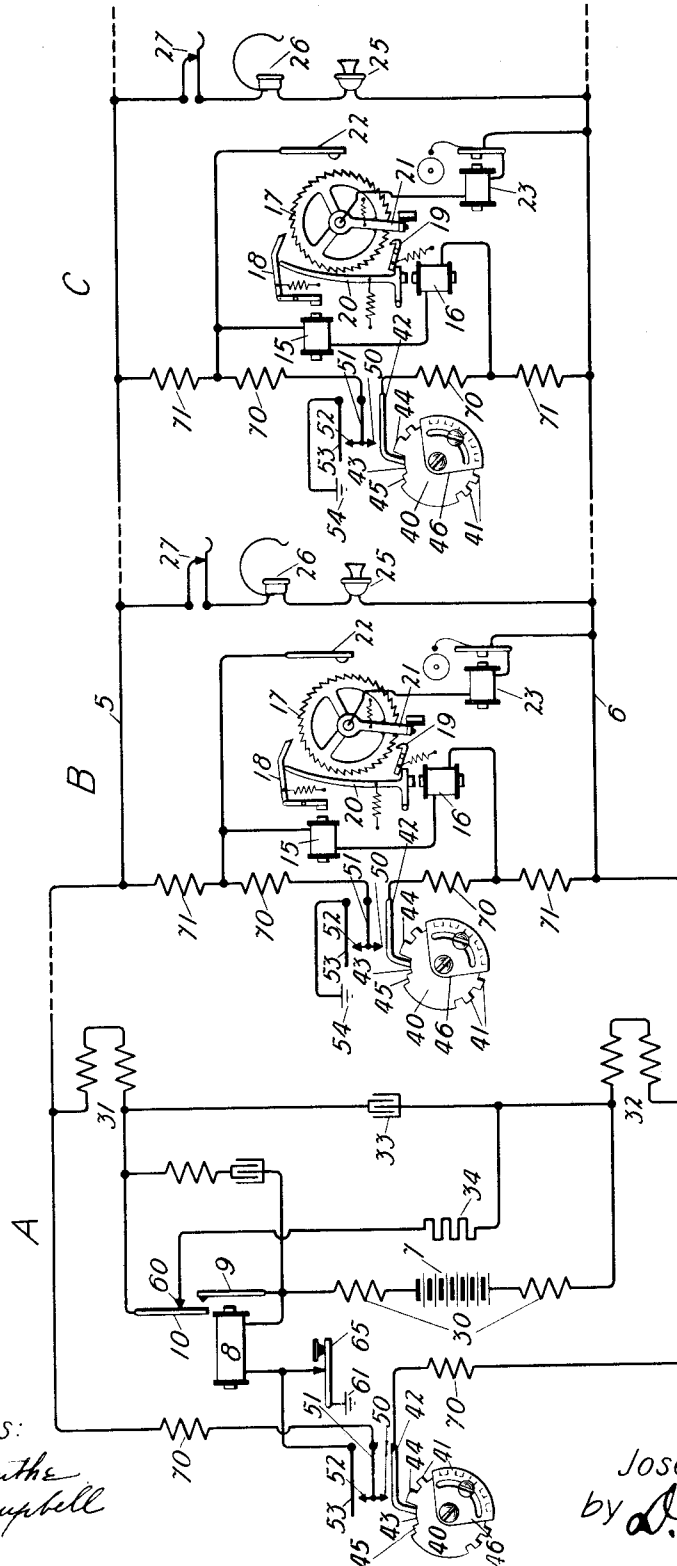


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 SIGNALING CIRCUIT FOR TRAIN DESPATCHING SYSTEMS.
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UNITED STATES PATENT OFFICE.

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SIGNALING-CIRCUIT FOR TRAIN-DESPATCHING SYSTEMS.

1,101,018.

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Patented June 23, 1914.

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To all whom it may concern:

Be it known that I, JOSEPH C. FIELD, citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Signaling-Circuits for Train-Despatching Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to party line selective signaling systems for train despatching or like purposes in which a plurality of way stations located upon a line are each provided with a selective device adapted, in response to a certain predetermined number of current impulses from a sending or despatching station, to close a circuit for a local signal.

The object of this invention is to provide means in a selective signaling system of this class for intercommunicating so that any way station attendant on the line can call or signal any other way station attendant upon the line without the assistance of the attendant at the sending or despatching station.

This invention is particularly adapted for use in connection with a selective signaling system in which the way station selectors are bridged across the line and an impulse sending relay located at a sending station is adapted to intermittently connect a source of current with the line to operate the selectors, the operation of the impulse relay being controlled by a circuit-closing key. In accordance with this invention there is provided at each of the way stations a circuit-closing key which when operated closes a circuit over the line through the impulse relay causing it to send back over the line current impulses for operating the selectors.

One of the features of this invention relates to the arrangement of the circuits and apparatus whereby a single battery may be used for operating the impulse relay and furnishing the current for the impulses sent out by the operation of said relay, this being accomplished by including the winding of the impulse relay in a circuit which is completed over the line wires to ground.

Another feature of this invention relates to the arrangement for increasing the re-

sistance of the impulse relay operating circuit when said relay is operated and consists in providing means in connection with said impulse relay for opening one of the parallel paths through the winding thereof when said relay operates.

Other features and advantages will be pointed out in the following detail description of the circuits and apparatus and the operation thereof.

The drawing is a diagram of a party line embodying this invention and illustrating schematically the apparatus used in connection therewith.

In said drawings A designates a sending or despatching station connected by means of line wires 5 and 6 with way stations B and C. Located at said sending station is a battery 7 and an impulse relay 8 adapted when operated to close contact levers 9 and 10 to send impulses from said battery 7 over the line wires as will be more fully described hereinafter.

At each of the way stations is a selector mechanism comprising quick and slow-acting magnets 15 and 16, a ratchet wheel 17 and stepping and holding pawls 18 and 19 normally retained out of engagement with said ratchet wheel 17 by means of an arm controlled by said slow-acting magnet 16. An arm 21 carried by said ratchet wheel 17 is adapted in the rotation of said ratchet wheel to engage a contact 22 to close a circuit through a signal 23. The quick and slow-acting magnets 15 and 16 for each selector are connected in series and bridged across the line wires 5 and 6. In the operation of the selector a current impulse from the battery 7 of sufficient duration to operate the slow-acting magnet 16 is put upon the line. The operation of said slow-acting magnet 16 withdraws the arm 20 from engagement with stepping and holding pawls 18 and 19 to permit them to engage the ratchet wheel 17. Succeeding impulses of short duration are then sent over the line which operate the quick-acting magnet to cause the stepping pawl 18 to rotate the ratchet wheel 17 through a sufficient arc to bring the contacts 21 and 22 into engagement with each other. When said contacts 21 and 22 are closed

current is held on the line for a long enough period to cause the operation of the signal 23. In addition to the selector mechanism and signal there is located at each of said way stations B and C a telephone set embracing a transmitter 25 and a receiver 26 adapted to be bridged across the line wires 5 and 6 by means of a key 27.

As shown on the drawing the battery 7 is adapted to be connected with the line wires 5 and 6 through retardation coils 30, 31 and 32. These coils act in conjunction with a condenser 33 in bridge of the line to smooth out or graduate the current impulses used in selecting in order that no disagreeable click or thump will be heard in receivers which may be connected with the line during a signaling operation. A bridge including a non-inductive resistance 34 normally closed across the line at the sending station is adapted to be intermittently opened by the operation of the contact levers 9 and 10 of the impulse relay 8, said non-inductive resistance serving as a temporary discharge path for the graduating devices in order that the current impulses on a heavily loaded line will not be too prolonged to permit the proper operation of the quick-acting stepping magnet.

The apparatus and operating circuit arrangement for sending the selector operating impulses over the line will now be referred to in detail. Located at the sending station A and at the way stations B and C is an impulse transmitting wheel 40 which may be rotated by a clockwork or other suitable mechanism. As shown each of said wheels has formed upon the larger portion of its periphery a plurality of equally spaced teeth 41, 41 adapted to pass beneath a circuit-closing spring 42 which normally rests in a recessed portion 43 in said wheel which is deeper than the notches separating the teeth 41, 41. Just adjacent to one end of the portion 43 is a tooth 44 having a wider face than the teeth 41, 41 and it is this tooth which first passes under the spring 42 when said wheel starts to rotate, the purpose of which is to keep the current on the line a sufficient length of time to cause the operation of the slow-acting magnet. Adjacent to the opposite end of said recessed portion 43 is a step 45, the same depth as the bottom of the teeth 41, 41, over which said spring 42 passes just before it falls into the portion 43 at the end of a revolution of said wheel 40. The number of teeth which pass under the spring 42 for signaling purposes is determined by means of an adjustable plate or segment 46 mounted upon the wheel 40 with its periphery flush with the outer ends or top of the teeth 41, 41. The passing of the spring 42 over the segment 46 causes a prolongation of the current im-

pulse on the line which operates the signal of the selected station.

The operation of the parts for the calling of any way station by another will be as follows: Assuming that attendant at station B desires to signal station C, he will set his impulse transmitter so that it will send the requisite number of impulses for closing the signaling circuit at station C and start the wheel 40 to rotating. As the tooth 44 on said wheel 40 comes into engagement with the spring 42 it will move said spring to close a contact 50 on a spring 51 which spring will in turn be moved to close a contact 52 on a spring 53 which is connected with ground at 54. As the spring 42 is connected with the line conductor 6 and the spring 51 with the line conductor 5, both of said line conductors will be grounded when the contacts 50 and 52 are closed and there will be established for an instant a parallel circuit for the impulse relay 8 over the two line conductors. The path over conductor 5 may be traced from ground at 54 over line conductor 5 through retardation coil 31 through a normally closed contact 60 on contact lever 10, non-inductive resistance 34, one-half of the retardation coil 30, battery 7, the other half of retardation coil 30, winding of impulse relay 8 to ground at 61. The other path will be from ground 54 through contacts 52 and 50, line conductor 6, retardation coil 32, one-half of the retardation coil 30, battery 7, the other half of the retardation coil 30 and the winding of the impulse relay 8 to ground at 61. This will energize the impulse relay 8 and close the contact through the levers 9 and 10 to connect the battery 7 with the two-line wires 5 and 6 for operating the magnets of the selectors. The instant the impulse relay 8 is energized the contact at 60 will be opened thus opening the path over the line conductor 5 and reducing the amount of current through said impulse relay about one half. As the spring 42 leaves the top of the tooth 44 it drops into the space between it and the succeeding tooth; this space is just deep enough to permit the opening of the contact 52 but not the contact 50 so that although the battery circuit through the impulse relay will be opened the springs 42 and 51 will still maintain a bridge of the line. This bridge will be maintained all the time that calling impulses are being sent over the line and will be opened only after the step 45 has passed under the spring 42. The advantage of this arrangement is that it prevents putting a tone upon the line by reason of any change of potential across the line wires during the sending of the selecting impulses.

The arrangement whereby the current through the impulse relay 8 is reduced to

very nearly one-half its value after the operation of said relay is an important feature of the circuit arrangement as it means that leaks to ground, which have the effect of preventing the release of the relay, are practically halved in value after it operates, and said relay can therefore be released with almost twice the amount of leak that it would be possible to release it through if it is receiving current over both sides of the line. The use of the one battery for operating the impulse relay and furnishing the calling current is also of considerable advantage inasmuch as it does away with additional equipment and the consequent additional attention to keep the system in operation. The ground 61 at the despatcher's station is connected through a key 65 with the winding of the impulse relay 8 in order that the grounded circuit may be opened at this point to enable the despatcher to call without ground connection in case that the leakage current becomes so great during extreme weather conditions that it interferes with the operation of the impulse relay. Tapering or variable resistances 70, 70 are inserted between the calling keys at the sending and way stations and the line wires for the purpose of balancing the line. Impedance coils 71, 71 are inserted in the selector bridge to protect the apparatus against lightning.

I claim:

1. In a selective signaling system, in combination a line comprising a metallic pair, selective signaling means in bridge of said pair, impulse sending means for operating said selective signaling means over said metallic pair, means for grounding the opposite sides of said metallic pair to operate said impulse sending means, and means for increasing the resistance of the grounded circuit upon the operation of said signal impulse means.

2. In a selective signaling system, in combination a line comprising a metallic pair, selective signaling means connected with said metallic pair, impulse sending means for operating said selective signaling means over said metallic pair, means for grounding the opposite sides of said metallic pair to operate said impulse sending means, and means for opening one side of said grounded circuit upon the operation of said impulse sending means.

3. In a selective signaling system the combination with line wires having a sending station and a plurality of way stations connected therewith, of a selector at each of said way stations responsive to current impulses, a source of calling current located at said sending station, an impulse relay at said sending station for connecting said source of current with said line wires, an operating circuit for said relay including

said line wires and said source of current, circuit-closing means and connections at said sending and said way stations for operating said impulse relay, and means for increasing the resistance of the circuit through said impulse relay when said relay is energized.

4. In a selective signaling system the combination with line wires having a sending station and a plurality of way stations connected therewith, of a selector at each of said way stations responsive to current impulses, a source of calling current at said sending station, an impulse relay for connecting said source of calling current with said line wires, an energizing circuit for said relay including said source of current and the line wires, circuit-closing keys and connections at said stations adapted to complete a circuit from said impulse relay over both said line wires in parallel to ground and means controlled by the operation of said relay for opening the path through one of said line wires.

5. In a selective signaling system the combination with line wires having a sending station and a plurality of way stations connected therewith, of a selector at each of said way stations responsive to current impulses, a source of calling current at said sending station, an impulse relay for connecting said source of calling current with said line wires, circuit-closing means and connections at said stations, an energizing circuit for said relay from ground over said line wires in parallel completed by said circuit closing means and connections and a normally closed contact controlled by said relay through which the circuit for said impulse relay over one of said line wires is completed.

6. In a selective signaling system the combination with line wires having a sending station and a plurality of way stations connected therewith, of a selector bridged across the line wires at each of said way stations responsive to current impulses, a source of calling current at said sending station, an impulse relay at said sending station for connecting said source of calling current with said line wires, said impulse relay having an operating circuit including said line wires, step-by-step circuit-closing key at each of said stations for operating said impulse relay, and a resistance bridge at each of said stations maintained across said line wires by the corresponding circuit-closing key during its operation.

7. In a selective signaling system the combination with line wires having a sending station and a plurality of way stations connected therewith, of a selector bridged across the line at each of said way stations responsive to current impulses, a source of calling current at said sending station, an impulse re-

lay for connecting said source of calling current with said line, an operating circuit for said impulse relay including said source of current and said line wires, a normally open resistance bridge at each of said stations, a step-by-step circuit-closing key at each of said stations, a contact controlled by said key adapted to maintain said bridge closed during the calling operation and a second contact intermittently closed by the operation of said circuit-closing key to complete the operating circuit of said impulse relay. 10

In witness whereof, I hereunto subscribe my name this 29th day of March A. D., 1911.
JOSEPH C. FIELD.

Witnesses:

IRVING MACDONALD,
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