J. G. NOLEN.

SIGNALING APPARATUS AND CIRCUITS THEREFOR.

APPLICATION FILED APR. 25, 1904.

946,258. Patented Jan. 11, 1910.

Fig 1

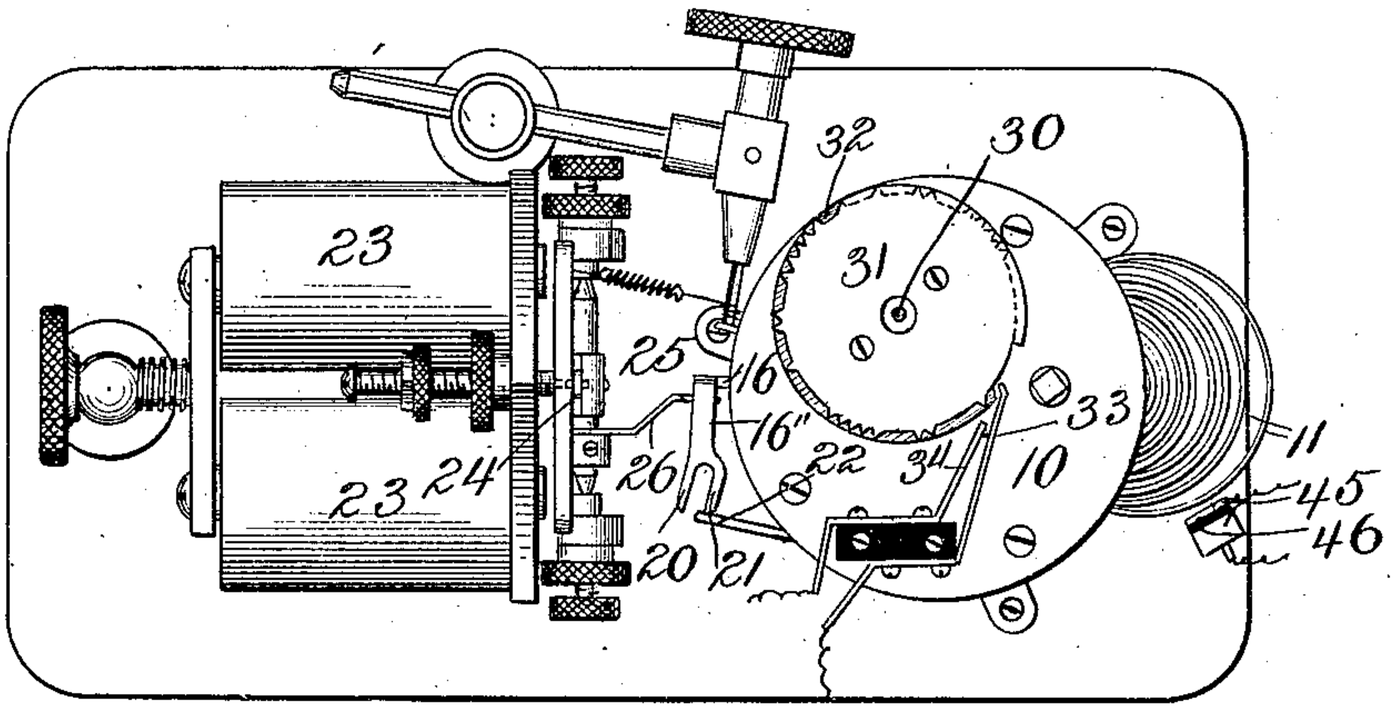


Fig 2

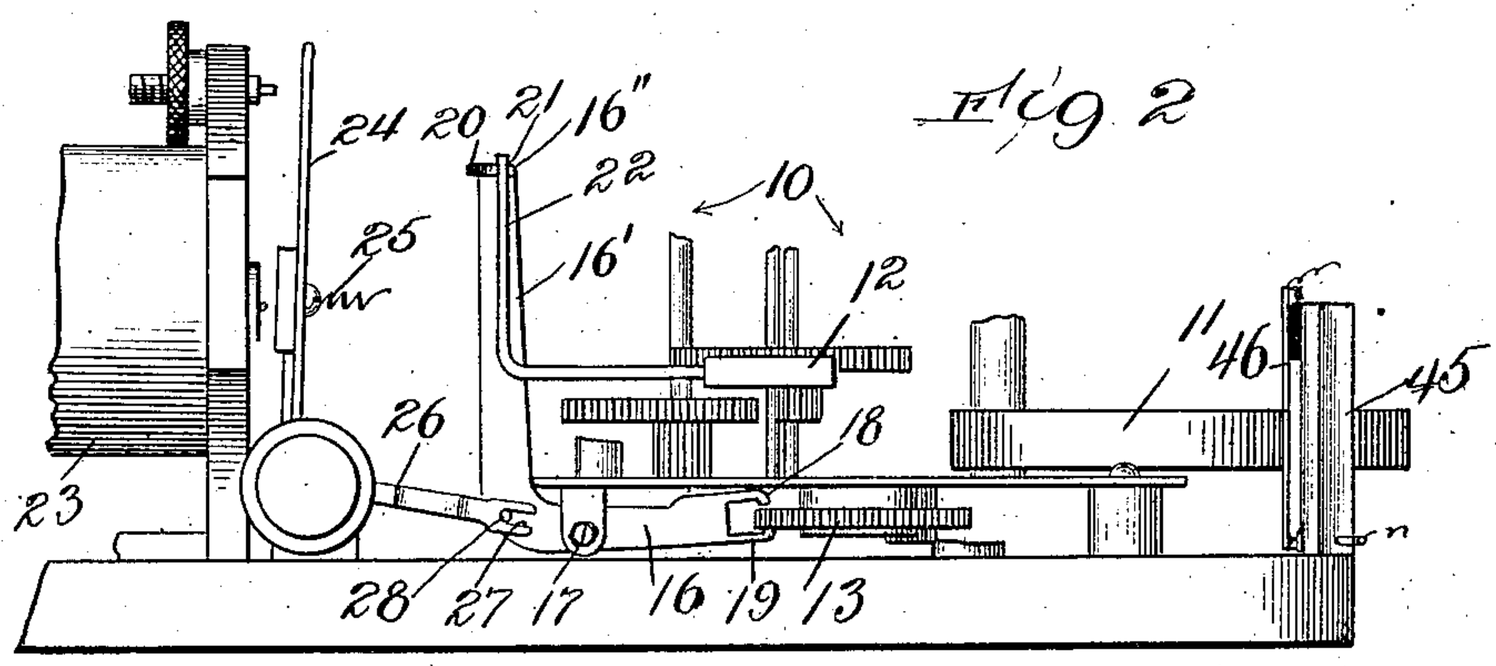


Fig 3

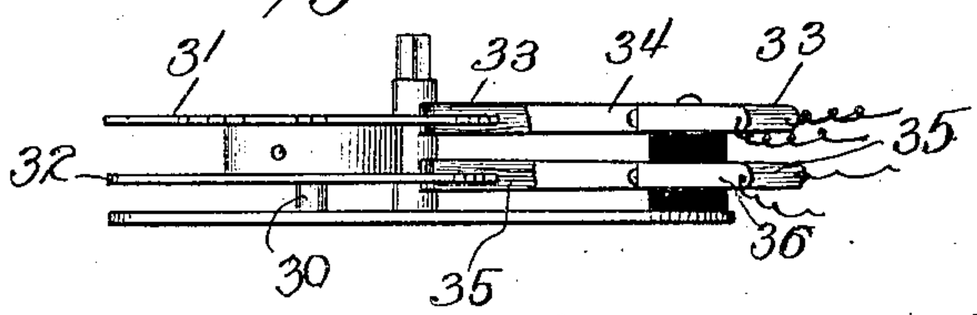


Fig 4.

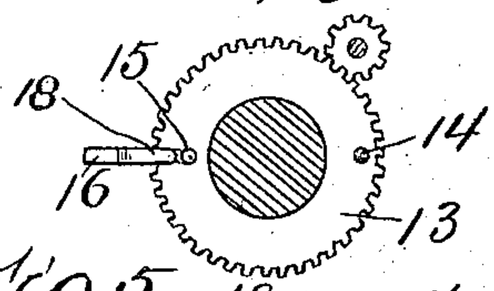


Fig 5

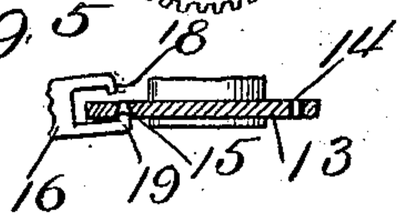
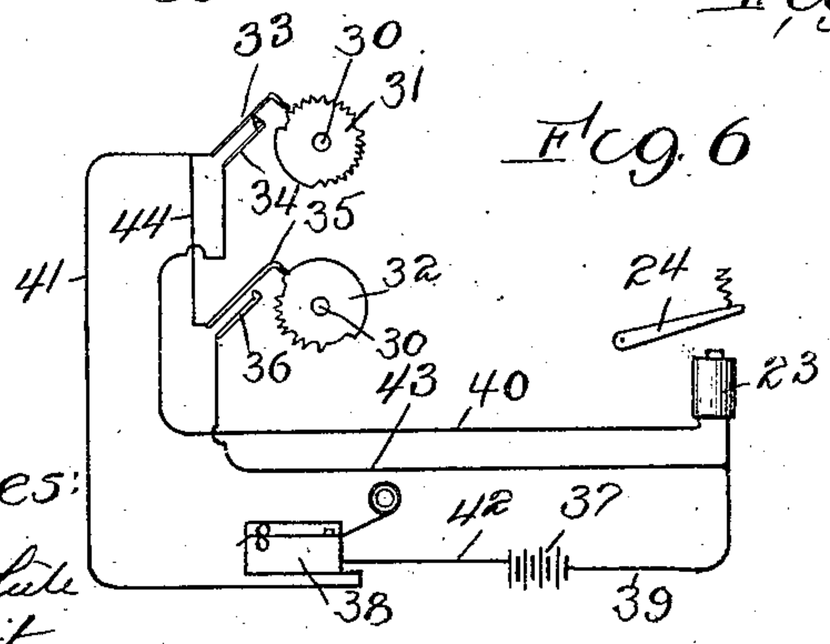


Fig 6



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SIGNALING APPARATUS AND CIRCUITS THEREFOR.

946,258. Specification of Letters Patent. **Patented Jan. 11, 1910.**

Application filed April 25, 1904. Serial No. 204,780.

To all whom it may concern:

Be it known that I, JAMES G. NOLEN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Signaling Apparatus and Circuits Therefor; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to signaling apparatus and circuits therefor, and has for one of its objects to provide a signaling instrument arranged for electrical control and adapted to transmit successive signals upon the successive occurrence of different conditions in the electrical controlling devices.

A further object of my invention is to provide such a signaling device wherein the electrical control is exercised through the agency of an electro-magnetic instrumentality, and which is adapted when the current flow through the magnet is sufficiently varied from normal conditions to transmit one signal, when the normal conditions are restored at a subsequent period of time to transmit another signal, and when the current flow is varied from and immediately restored to normal condition to transmit a signal different from the before-mentioned signals.

A further object of my invention is to provide a signaling apparatus of the character described which is simple in construction and operation.

Another object of my invention is to provide a novel circuit arrangement wherein my improved signaling apparatus may advantageously be employed.

Other and further objects will become apparent to those skilled in the art from the following description.

In the drawings wherein I have illustrated one operative embodiment and application of my invention, Figure 1 is a front elevation of a signaling apparatus complete. Fig. 2 is a side elevation thereof portions being broken away. Fig. 3 is a detail of the number wheels and contact devices. Figs. 4 and 5 are details of the motor stop devices. Fig. 6 is a diagrammatic illustration of an operative application of my invention.

Throughout the drawings like numerals of reference refer always to like parts.

Generally speaking my improved apparatus comprises a motor of any suitable character—in practice usually a spring motor—normally set or ready for operation, and associated in driving relations with the mechanical circuit breaker, or breakers, of the circuit or circuits, wherein the apparatus is to send its signal, said parts constituting as a whole what I will call a signal box. With said signal box is associated an electrically actuated means for controlling the operation of the box. To accomplish such electric control of the box I employ an electro-magnetic device having a movable element operatively associated with mechanical devices, which I shall hereinafter term the motor controlling mechanism, which in turn is operatively associated with some movable part of the motor to control its operation.

In the drawings 10 indicates generally a signal box mechanism, in the present instance comprising a suitable train of gearing adapted to be driven by a spring 11, and preferably provided with the usual escapement having a vibrating pallet 12.

13 indicates a wheel moving with or forming part of the train and in the present embodiment mounted on the bottom frame piece of the motor. A mechanical contact breaker is also operatively connected with the motor to act upon the signal circuits or circuit, a specific form of which will be hereinafter described.

The controlling mechanism of the motor comprises two stop devices associated with a moving part of the motor mechanism, each stop device being adapted to stop the motor mechanism when the motor parts assume predetermined positions, and each stop being preferably arranged so that when tripped or moved to motor-releasing position it permits the travel of the motor parts past the position wherein they may be stopped by the other stop device before it is able to again stop the mechanism. The stop devices are also associated with mechanical locking means which serve to lock them against movement to motor stopping position during certain periods of operation of the motor, said locking means being preferably actuated by the motor itself in timed relation thereto.

In the specific construction the wheel 13 of the motor is provided with two apertures 14 and 15 arranged at different radial dis-

tances from the axis of rotation of the wheel at diametrically opposite points thereon.

16 indicates a stop lever pivoted as at 17, and having its inner end bifurcated to form two fingers 18 and 19, extending respectively above and below the wheel 13 and provided with ends turned inward toward each other but out of vertical alinement so that they are adapted to engage respectively the apertures 14 and 15 of the wheel 13. The end of the lever 16 remote from the wheel 13 is preferably upturned as indicated at 16′ and is provided at its extremity with a horizontal portion 16″ terminating in two prongs 20 and 21.

22 indicates a stem secured to the pallet 12 to vibrate therewith, and having an upturned portion extending into proximity to the prongs 20 and 21 of the lever 16. The arrangement of these parts is such that when the end of the lower finger 19 is engaged with its aperture 15 of the motor wheel 13, the prong 21 is interposed in the path of oscillation of the upturned end 22 of the pallet stem, and when the upper finger 18 is in engagement with its aperture 14 of wheel 13, the opposite prong 20 is interposed in the path of oscillation of the said stem 22. The separation of the prongs 20 and 21 is such that if both fingers 18 and 19 be moved out of engagement with their apertures in the wheel 13 so that said wheel is free to revolve therebetween, the stem 22 is left free to vibrate between the prongs 21 and 20. It will be apparent that the fingers 18 and 19 alone would serve to stop the movement of the motor mechanism, but as they work in a slowly moving part of quite high torque I prefer to use in conjunction therewith the supplemental device for simultaneously acting upon the motor escapement mechanism, as thereby the motor mechanism may be quickly stopped with little effort at the desired points and as quickly and easily released. It will further be apparent that the wheel 13 constitutes a means for locking the stop devices against movement to motor-stopping position during periods of activity of the motor, for as long as the fingers 18 and 19 are opposed to imperforate surfaces of the wheel 13, the stop devices can not move to any operative extent.

While I claim the mechanism described as new and advantageous I do not desire to be understood as limiting myself thereto, as it will be apparent that many mechanically equivalent contrivances might be employed for stopping the motor mechanism for purposes herein described.

The electromagnetic actuating device for the motor controlling mechanism in the present embodiment comprises an electro-magnet 23 and its armature 24, normally held by a spring 25 in open position. Said armature 24 is connected with the lever 16 so that the two move together in both directions, such connection being herein indicated as made through a lever arm 26 rigidly secured to the armature and having in its end a slot 27 embracing a pin 28 carried by the lever 16 upon the side of the pivot remote from the fingers 18 and 19. It will be apparent now, assuming that the box spring 11 be wound, and the motor controlling parts to be in the normal position indicated in Fig. 2 that if the armature 24 be moved toward its magnet 23 the lever arm 26 will be lifted; thereby depressing the inner end of the stop lever 16 and throwing the finger 19 out of engagement with its aperture 15 in the moving part 13 of the motor. As the inturned end of the fingers 18 and 19 are not in vertical alinement, the finger 18 is unable to engage in the aperture 15 but rests upon the top of the wheel 13, thereby positioning the lever 16 substantially midway of its limits of movement and so freeing both the wheel 13 and the escapement stem 22 for their respective rotary and vibratory movements. Assuming that the force tending to move the armature into contact with the poles of its magnet continues to be applied it will be apparent that the motor mechanism may move to a predetermined extent until the aperture 14 arrives between the finger ends of the lever 16. Now the finger 18 is forced into engagement with said aperture 14 thereby throwing the prong 20 of the stop lever 16 into the path of the vibratory stem 22 and quickly stopping the motor mechanism. Should now the armature be released so that its spring 25 may draw it outward, the armature in its movement toward open position depresses the outer end of the lever 16 thereby removing the finger 18 from engagement with its aperture and raising the finger 19 into contact with the under surface of the wheel 13. Said wheel now makes a second half revolution before the aperture 15 again comes above the finger 19, when the controlling mechanism again stops the motor. It will now further be apparent that should the armature be moved to closed position and then immediately reopened the wheel 13 will be permitted to make a full revolution before being brought to a stop by the engagement of the finger 19 with the aperture 15, and that the same result will follow if starting from closed position the armature be first opened and then re-closed. Thus each of the stop devices when tripped permits the travel of the motor parts past position where they may be stopped by the other stop device before it may itself again perform its function of stopping the motor.

To describe now the specific make and break devices for the signaling circuit herein shown, 30 indicates an arbor of the motor

train preferably so geared relative to the wheel 13 that it makes two revolutions to one of the wheel. Mounted upon the arbor above the upper frame member of the motor are two number wheels 31 and 32, each having on its periphery a plurality of teeth arranged in some predetermined order as is usual in signal box construction. Preferably the tooth arrangements of the two wheels 31 and 32 are slightly different, in the showing one wheel having thereon teeth to represent the number 125 twice repeated and the other having teeth to represent the number 125 once only. The wheels are preferably so arranged that the toothed portion of each comes opposite an untoothed portion of the other wheel, and the untoothed portion of each wheel is provided with a raised peripheral portion equal to or greater than the height of the teeth and in peripheral extent equal to the toothed peripheral portion of the other wheel. Associated with the wheel 31 are the usual pen 33 and contact 34, while associated with the wheel 32 are the pen 35 and its contact 36. These pens are preferably arranged in circuits such that one pen and its contact are constantly in a signaling circuit, while the other pen and contact are in a circuit to be supervised which, when complete, communicates with some signal receiving instrument but which is a circuit influencing the magnetic conditions of the electromagnet and is adapted to be ruptured or established to cause the actuation of the signal box.

In the form of circuit arrangement shown in Fig. 6, 37 indicates a source of current supply, and 38 a signal receiving instrument or recorder of any preferred type, arranged in series with one of the circuit breaking pens. Specifically the circuit may be traced from battery 37 by wire 39 to the magnet 23, thence by wire 40 to the contact point 34 normally making contact with the pen 33 from which extends wire 41 running to one terminal of the receiving instrument 38, from the other terminal of which extends wire 42 connected to the remaining terminal of the battery 37. A circuit to be supervised is provided to include the other circuit breaking pen 35, such circuit being herein shown as a normally closed short circuit provided around the magnet 23 by the wire 43 connected with the wire 39 and extending to the contact 36 from the coacting pen 35 whereof extends a wire 44 connected to the wire 41. The arrangement is such that when the shunt circuit through the wire 43 is closed the current flowing through magnet 23 is insufficient to magnetize it to such an extent that it attracts its armature 24 against the tension of its spring, but when said wire 43 is ruptured and all the current flows through the magnet 23 the latter is magnetized so that it attracts its armature 24. Thus the circuit to be supervised in effect controls the magnet. It will be apparent now that if the circuit to be supervised be broken, the movement of the magnet armature 24 will trip the signal box, as heretofore described, to permit a half revolution of the wheel 13 and the corresponding full revolution of the number wheels 31 and 32. A signal is under such conditions transmitted from the pen 33 and its contact 34 over the main circuit to the receiving instrument 38. Under such conditions the lower number wheel 32, the pen whereof is in the circuit to be supervised, transmits no signal as its pen 35 and contact 36 now have no current passing through them. Consequently the signal received at the central station is simply that sent by the wheel 31 alone, that is to say, the number 125 twice repeated followed by a mark or "rundown" indicating the passage of the peripherally raised portion of the wheel under the pen 33. Should now the circuit to be supervised be reëstablished the current flow through the magnet 23 is thereby reduced to such an extent that the armature 24 is retracted by its spring and the signal box accordingly again tripped that its number wheel may make another revolution. Under these conditions, however, the current flows through both main circuit and the shunt circuit, and both wheels 31 and 32 actuate their pens to transmit their respective signals to the central receiving instrument, which consequently records the number 125 thrice repeated. Should, however, the circuit under supervision be broken and then immediately closed so that the increase in flow of current through the magnet 23 is momentary only, the signal box is actuated as heretofore described, so that its wheel 13 makes a complete revolution and the number wheels correspondingly make two revolutions. During the whole of the time of the revolutions of the number wheels, however, current flows through both wires 40 and 43 whenever the contacts at 34 and 36 are closed so that both wheels are enabled to send their respective signals and the instrument at central station receives a signal of number 125 six times repeated.

While I have described one system of wiring whereby advantageous results may be attained it will be apparent that my mechanism is adapted for various wiring arrangements, and that it may be equipped with various pen and number wheel mechanisms,

I prefer to provide in conjunction with my box a pair of contact points, so arranged relative to the main spring 11 of the motor that when said spring has unwound to some predetermined extent it forces the contact points together. In the drawing 45 indicates a post bearing at its lower end a con-

tact point, and 46 indicates a spring connected to the post at its upper end and arranged in the path of expansion of the main spring 11, for movement thereby into contact with the stationary post 45. These contact devices may be connected with any suitable electric annunciator which will give a warning when the motor is almost run down.

While I have herein described one operative embodiment of my invention, the details of which I claim as new and advantageous, I do not desire to be limited to the construction illustrated, as it will be apparent that the broad features of my invention might be embodied in devices differing widely in specific construction from those herein indicated, and that equivalent constructions will readily suggest themselves to those skilled in the art.

Having described my invention, what I claim and desire to secure by Letters Patent, of the United States, is:—

1. In a signaling apparatus, the combination of a signal box having a normally wound motor, motor controlling mechanism including a movable stop device arranged to stop the motor at either end of its range of movement and means actuated by the motor for positively locking said stop device in mid-position against movement in either direction to position to stop the motor during certain periods of operation of the motor, and electromagnetic means for actuating the controlling device.

2. In a signaling apparatus, the combination of a signal box having a normally wound motor, motor controlling mechanism including a movable stop device and means operated by the motor for mechanically locking said stop device against movement in either direction to stop the motor during certain periods of operation of the motor, the stop device being arranged when moved in one direction to trip the box and subsequently stop the same and when moved in the other direction to again trip the box; and electro-magnetic means for actuating the controlling device.

3. In a signaling apparatus, the combination of a signaling box having a normally wound motor, provided with a vibrating part; motor controlling mechanism including a movable stop device arranged to operate upon the vibrating part of the motor, and mechanical means for locking said stop device against movement in either direction to stop the motor during a portion of a cycle of operation of the motor, said parts being so arranged that full movement of the stop device in either direction trips the motor and subsequently stops the same; in combination with an electromagnetic means for actuating the controlling mechanism.

4. In a signaling apparatus, the combination with a signaling box having a normally wound motor, of motor controlling devices comprising a motor driven wheel having two unsymmetrically located apertures in a part thereof, a movable stop device having opposing parts disposed for engagement with the respective apertures exclusively, and arranged to engage their apertures upon movement of the device in opposite directions, and electro-magnetic means controlling the movement of the stop device.

5. In a signaling apparatus, the combination of a signaling box having a normally wound motor, motor controlling mechanism comprising a stop device having two fingers 18 and 19, and a wheel 13, having apertures therein at different radial distances from the center, adapted to receive the respective fingers 18 and 19, said wheel being driven by the motor; and means for actuating said motor controlling mechanism.

6. In a signaling system, an electromagnetic device comprising a magnet and a part movable in response thereto, a circuit to be supervised arranged to influence the current flow through said magnet, a normally-set signal box associated with the movable part of the magnetic device to be tripped by said movable part when the latter is moved in either direction, said signal box having two circuit breakers, one in the circuit to be supervised, another circuit including the other circuit breaker in parallel with the first said circuit breaker, and signal-responsive means in circuit with both circuit breakers of the signaling box.

7. In a signaling system, an electro-magnetic device comprising a magnet, and a part movable in response to said magnet, a circuit to be supervised arranged relative to said magnet to change the current flow through said magnet to vary the position of its movable part when the circuit is broken, a normally-set signal box comprising motor mechanism associated with the movable part of the magnetic device to be tripped and subsequently reset thereby when the said part is moved in either direction, and mechanical circuit interrupting devices arranged to work upon two independent sets of contact parts, one of said sets of contact parts being included in the circuit to be supervised, and a main circuit including the other set of contact parts in a portion thereof shunted by the supervisory circuit and signal responsive means arranged in circuit with each of said sets of contact parts.

8. In a signaling system, an electromag-

netic device comprising a magnet and a part movable in response thereto, a normally set signal box mechanically associated with the movable part of the magnetic device to be tripped thereby when said part is moved in either direction, said box comprising two sets of circuit pens, a closed main circuit including a source of electrical supply, a signal responsive device, the magnet and one of the said pens, and a circuit to be supervised including the other pen, constituting a shunt around the magnet.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

JAMES G. NOLEN.

In presence of—
GEORGE T. MAY, Jr.,
MARY F. ALLEN.