L. M. POTTS.

APPARATUS FOR TRANSMITTING SIGNALS OVER TELEGRAPHIC CIRCUITS.

APPLICATION FILED JUNE 5, 1908.

952,944. **Patented Mar. 22, 1910.**

2 SHEETS—SHEET 1.

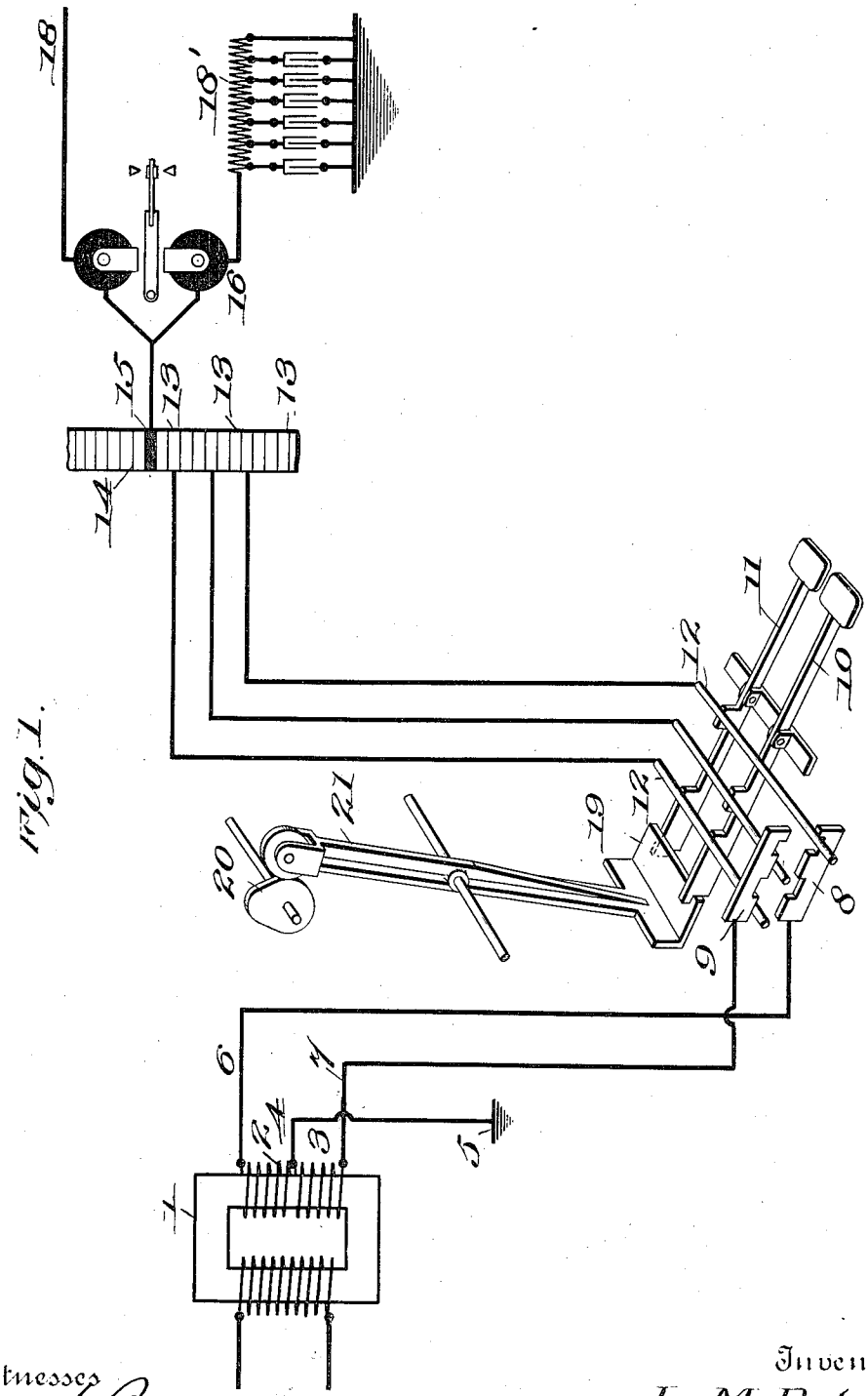

Fig. 1.

Witnesses
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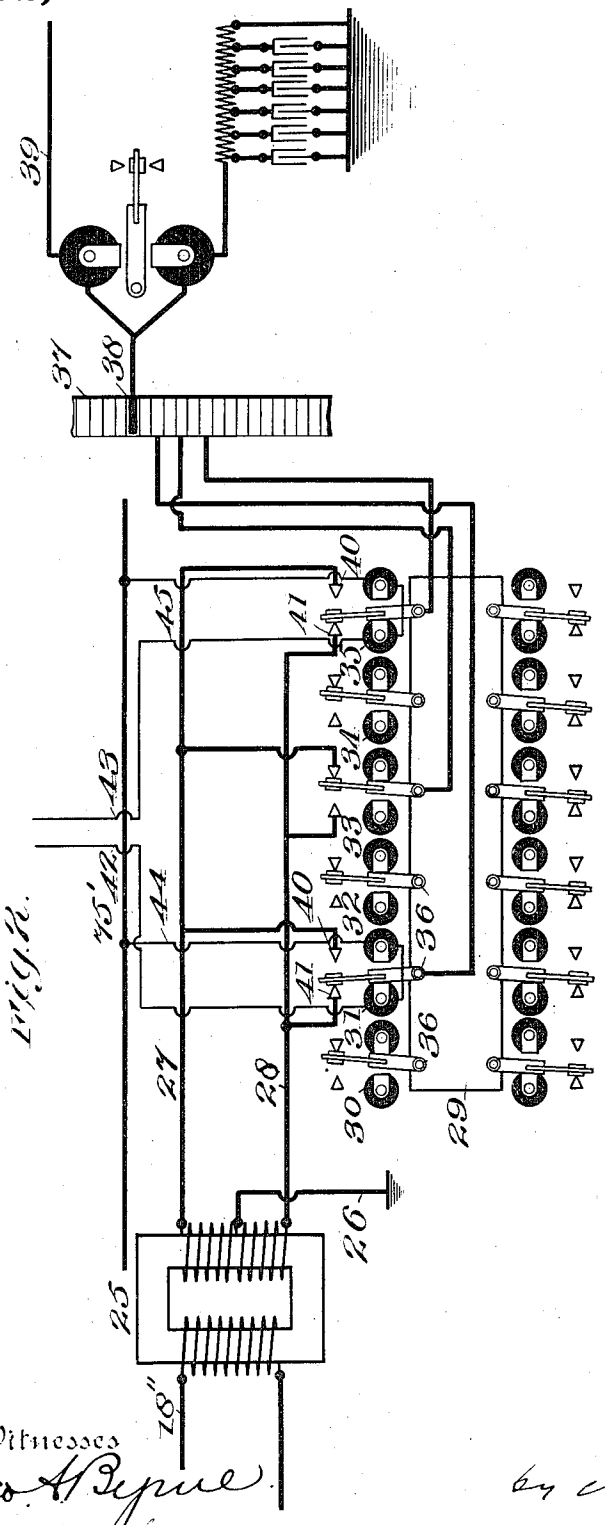

Fig. 2.

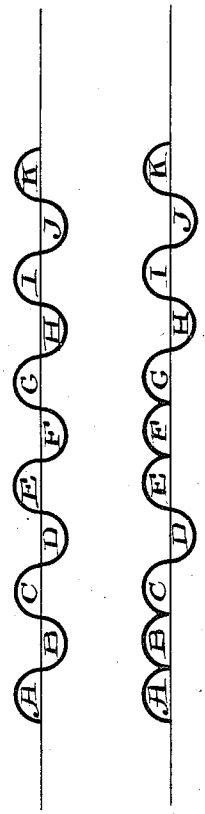

Fig. 3.

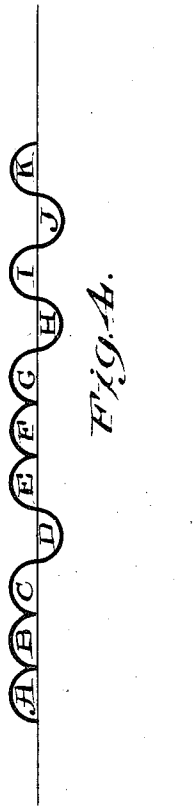

Fig. 4.

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UNITED STATES PATENT OFFICE.

LOUIS M. POTTS, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE ROWLAND TELEGRAPHIC COMPANY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR TRANSMITTING SIGNALS OVER TELEGRAPHIC CIRCUITS.

932,944. Specification of Letters Patent. Patented Mar. 22, 1910.

Original application filed January 25, 1908, Serial No. 412,628. Divided and this application filed June 5, 1908. Serial No. 436,977.

To all whom it may concern:

Be it known that I, LOUIS M. POTTS, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Apparatus for Transmitting Signals Over Telegraphic Circuits; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an apparatus for transmitting signals over telegraphic circuits, and the object of my invention is to produce such an apparatus as will be certain in action, easy to operate, and will be capable of using the present reversed wave method of transmission, all as more fully set forth in my copending application Serial No. 412,628, filed January 25, 1908, for a method of and an apparatus for transmitting signals, of which this case is a division.

To these ends I employ the now well known reversed wave method of transmission, coupled with a means connecting the normal or reverse sides of the transformer secondaries, to the segments of the sending commutator consisting of a switch which may be operated electro-magnetically, or otherwise.

My invention further consists in a novel repeating apparatus having the above structure, all as will be more fully hereinafter described and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals indicate like parts in all the views: Figure 1, represents diagrammatically a sending apparatus for use at a terminal station. Fig. 2, a like view of an apparatus for use at a repeating station, and Figs. 3 and 4, diagrammatic illustrations respectively of the unmodified and modified current half waves employed.

In the sending apparatus illustrated in Fig. 1, which is suitable for use at a sending terminal station, 1, represents a static transformer which is supplied with an alternating current. This transformer has two secondary windings 2 and 3, and the common terminal 4, of these secondaries is grounded at 5. The other terminals 6 and 7, are connected respectively to the contacts 8 and 9, on the key board as shown. This particular connection of the secondaries is such that when one of the line terminals is positive, the other is negative and vice versa. That is to say, the normal side 6, and the reverse side 7, of the secondaries of this transformer, are connected directly to the segments of the sending commutator by the means now to be described, and the electromotive force furnished by these two transformer line terminals always differs by 180°, as is well known.

The keys 10, 11, of the key board are so arranged that the depression of each key lever raises a certain number of contact bars 12, which overlie the said levers. Each of these bars 12, is connected to one of the segments 13, of the sending commutator 14, the brush 15, of which is connected to the split of the main line relay 16. The brush 15, is rotated by the same motor (not shown) which furnishes the alternating current for the transformer 1, as is customary in the Rowland telegraphic system; and it is so geared to said motor that the said brush will pass over one segment in the brief interval of time occupied by the semi-cycle, or half wave of the alternating current.

When no key lever on the key board is depressed, the contact bars rest against the lower contact strip 8, and as the brush 15, passes over the sending commutator an unmodified alternating current of the form shown in Fig. 3, is sent to line. When a key is depressed, however, certain of the bars 12, are raised (two in the Rowland system) which are thereby disconnected from the contact strip 8, and connected with the contact strip 9. When now the brush passes over the commutator 14, an alternating current is sent to line, as in the previous case, but the half waves corresponding to the bars 12, that have been raised are sent to line reversed, so that the general character of the current is that illustrated in Fig. 4. In other words, the key levers, bars 12 and contact strips 8 and 9, act as a mechanically operated switch for connecting the normal secondary 6, or the reverse secondary 7, of the transformer, to the commutator segments at will.

A lock 19, is provided over the ends of the

key levers which is so operated by the cam 20, and lever 21, contacting therewith, as to release said keys once in each revolution of the brush on the sending commutator. By this means the key levers raised are also locked in their upper positions as the brushes pass over the segments corresponding to the half waves sent out at the particular key board in question. In other words, in this system a plurality of key boards are used, and the keys on any particular key board cannot be operated when the brush on the sending commutator is making contact with any segments allotted to the key board in question, as is well known in the Rowland system.

The signals sent out from this apparatus traverse the real line 18, and artificial line 18′, in the manner well known; and may be received by any suitable means. When it is desired to repeat these signals, I provide banks 29 of magnets as shown in Fig. 2. In the Rowland system of telegraphy, as is well known, the half waves controlled at any one key board are eleven in number and are lettered from A to K as illustrated in Figs. 3 and 4. In bank 29, there are provided magnets 30, 31, 32, etc., for each of these half waves, and also back stops 40 by which each half wave may be transmitted in its normal condition, and front stops 41 by which each half wave may be reversed at will.

25 represents a transformer similar to transformer 1, fed from a suitable alternating circuit 18″, and having a secondary terminal 27 adapted to send out normal or unmodified half waves, and another secondary terminal 28 adapted to send out reversed or modified half waves.

26 represents a ground connection for the transformer secondaries, as shown.

The terminal 27 is joined in parallel to all the back stops 40; and the terminal 28 is likewise joined in parallel to all the front stops 41, of the repeating magnets in the bank, as shown. Each of the coils of magnets 30, 31, 32, etc., is connected at one end to a suitable conductor 42, 43, etc. The other end of each of these conductors is connected to a segment of a suitable receiving commutator, not shown, there being one segment, and therefore one conductor 42, 43, etc., for each of the eleven half waves used at any particular key board, and the said conductors are reversely connected to the coils of each alternate magnet.

In my original application above I have disclosed a suitable relay, operating synchronously with said commutator and fed from a suitable, direct current source, which operates to cause said conductors 42, 43, etc., to be traversed by alternating normal half waves, when no signals are being received, and which local half waves are synchronous with those received by said relay from the distant station. These unmodified local half waves, owing to the reversed connections just described, will also cause all the tongues 36 in the bank 29 to be thrown against their back stops 40. In order to complete the circuit for such half waves, the ends of the coils of the magnets not connected to the conductors 42, 43, etc., are joined to the wires 44, 45, etc., which connect with the wire 75′, and this wire as fully disclosed in my application above, furnishes a path through which the local circuit is completed. Each of the tongues 36 of the bank 29 is connected, as shown, to a segment of the repeating commutator 37, running synchronously with the receiving commutator, and is in turn through the brush 38, joined to the line 39, into which the message is to be repeated.

From what has been so far disclosed it will be evident that so long as no signals are received, the relay described in my original application will cause alternating half waves of current from a local direct current source, not shown, to traverse the wires 42, 43, etc.; that said local half waves will cause all the tongues 36 to contact with their back stops; and since the secondary terminal 27 is at all times ready to send normal or unmodified waves, that said terminal will send to line 39 alternating half waves from the transformers 25, which half waves will be synchronous with those originally received from the distant station, by the relay above mentioned. It was, also, disclosed in my original application, that when there was received from the distant station modified, or reversed half waves, constituting signals, that the conductors 42, 43, etc., and the coils of magnets 30, 31, 32, etc., were likewise traversed by reversed or modified half waves supplied from the local current feeding said relay; and that such reversed or modified half waves would cause their corresponding tongues to be thrown against their front stops 41. That is to say, it was made clear in my original application above, if the half wave B, Fig. 3, should be received by the relay, in its reversed condition, as illustrated in Fig. 4, that the connection 42, corresponding to said half wave B, would be likewise traversed by a reversed half wave from the local direct current source, and that the tongue 36 corresponding to said half wave would be thrown against its front stop 41, as shown. The same remarks apply to any other half wave such as F, and the tongue corresponding to which is likewise shown as thrown against its front stop 41. It is therefore also plain, that when reversed half waves pass through the receiving relay, from a distant station, the tongues 36 of bank 29, corresponding to said half waves will make contact with their

front stops, and thereupon directly join the line 39, with the secondary terminal 28, which in turn will impress upon said line reversed half waves which will be synchronous with those originally received. In other words, it is evident that this whole repeating bank of magnets 29, will act precisely as the transmitting key board illustrated in Fig. 1, although it is controlled from a distance, to send to line normal or unmodified half waves when no signals are being transmitted, and to send to line reversed or modified half waves when signals are being transmitted. The full connections with the magnets in bank 29, are omitted for the sake of clearness, except in the case of the magnets corresponding to half waves B and F.

The operation of my invention will be clear from the above, and therefore need not be repeated here. Suffice it to say, that an operator pressing upon the keys 10, 11 etc. in Fig. 1, will reverse the right combination of half waves to produce the proper signal at the distant station, and if such half waves are to be repeated, it is only necessary to join the repeater shown in Fig. 2, in the circuit, when said signals will be repeated into the line or lines to which it may be connected. Of course, if a plurality of key boards are used, which is generally the case, a plurality of repeaters will be, also, used, and as fully set forth in my original application, if a signal overload relay is employed, the long delays heretofore experienced due to defective synchronism will not be experienced.

I do not wish to be limited to the exact details of operation and construction herein disclosed, as it is evident that the same may be varied without departing from the spirit of my invention.

What I claim:—

1. In a telegraphic apparatus the combination of a plurality of sources of alternating half waves of current, a commutator; and means directly connecting said sources of current to said commutator and adapted to cause one of said sources to send only modified or reversed half waves to line, substantially as described.

2. In a telegraphic apparatus the combination of a plurality of sources of alternating half waves of current; a commutator; and means consisting of a switch directly connecting said sources of current to said commutator and adapted to cause one of said sources to send only modified or reversed half waves to line, and to cause the other source to send to line only unmodified half waves, substantially as described.

3. In a telegraphic apparatus the combination of a plurality of sources of alternating half waves of current; a commutator; a switch directly connecting said commutator with said sources and adapted to send the line modified and unmodified half waves; and means for holding said switch closed until the brush of said commutator picks up the said half waves and transmits them to line, substantially as described.

4. In a telegraphic apparatus the combination of a transformer provided with a secondary terminal adapted to send to line normal or unmodified half waves of current and another secondary terminal adapted to send to line modified or reversed half waves of current; a pair of contacts to which said terminals are connected; and means playing between said contacts and adapted at will to connect either of said terminals to line, substantially as described.

5. In a telegraphic apparatus the combination of a transformer provided with a secondary terminal adapted to send to line normal or unmodified half waves of current and another secondary terminal adapted to send to line modified or reversed half waves of current; a common ground for said terminals; a pair of contacts to which said terminals are connected; means playing between said contacts and adapted at will to connect either of said terminals to line; and a suitable commutator joined to said means and said line, substantially as described.

6. In a telegraphic apparatus the combination of a plurality of sources of alternating half waves of current; a commutator; and a switch directly and magnetically connecting said commutator with said sources and adapted to send to line modified and unmodified half waves, substantially as described.

7. In a telegraphic apparatus the combination of a plurality of sources of alternating half waves of current, consisting of a transformer having a plurality of secondary terminals provided with a common ground; a commutator; and a switch directly and magnetically connecting said commutator with said sources, comprising a plurality of magnets having armatures and front and back contacts, and adapted to send to line modified and unmodified half waves, substantially as described.

8. In a telegraphic apparatus the combination of a transformer provided with a plurality of secondary terminals having a common ground; a bank of repeating magnets having armatures and front and back stops; connections between one of said terminals and said front stops; connections between another of said terminals and said back stops; and connections between said armatures and the line, substantially as described.

9. In a telegraphic apparatus the combination of a transformer provided with a plurality of secondary terminals having a common ground; a bank of repeating magnets having armatures and front and back

stops; connections between one of said terminals and said front stops; connections between another of said terminals and said back stops; and connections between said armatures and the line, comprising a commutator synchronizing with said transformer, substantially as described.

10. In a telegraphic apparatus the combination of a transformer provided with a plurality of secondary terminals having a common ground; a bank of repeating magnets having armatures and front and back stops; connections between one of said terminals and said front stops; connections between another of said terminals and said back stops; connections between said armatures and the line, comprising a commutator synchronizing with said transformer; and means by which all of said armatures may be kept in contact with said back stops when no signals are being transmitted and by which some of said armatures are caused to make contact with their front stops when signals are transmitted, substantially as described.

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

LOUIS M. POTTS.

Witnesses:
HEYWARD E. BOYCE,
PHILIP H. HARRISON.