

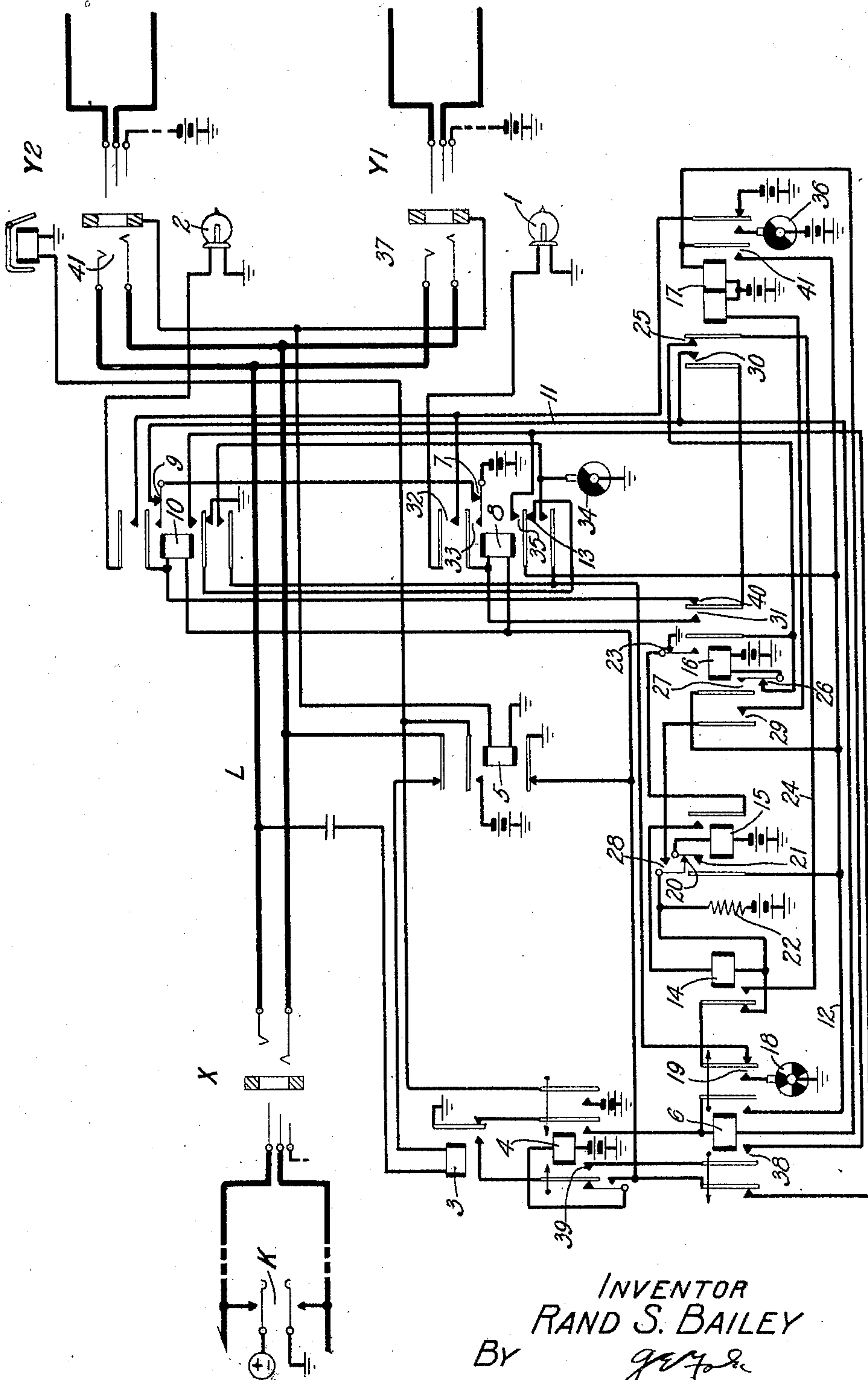
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TOLL TRUNK CIRCUIT

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TOLL TRUNK CIRCUIT.

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This invention relates to improvements in signaling systems. More particularly, it relates to improved arrangements for controlling the operation of signaling devices employed at toll offices in connection with telephone lines wherein a ring-down trunk or toll line is terminated at a plurality of toll operators' positions, such for example, as at both an inward and a through position, each line at each position being provided with a line lamp or other signaling device.

In such systems it is sometimes desirable that an operator at the other end of the line be able to selectively actuate the signal device at either the inward or through position. In one aspect of the present invention means for satisfying this need are provided whereby the signal device at one position or the other is actuated depending on the number of times the ring-up relay operates within a predetermined time interval, as for example, once for the inward position and twice for the through position.

Further, it may sometimes occur that a call, indicated by a signal at one of these positions, remains unanswered for more than a predetermined period of time. In a second aspect of the invention an arrangement is provided, comprising in addition to the means for selectively displaying one or the other of the line signals, means for changing the condition of the displayed signal in such a manner that it will be noticeable to the operator.

In a specific and preferred embodiment of the invention electric lamps are employed as signaling devices at each position, one or the other of which is steadily lighted in response to one or two successive operations of the ring-up relay, and after a predetermined time interval the steadily lighted lamp is changed to a flashing lamp in case the call has not been answered in the meantime.

The invention will be readily understood from the following description when read in connection with the accompanying drawing, in which L represents a line outgoing from an operator's position X and terminating in multiple at operator's positions Y¹ and Y², at which positions line lamps 1 and 2 are respectively located.

A description of the operation of the system of this invention will now be given. It will be first assumed that the operator at position Y¹ is desired. The operator at po-

sition X, therefore, plugs into the line L and rings once by operating the key K, whereupon the bridged ring-up relay 3 at the incoming end of the line operates, which in turn closes an obvious circuit for the operation of relay 4, which relay locks up in an obvious circuit to ground on the back contact of the sleeve relay 5. When the operator at X stops ringing, by releasing the key K, relay 3 releases thereby closing a circuit for relay 6, which may be traced from battery, normal contacts 7 of relay 8, normal contacts 9 of relay 10, conductor 11, winding of relay 6 and inner right operated contacts of relay 4 to ground at the back contact of relay 3. Relay 6 operates in this circuit and in closing locks itself up to a holding ground at the back contacts of relay 10, over conductor 12 and contacts 13 of relay 8. Relay 6 is, therefore, held up through back contacts of the relays 8 and 10 in series. As soon as relay 6 operates, the counting relays 15, 14, 16 and 17 operate in sequence from the 60 I. P. M. interrupter 18, relays 15, 16, and 17 locking to ground on conductor 12 through the back contacts of relay 10, as previously described in connection with relay 6. The operation of these counting relays will now be described: When relay 6 operates, it closes its contacts 19, thereby connecting interrupter 18 through the winding of relay 15 to battery over the back contact of relay 14 and contacts 20 of relay 15. When the brush of interrupter 18 makes contact with a ground segment, relay 15 operates and locks up at its contacts 21 to ground on conductor 12, which is supplied over contacts 13 of relay 8 and back contacts of relay 10. Relay 15 in operating closes at its right hand contacts a path for operating relay 14, which may be traced from battery, resistance 22, winding of relay 14, right hand contacts of relay 15, normal contacts 23 of relay 16 to ground. The operation of relay 14 transfers the interrupter 18 from the operating circuit for relay 15 to conductor 24, thereby preparing an operating circuit for relay 16 which will be completed when the brush of interrupter 18 again connects with a ground segment. The operation of relay 16 may be traced from ground at interrupter 18, contacts 19 of relay 6, operated contacts of relay 14, conductor 24, normal contacts 25 of relay 17, normal contacts 26 of relay

16 and the winding of this relay to battery. When relay 16 operates, it locks itself, as before mentioned, over its contacts 27 to ground on conductor 12 as previously described. Relay 16 in operating opens the holding ground at its contacts 23 for relay 14, which relay thereupon releases. A circuit is now prepared for the operation of relay 17 from ground at interrupter 18. This circuit may be traced as follows: ground at interrupter 18, contacts 19 of relay 6, normal contacts of relay 14, contacts 28 of relay 15, contacts 29 of relay 16 and left hand winding of relay 17 to battery. When ground is applied to this circuit at the interrupter 18, relay 17 operates and locks up through its right hand winding through contacts 41 to ground on conductor 12, as previously described. When relay 17 operates, the following circuit is completed for the operation of relay 8: battery, contacts 7 of relay 8, contacts 9 of relay 10, contacts 30 of relay 17, contacts 31 of relay 16, winding of relay 8 to ground at the lower back contact of sleeve relay 5. Relay 8 operates in this circuit. The operation of relay 8 removes battery at its contacts 7 to release relay 6 and opens at its contacts 13 the locking ground previously supplied to conductor 12, thereupon causing the release of relays 17, 16, and 15. When relay 17 releases it completes a circuit for lighting line lamp 1, which may be traced from battery, outer right normal contacts of relay 17, contacts 32 of relay 8 and the filament of lamp 1 to ground. Lamp 1 burns steadily in this circuit. It will be noted that when relay 8 operated, it locked itself up over its contacts 33 to ground at the lower contacts of sleeve relay 5.

When relay 8 operated and relay 6 released, a 15 I. P. M. interrupter 34 is substituted for the 60 I. P. M. interrupter 18 to again cause relays 15, 14, 16 and 17 to be sequentially operated and this time locking up to ground over the lower back contacts of relay 5, outer left back contact of relay 6 and contacts 35 of relay 8 to conductor 12. Relays 15, 14, 16, and 17 are operated in sequence from the slower interrupter 34 in exactly the same manner as described in connection with interrupter 18 and when relay 17 operates, it removes the steady battery from line lamp 1 and substitutes battery through interrupter 36, thereby causing the lamp 1 to flash as an indication to the operator that the call has remained unanswered for a relatively long period and that it should be given immediate attention. When the operator at position Y¹ answers by plugging into the jack 37, battery on the sleeve of her answering cord causes the operation of relay 5, thereby removing the holding ground from conductor 12, as previously described, whereupon relays 4, 8,

15, 16, and 17 release. When the operator at position Y¹ removes her plug from the jack 37, sleeve relay 5 releases and the circuit is returned to normal.

It will now be assumed that the operator at position X desired to signal the operator at position Y². She, therefore, plugs into the line L and operates her ringing key twice, thereby sending two impulses of ringing current over the line. On the first impulse of ringing current, relays 3, 4, 6, 15, and 14 operate as previously described, but if the operator at position X transmits a second impulse to again operate relay 3 before relay 16 is operated from interrupter 18, a circuit will be completed for the immediate operation of relay 17, which may be traced as follows: battery, right hand winding of relay 17, contacts 38 of relay 6, contacts 39 of relay 4 and the front contacts of relay 3 to ground. Relay 17 in operating at this time completes a circuit for the operation of relay 10 which may be traced from battery, contacts 7 of relay 8, contacts 9 of relay 10, contacts 30 of relay 17, contacts 40 of relay 16, winding of relay 10 and lower back contact of sleeve relay 5 to ground. When relay 17 operated, it locked up as before to ground on conductor 12, but the operation of relay 10 removed this ground and also the operating battery of relay 6, thereby causing relays 6, 15, 14 and 17 to release. The release of relay 17 now completes a steady battery supply circuit for line lamp 2 over the upper contacts of relay 10, thereby causing this lamp to burn steadily. The operation of relay 10 and the release of relay 6 again substitutes, the slow interrupter 34 for the fast interrupter 18 in the operating circuit for relays 15, 14, 16 and 17, as previously described and these relays are thereupon operated in this order as also previously described to cause the flashing of lamp 2 in series with interrupter 36 when relay 17 is operated in case the call is not answered within the time required to go through this cycle of operations. When the operator at position Y² answers by inserting her answering cord in jack 41, sleeve relay 5 is operated, which releases relays 4 and 10 and when the plug is removed, relay 5 releases, thereby restoring the circuit to normal. The time required before relay 16 operates after the first impulse of ringing current is sufficient to permit the operator at position X to operate her key a second time in case she desires to signal the operator at position Y².

What is claimed is:

1. In a signaling system, a line, a plurality of operators' positions at which said line appears, a signal for said line at each of said positions, and means comprising a periodically operating interrupter mechanism and a sequentially operating chain of

relays controlled in their operation by different numbers of signal impulses for selectively operating said signals.

2. In a selective signaling system, a line, a plurality of operators' positions, a signal for said line at each of said positions, an interrupter, and a chain of sequentially operating relays jointly controlled in their operation by said interrupter and by different numbers of signal impulses for selectively operating said signals.

3. In a selective signaling system, a line, a plurality of operators' positions at which said line appears, a signal for said line at each of said positions and means including a periodically operating interrupter associated with said line responsive to different numbers of signal impulses for selectively operating said signals.

4. In a selective signaling system, a line, a plurality of operators' positions at one end thereof at which said line appears, a signal for said line at each of said appearances, an electroresponsive device associated with said line and responsive to ringing currents in said line, an interrupter and means comprising a chain of sequentially operating relays in part controlled by said interrupter and responsive to a single actuation of said device to cause the display of a first one of said signals and responsive to a second actuation within a predetermined time interval to cause the display of another of said signals to the exclusion of said first signal.

5. In a selective signaling system, a line, a plurality of operators' positions at one end thereof at which said line appears, a signal for said line at each of said appearances, a ring-up relay associated with said line, an interrupter, and a sequentially operating chain of relays jointly controlled in their operation by said interrupter and by a single actuation of said ring-up relay to cause the display of a first one of said signals and jointly controlled by said interrupter and a second actuation of said ring-up relay within a predetermined time interval to cause the display of another of said signals to the exclusion of said first signal.

6. In a selective toll signaling system, a line, a plurality of toll operators' positions at one end thereof, at all of which positions said line appears, a signal for said line at

each of said appearances, a ring-up relay associated with said line, and means comprising a plurality of sequentially operating relays responsive to a single actuation of said ring-up relay to cause the display of a first one of said signals and responsive to a second actuation of said ring-up relay before the operation of a certain one of said plurality of relays to cause the display of another of said signals to the exclusion of said first signal.

7. In a signaling system, a line, a plurality of operators' positions at which said line appears, a signal for said line at each of said positions, and means associated with said line responsive to different numbers of signal impulses for selectively operating one of said signals and for changing the character of operation of said signal after a predetermined interval of time following its initial operation.

8. In a signaling system, a line, a plurality of operators' positions at which said line appears, a signal lamp for said line at each of said positions, and means associated with said line responsive to different numbers of ringing impulses for selectively lighting one of said signal lamps and for flashing said signal lamp after a predetermined interval of time following its initial illumination.

9. In a toll signaling system, a line, a plurality of toll operators' positions at which said line appears, a signal lamp for said line at each of said appearances, and means comprising a plurality of sequentially operating relays associated with said line responsive to different numbers of ringing current impulses for selectively lighting one of said signal lamps and for flashing said lamp after a predetermined period of time following its initial illumination.

10. In a signaling system, a line, a plurality of operators' positions at which said line appears, a signal for said line at each of said positions, a periodically operating interrupting mechanism, and means comprising a sequential operating chain of relays partially controlled in their operation by said interrupter mechanism for selectively operating said signals.

In testimony whereof, I have signed my name to this specification this 6th day of June, 1927.

RAND S. BAILEY.