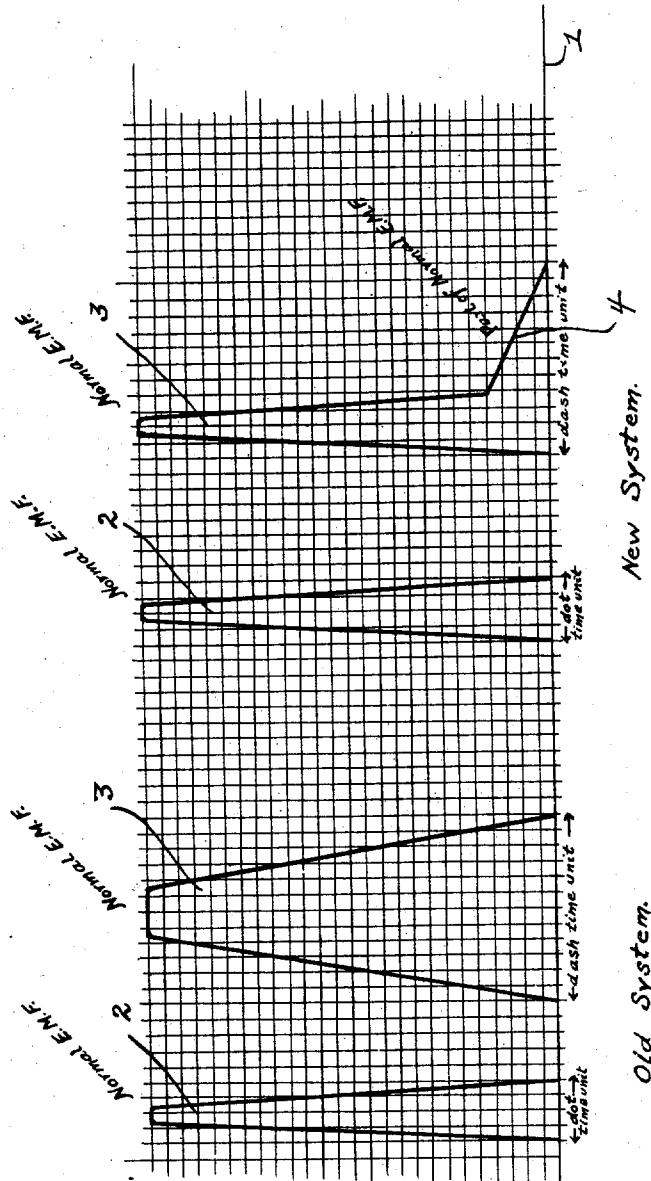


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TELEGRAPHY.

APPLICATION FILED JULY 8, 1908.

988,879.

Patented Apr. 4, 1911.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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TELEGRAPHY.

988,879.

Specification of Letters Patent.

Patented Apr. 4, 1911.

Application filed July 8, 1909. Serial No. 506,611.

*To all whom it may concern:*

Be it known that I, ISIDOR KITSEE, 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, more specially over lines with distributed capacity, such for instance as submarine cables.

The universal telegraph code—Morse alphabet—consists of dots and dashes grouped differently for different letters. On land lines, these dots and dashes are produced through a shorter or longer contact of the transmitting key with a source of current of one polarity. But the peculiar conditions which are met with in the transmission of electricity through long submarine lines render it necessary to discard the method of land telegraphy and to substitute therefor the system whereby impulses of one polarity are transmitted to denote a dot and impulses of a second polarity are transmitted to denote a dash. If the code to be transmitted would consist alternately of dots and dashes, the ideal clearing of the line would be reached. In reality, the code never consists of alternating dots and dashes; but, on the contrary, in nearly every word or syllable, two or more dots or two or more dashes are grouped and impulses of one polarity have to be transmitted in succession without an opportunity being given to clear the line. This drawback is readily realized by persons versed in the art.

In my experiments covering a number of years, I have found that it is possible to transmit and receive a comparatively large number of pulses over submarine cables provided these pulses are alternately of opposite polarity and of the same duration. In some of my experiments, I have succeeded in transmitting and receiving as high as 1800 pulses per minute over a line of 8000 ohms resistance and 260 microfarad capacity. But in practical telegraph work, means have to be found to distinguish a dot from a dash, and as it is not efficient to group two impulses of one polarity together, as is practiced today in cable telegraphy, or to prolong the whole force of the transmitting current for a comparatively long

time to produce a dash, as is used on land telegraphy, I have recourse to an arrangement as will hereinafter be more fully described and claimed.

The first requisite, as stated above, in telegraphing over lines with distributed capacity is, that an impulse of one polarity should always be followed by an impulse of opposite polarity and that these impulses should be, as far as is practical, of the same duration and also of the same electro-motive force. When an impulse is transmitted over a line with distributed capacity, the line is charged, so to speak, and it requires an impulse of opposite polarity to discharge this line. The longer the charging impulse lasts, the greater the charge bound by the dielectric of the line, and it requires then a prolonged charge of opposite polarity to nullify the effect of the charging current. But the charging of the line is not only in proportion to the duration of the impulse, but also to the strength or electro-motive force of said impulse; as for example, a line with distributed capacity will be charged to a certain extent with an impulse of say—100 volts—at one time unit to a far greater extent than if charged with a force of 10 volts for the same length of time.

To obviate, therefore, the difficulties aforesaid and to produce a system of telegraphing more efficient than the present double key system, I have recourse to the following arrangement:—I impress upon the line "true reversals;" i. e., impulses alternately of opposite polarity and of the same duration and intensity, the duration not exceeding the time unit for a dot; and I differentiate between the dot and dash by adding to the main impulse, an impulse of an electro-motive force low as compared with the impulse of the transmitting battery. In my system, therefore, the dot is sometimes symbolized by a positive and at other times by a negative impulse of one unit duration and of a potential equal to the whole transmitting force, and the dash is symbolized some times by an impulse of positive polarity and at other times by an impulse of negative polarity of one unit of time and of a potential equal to the whole transmitting force followed quickly by an impulse of about twice the duration but of a very low electro-motive force.

In some of my experiments, I have used a

battery of 26 volts such as is usually employed in cable telegraphy and I transmitted with this battery true reversals; *i. e.* impulses alternately of opposite polarity, and I prolonged the time duration for a dash with a battery of 4 volts. Such arrangement gave me very good results, more specially when I employed a line relay for the purpose of translating the received impulses into sound.

I have found by experiments, that it required only a very low electro-motive force to prolong the movement of the movable part of the relay for the purpose of producing a dash after the inertia was overcome through the force of the whole transmitting battery.

In the accompanying drawing, I have illustrated the effect of dots and dashes on a line in chart-like diagram.

In this drawing: 1 is the zero line; 2 represents the dot curve; 3 represents the dash curve, according to the old system; and 2 represents the dot curve; and 3 and 4 combined the dash curve according to the new system. In telegraphing, therefore,—for instance—the letter “b” (and starting with the positive impulse), I produce the dash by impressing upon the line a short positive impulse of the whole battery force followed by an impulse of the same polarity but of a force of say only 4 volts; and I produce the first dot by a short negative impulse, the second dot by a short positive impulse, and the third dot by a short negative impulse. It will, therefore, be seen that the characters of the alphabet are independent of the polarity of the impressed pulse and that no matter if this character is a dot or dash, the time unit of the whole transmitting force is always the same and the only difference between the symbolizing of these two characters comprises a short impulse of a very weak current.

In practical telegraphy, the dash sometimes is symbolized by the positive and sometimes by the negative current and the additional small force is, therefore, nearly neutralized and we have, in practice, a system approaching the “true reversal” style far

nearer than any of the existing systems of to-day.

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

1. The method of telegraphing over lines with great distributed capacity, which consists in impressing upon the line impulses alternately of opposite polarity but of the same intensity and duration, and differentiating between the dot and dash by adding to the dash impulse an impulse of same polarity but of comparatively low electromotive force.

2. In telegraphy, the method of differentiating between a dot and dash, which consists in impressing upon the line for the dot an impulse of short duration and impressing upon the line for the dash an impulse of short duration followed by an impulse of comparatively low electro-motive force.

3. In telegraphy, the method, which consists in symbolizing a dot by a short impulse of positive or negative polarity and symbolizing a dash by a short impulse of positive or negative polarity prolonged by an impulse of comparative low electro-motive force.

4. In cable telegraphy, the method of differentiating between code characters, which consists in impressing upon the line for each character an impulse of substantially alike duration and intensity, irrespective of polarity and prolonging one character-impulse by an impulse of same polarity but lower electro-motive force.

5. In cable telegraphy, the improvement, which consists in transmitting true reversals irrespective of the characters to be transmitted and differentiating then between the dot and dash by prolongation of the normal impulse with the aid of a source of current of comparatively low electro-motive force.

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

ISIDOR KITSEE.

Witnesses:

EDITH R. WILLEY,  
MARY C. SMITH.

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