connection between said line conductor and said relay, whereby said relay is subjected to two weak and to two powerful impulses for a pair of positive and negative line impulses.

34. As an improvement in the art of electrically transmitting intelligence, the method which consists in impressing positive and negative impulses upon a line conductor, causing each impulse to rise gradually and rapidly diminish at the receiving end, and deriving from said line current a signal reproducing current.

35. As an improvement in the art of electrically transmitting intelligence over a line or cable having great capacity, the method which consists in subjecting the line or cable to a potential difference, whereby a

current change occurs in the cable at its distant end, and thereafter electrically operating upon said line or cable to cause said current at its distant end to change at a rapid rate, and employing said rapid rate of change of said current to reproduce a signal.

36. As an improvement in the art of electrically transmitting intelligence over a line or cable having great capacity, the method which consists in impressing a current upon the line or cable, causing said current to gradually rise, causing said current to rapidly diminish, and reproducing a signal in response to the rapidly diminishing current.

37. As an improvement in the art of electrically transmitting intelligence over a line or cable having great capacity, the method which consists in impressing a current upon the line or cable, causing said current at the receiving end of said line or cable to rapidly change in value, and inductively deriving from said rapidly changing current a signal reproducing current.

38. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus comprising oppositely disposed sources of energy in communication with said line or cable, and means for momentarily isolating one of said sources of energy, and associated receiving apparatus comprising a signal translating instrument, and an inductive connection between said line or cable and said instrument.

39. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus comprising oppositely disposed sources of energy in communication with said line or cable, and means for alternately isolating said sources of energy, and associated receiving apparatus comprising a signal translating instrument, and an inductive connection between said line or cable and said instrument.

40. In a telegraph system, the combination with a line or cable having great capacity, of transmitting apparatus comprising oppositely disposed sources of energy in communication with said line or cable, means for momentarily isolating one of said sources of energy, and associated receiving apparatus comprising a signal translating instrument, and an inductive connection between said line or cable and said instrument, said line or cable having a conductive connection to earth at the receiving end.

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.