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J. F. TOOMEY

SIGNALING SYSTEM

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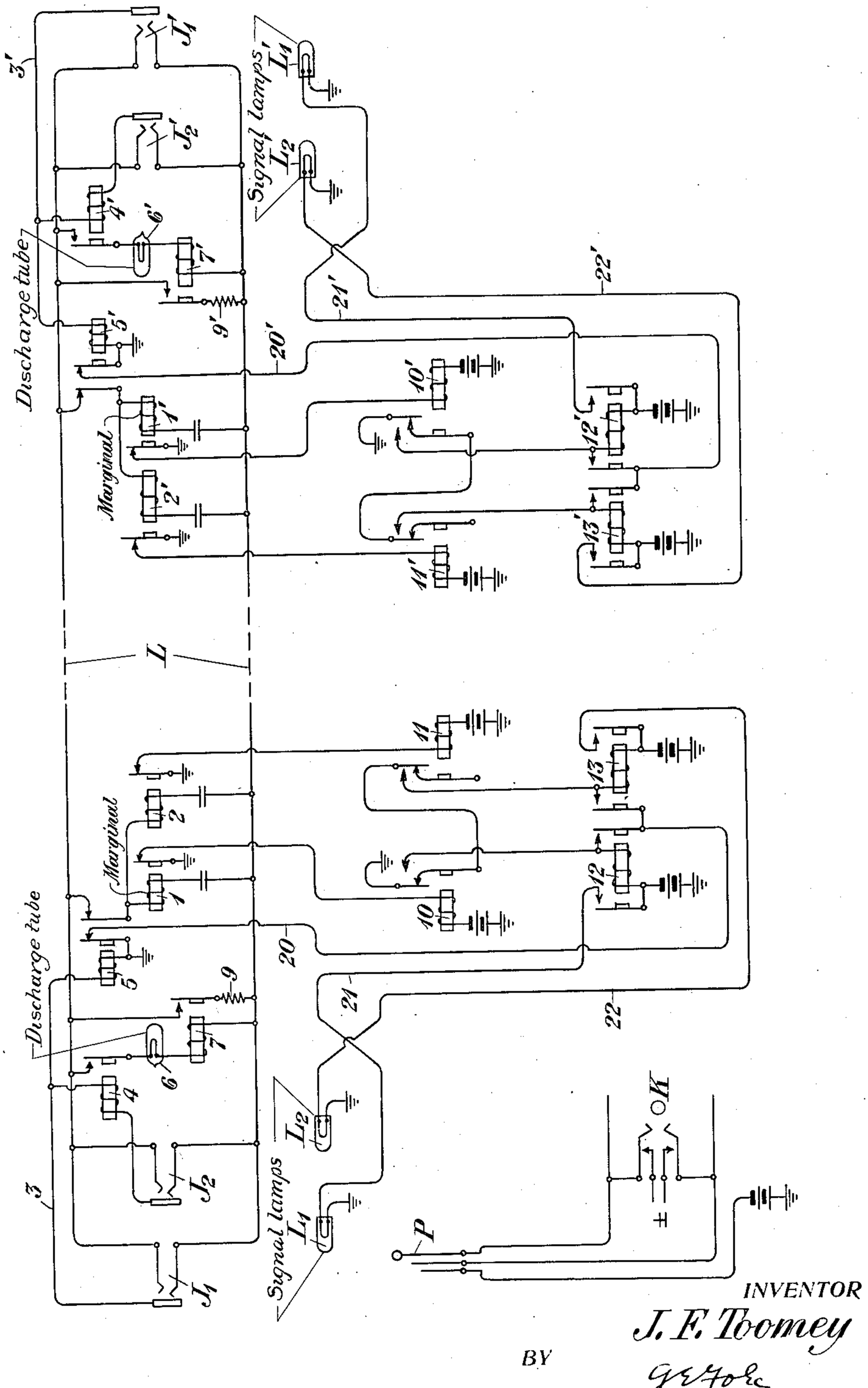

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SIGNALING SYSTEM.

Application filed April 22, 1924. Serial No. 708,269.

To all whom it may concern:

Be it known that I, JOHN F. TOOMEY, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Signaling Systems, of which the following is a specification.

This invention relates to transmission circuits and more particularly to improvements in signaling arrangements associated therewith.

One of the cardinal features of the arrangements of the invention consists in the provision in the circuits of the signaling relays of a discharge tube, such for example as a neon tube, or any tube filled with gas having the properties that under normal conditions it will present an open circuit to currents but when subjected to a critical voltage will break down and thus present a closed circuit for the associated relay arrangements. The tube in its normal condition will not be affected or break down from the usual message currents transmitted over the circuit and the signaling path will remain open. However, when a high enough voltage, such as the voltage of the currents used for signaling, is applied to the line, the tube will break down and the discharge which will take place in the tube closes the normally open signaling circuit. The arrangements of the invention afford the important advantage that any number of signaling relays may be bridged across a transmission circuit without in any way impairing its transmission efficiency because the circuits of the signaling relays or devices will be open at the tubes except during the signaling interval and hence will present an infinite impedance across the line. Furthermore, the arrangements of the invention permit the use of many desirable selective signaling features which would otherwise be difficult and expensive to obtain. Other features and objects of the invention will appear more fully from the following detailed description thereof.

In the drawing is illustrated a circuit diagram of a toll line providing selective signaling between two stations in which the various features of the invention are illustrated.

In the drawing is shown a transmission line, such as the toll line L, interconnecting two stations A and B. The line L terminates at station A in the jacks J^1 and J^2 which might be located at different positions. Associated with each of the jacks are provided the signal lamps L_1 and L_2. A sleeve circuit 3 is common to both jacks and includes the relays 4 and 5. Relay 5 is a cut-off relay and relay 4 controls the circuit of a signaling relay 7. Connected in series with relay 7 is the discharge tube 6, such for example as a neon tube. The discharge tube 6 is filled with a gas such that it will normally not be affected by the ordinary telephone currents transmitted over line L when it is bridged across said line. However, when the signaling currents of higher voltage are applied to the line this voltage will cause the discharge tube to break down and the ensuing discharge will cause a circuit to be closed through relay 7. This presents a distinct advantage in a long distance line such as shown in that a signaling relay such as 7 may be bridged across the circuit and will in no way impair the transmission of the telephonic currents as the signaling circuit will be normally of infinite impedence as bridged across said line. The number of signaling relays which may in this manner be bridged across the circuit is not limited. The relay 7 in the case shown controls the bridging across the line of a resistance 9 for purposes to be pointed out hereinafter. Bridged across line L are the signaling relays 1 and 2. Relay 1 is marginal and will only operate on signaling current of a predetermined strength while relay 2 will operate on all of the signaling currents utilized. Relays 1 and 2 control relay 10 and 11, which in turn control relays 12 and 13 to operate the signal lamps L_1 and L_2, as will be pointed out in detail hereinafter. Adapted to cooperate with the jacks J_1 and J_2 is the plug P of a toll cord, only a portion of which is shown. In the toll cord is provided a ringing key K whereby a source of signaling current may be applied to the line. This signaling current will be of sufficient voltage to cause the discharge tubes, such as 6, to operate. At station B are provided arrangements identical with those at station A. Accordingly, like parts have been designated by like reference characters with the added designation of prime.

The operation of the arrangements is as follows: If the operator at station A desires to signal one of the positions at station B the plug P of the toll cord will be inserted

in one of the jacks, such as jack J_1. A circuit will then be completed from battery in the sleeve of the cord over the sleeve of line L to the relay 5 and ground. This will operate the relay 5, which will pull up its armatures and open the circuits of the relays 1 and 2 bridged across the circuit. The operator will then throw the key K and apply signaling current to the conductors of the line L, which will be transmitted to station B and thence through relays 1′ and 2′ bridged across the line conductors. This signaling current will operate both the relays 1′ and 2′, which will pull up their armatures and open the normally closed circuits through relays 11′ and 10′ thereby causing these relays to release. The release of relay 10′ will cause ground to be applied to the make contact of relay 10′, through the winding of relay 12′, to battery, thereby operating relay 12′. The release of relay 10′ will remove the ground ordinarily applied to the armature of relay 11′ so that the release of relay 11′ will not cause relay 13′ to operate at this time. The operation of relay 12′ will connect battery from its right-hand armature and contact to conductor 21′ and thence to the signal lamp L'_1. Accordingly the signal lamp L'_1 at the position at which jack J'_1 is located may be lighted by the above operations. A locking circuit for relay 12′ will be closed from ground, armature and contact of relay 5′, conductor 20′, left-hand armature and contact of relay 12′, winding of relay 12′, to battery and ground.

If the operator at station A desires to signal one of the other positions at station B, such for example, as the position at which lamp L'_2 is located, the plug P will be inserted in jack J_2 and the key K will be thrown. The relay 4 is included in the sleeve circuit closed by this operation and it will be operated as well as the cut-off relay 5. The operation of relay 4 will bridge across the line conductors the circuit including the discharge tube 6 and the relay 7. The voltage of the signaling current applied to the line by the operation of key K is sufficiently great as that tube 6 will break down and the ensuing discharge taking place therein will allow the signaling current to flow therethrough and through the winding of relay 7 and thus cause relay 7 to operate. It is pointed out again that the voltage of the telephonic currents transmitted over the line conductors is not sufficiently great to cause a discharge to take place in the tube 6 so as to operate it. The operation of relay 7 will bridge across the line conductors the circuit 8 which includes a resistance 9. Accordingly, a portion of the signaling current will be shunted over circuit 8 and resistance 9 and the signaling current transmitted on to station B will be materially reduced. This reduced signaling current will be transmitted through relays 1′ and 2′. However, the strength of the signaling current will be so reduced that relay 1′ which is marginal will not be operated thereby but relay 2′ will be operated. Relay 2′ will open the circuit of relay 11′ and release it. This will allow the following circuit to be completed,—from ground, lower contact of relay 10′, armature and upper contact of relay 11′, winding of relay 13′, to battery and ground. This will operate relay 13′ which will pull up its armatures and close a circuit from battery, left-hand armature and contact of relay 13′, conductor 22′, to lamp L'_2, thereby operating lamp L'_2 located at the position at which jack J'_2 is located. A locking circuit for relay 13′ will also be closed from ground, armature and contact of relay 5′, conductor 20′, right-hand armature and contact of relay 13′, to battery and ground. With such an arrangement the operator at station A may selectively signal any of the positions at station B.

While an arrangement has been shown whereby the discharge tube and signaling relay 7 indirectly control signaling apparatus at a distant station, nevertheless, the signaling relay 7 might well be utilized to directly control other types of signaling apparatus. It is also pointed out that selectivity in signaling from the point of view of the direction of the current flow may also be attained by employing the arrangements of the invention, such as a discharge tube and a signaling relay bridged across the line conductors, for while the voltage applied at station A and flowing toward station B might be high enough to break down and operate the tube at station A, nevertheless, the same signaling voltage applied at station B and flowing toward station A by the time it traversed a long distance line and reached station A would be so reduced that it would not operate the discharge tube at A. Hence the tube at station A would operate with current flowing in one direction but not with current flowing from the other direction.

Accordingly, while the arrangements of the invention have been disclosed as embodied in certain specific arrangements which are demed desirable, it is understood that they are capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A transmission line to which are applied currents of relatively low voltage and currents of higher voltage, and a circuit bridged across said transmission line including signaling means and a discharge tube, said discharge tube being of such construction that it will maintain said bridged circuit open when subjected to said low volt-

ages and will operate to close said bridged circuit when subjected to said higher voltages.

2. A transmission line to which are applied telephonic currents of relatively low voltage and signaling currents of higher voltage, and a circuit bridged across said transmission line including signaling means and a discharge tube in series, said discharge tube being of such construction that it will not operate when subjected to said low voltage currents and hence will cause said bridged circuit to present substantially an infinite impedance across said transmission line and will break down and operate when subjected to said currents of higher voltage and thus close said bridged circuit for operating said signaling means.

3. A transmission line interconnecting two stations, signaling devices and signaling relays at each of said stations, said signaling relays at each station being responsive to currents of different strengths for selectively operating the signaling devices thereat, means at one of said stations for applying to said line telephonic currents of relatively low voltage and signaling currents of higher voltage, and means at one of said stations for varying the strength of the signaling currents transmitted over said line, said means comprising a circuit adapted to be bridged across said transmission line and including in series a relay and a discharge tube, said discharge tube being of such construction that it will maintain said bridged circuit open when subjected to said low voltages and will operate to complete said bridged circuit when subjected to said higher voltages, and means controlled by said relay for bridging an impedance across said line.

4. A transmission line interconnecting two stations, signaling devices and signaling relays at each of said stations, said signaling relays at each station being responsive to currents of different strengths for selectively operating the signaling devices thereat, means at one of said stations for applying to said line telephonic currents of relatively low voltage and signaling currents of higher voltage, means at one of said stations for varying the strength of the signaling current transmitted over said line, said means comprising a circuit adapted to be bridged across said transmission line, and selective means at said station for bridging said circuit across said line, said bridged circuit including in series a relay and a discharge tube, said discharge tube being of such construction that it normally presents an open circuit when subjected to said relatively low voltages but will operate and present a closed circuit when subjected to said higher voltages, and means controlled by said relay for bridging an impedance across said line.

5. A transmission line interconnecting two stations, signaling devices at each of said stations, means at one of said stations for applying to said line telephonic currents of relatively low voltage and signaling currents of higher voltage, a circuit bridged across said line at said station and including in series a discharge tube and a relay, said discharge tube being of such construction that it normally presents an open circuit when subjected to said relatively low voltages and operates to present a closed circuit when subjected to said higher voltages, and means controlled by said relay for controlling said signaling devices at said distant station.

In testimony whereof, I have signed my name to this specification this 19th day of April, 1924.

JOHN F. TOOMEY.