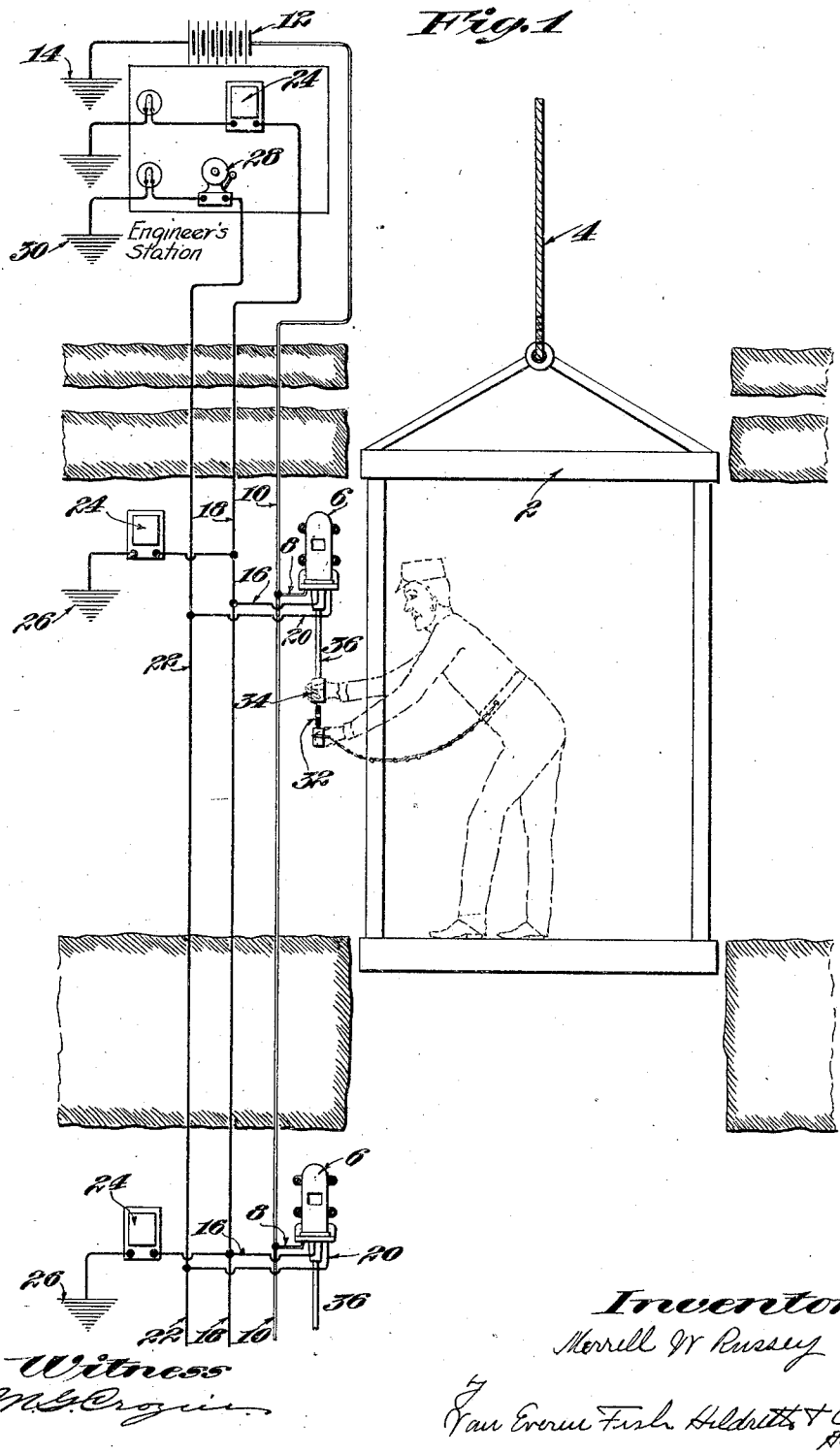
Dec. 17, 1929. M. W. RUSSEY 1,739,613

MINE HOIST SIGNAL SYSTEM AND SWITCH

Filed May 27, 1924 3 Sheets-Sheet 1

Fig. 1



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MINE HOIST SIGNAL SYSTEM AND SWITCH

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Fig. 2

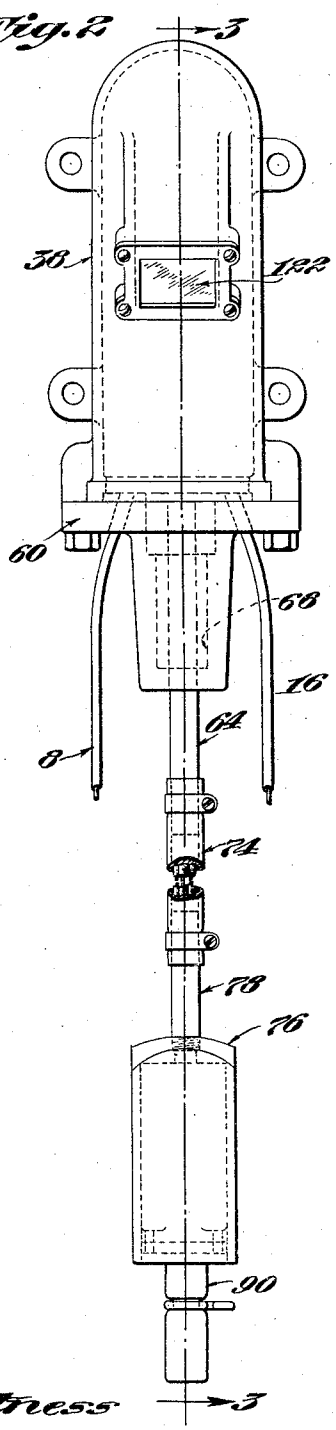
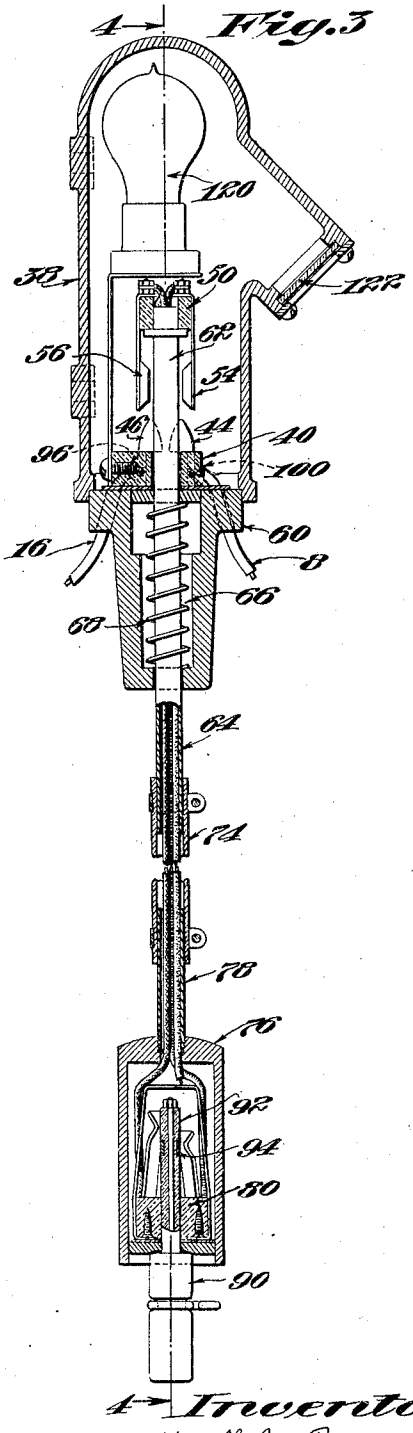


Fig. 3



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MINE HOIST SIGNAL SYSTEM AND SWITCH

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Fig. 4

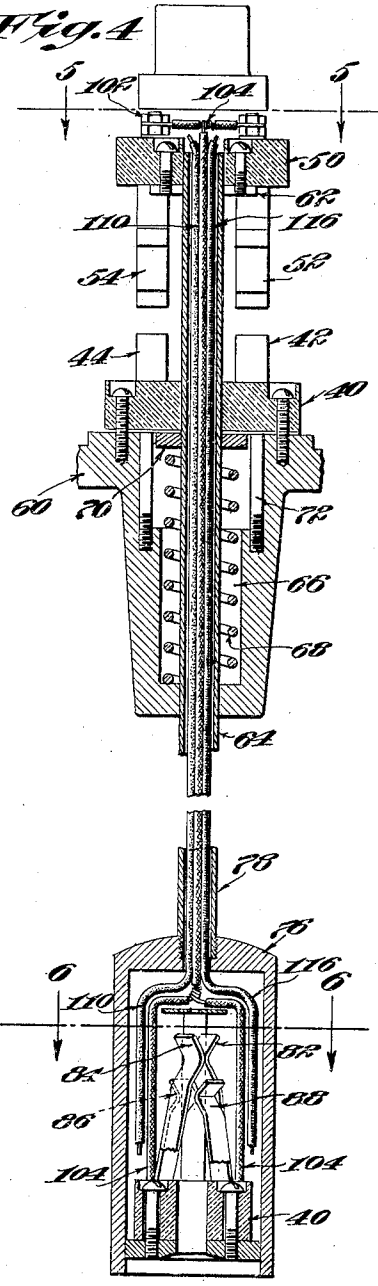


Fig. 5

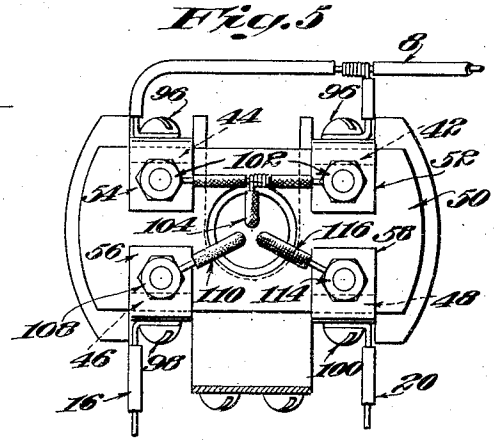


Fig. 6

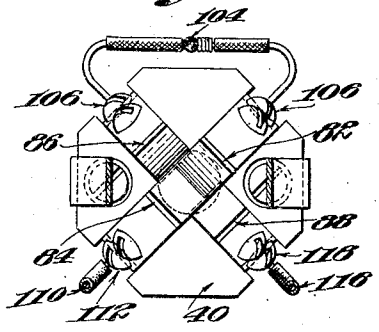
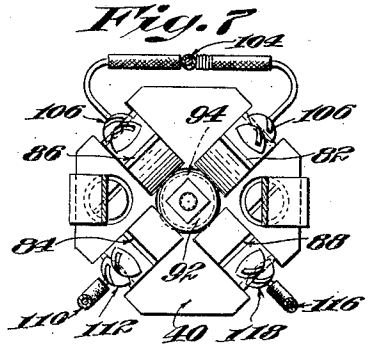


Fig. 7



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Patented Dec. 17, 1929 1,739,613

UNITED STATES PATENT OFFICE

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MINE-HOIST SIGNAL SYSTEM AND SWITCH

Application filed May 27, 1924. Serial No. 716,135.

The invention relates to a mine hoist signal system and switch therefor.

It is customary to provide mine hoist signal systems with two signal circuits each controlled by switches located at the different levels of the mine, one series of switches being used to operate signals at the different levels to indicate that the cage is wanted at any particular level and the other series of switches being used by the cage tender to signal to the engineer located in the hoist room that the cage is to be moved to a given level. The cage moving signals should be given only by the cage tender as otherwise confusion and serious accidents may occur and in some systems provision is made for preventing the accidental operation of the moving signal switches by ignorant or unauthorized persons.

With the present system a single switch at each level is used to operate both the cage calling and cage moving signals. Normally the switch when operated gives the calling signals and means is connected with each switch which is under the exclusive control of the cage tender and by which he may cut that switch out of the call circuit and include it temporarily in the moving signal circuit so that when he operates it, it will give the moving signals to the engineer in the hoist room. The signal switch is preferably a pull switch normally in the calling circuit and connected with an auxiliary switch, preferably a jack and plug switch located at the end of the main switch pull, which includes the main switch in the call circuit and cuts it out of the moving signal circuit when the plug is out and cuts it out of the calling circuit and includes it in the moving signal circuit when the plug is in. With this construction the plug of the auxiliary switch may be attached to the belt of a cage tender so that it will be conveniently at hand whenever it is to be inserted into the jack and thus connect the main switch to operate the cage moving signals. If for any reason the cage tender neglects to withdraw the plug or in case the car starts before he has time to remove the plug after finishing his signal to the engineer, the flexible pull of the main pull switch merely swings into line with the attachment to his belt and the plug is automatically pulled from the switch by the movement of the cage and the main switch thus automatically restored to normal action so that it will sound call signals when operated. This form of main and auxiliary switch may be used with advantage even in systems in which separate switches are used for the call and cage moving signals since it will effectively guard against unauthorized and improper operation of the moving signals and at the same time will avoid danger of injury to the cage tender.

The invention is illustrated in the accompanying drawings in which Figure 1 is a diagrammatic view showing a mine hoist signal system embodying the invention; Fig. 2 is a front elevation of a main signaling and auxiliary switch; Fig. 3 is a sectional view on line 3—3 of Fig. 2; Fig. 4 is a detail on a somewhat larger scale showing the arrangement of the contact fingers of the main and auxiliary switches and indicating the wiring connecting the fingers; Fig. 5 is a plan view on line 5—5, Fig. 4, indicating the manner in which the main switch is connected with the supply conductor through which the electric current is supplied and with the conductors of the cage calling and cage moving signal circuits; Fig. 6 is a view on line 6—6 of Fig. 4, showing the contacts of the plug and jack auxiliary switch with the plug removed; and Fig. 7 is a similar view with the plug inserted.

In the diagram shown in Figure 1, 2 indicates the cage or one of the cages adapted to be raised and lowered in the shaft of a mine through a hoisting cable 4 which is connected with a hoisting engine in the hoist room at the head of the shaft. At each station or level of the shaft a signaling pull switch 6 is installed in position where it may be conveniently reached by the cage tender without leaving the cage. The switch is connected through a wire 8 with the conductor 10 through which the electric current is supplied as through a transformer or battery 12 which is grounded at 14. The switch is also connected through the wire 16 with the conductor 18 of the call signal circuit and through the wire 20 with the conductor 22 of the cage

moving signal circuit. The conductor 18 of the call circuit is connected at each level or station with a call signal 24, each of which is grounded as at 26 and are thus connected in parallel in the circuit and are each sounded when the switch is operated to send the electric current through the conductor 18. The call circuit may also and usually will have a signal 24 located in the hoist room to indicate to the engineer that the cage is wanted at a given level or for a given purpose indicated by the signals. The cage moving signal circuit is connected with a signal 28 in the hoist room and is grounded at 30 so that when any switch 6 is operated to send the electric current through the conductor 22, the cage moving signal will be operated in the hoist room.

Each switch 6 is normally connected so that it is in the call circuit and is cut out of the cage moving signal circuit and operation of the switch at any station or level operates the call signals to indicate that the cage is wanted at a given station. The cage tender carries a special plug 32 which he may insert in the jack 34 of an auxiliary jack and plug switch which is carried by the lower end of the pull 36 through which the main switch is operated when he wishes to signal the engineer to move the cage. Insertion of the plug cuts the main switch out of the call circuit and includes it in the cage moving signal circuit so that the cage tender may operate the switch to signal the engineer. After the cage tender has given the signal he removes the plug from the auxiliary switch, thus cutting it out of the cage moving signal circuit and restoring it to the cage calling circuit. The plug may, as indicated, be attached to the belt of the cage tender and if he neglects to remove it, the flexible pull 36 will merely swing upward or downward into position to permit the movement of the cage to withdraw the plug without danger to the cage tender. As only the cage tender is allowed to carry one of the special plugs, it is practically impossible for anyone else to give the signal to move the cage.

The construction of the main and auxiliary switches and the manner in which they are connected with the current supply conductor and conductors of the cage calling and cage moving signal circuits is illustrated in Figures 2 to 7. The main switch is enclosed within a housing 38 and comprises a lower contact finger block 40 carrying the contact fingers 42, 44, 46 and 48 and the upper contact finger block 50 carrying the contact fingers 52, 54, 56 and 58. The lower block is secured on the plate 60 which closes the lower end of the casing and the upper block is secured to a flange 62 on the upper end of a tubular switch rod 64 which extends down through the block 40 and down through a spring socket 66 carried by the plate 60. The switch rod is held normally in raised position with the contact fingers on the upper block out of engagement with the contact fingers on the lower block by a spring 68 within the socket 66 and engaging a flange 70 which is welded to the rod. The rod is held from rotation by guide pins 72 engaging notches in the flange 70. A hose pipe or other flexible tube 74 is secured to the lower end of the switch rod 64 and forms a flexible pull by which the rod may be operated to engage the contact fingers of the switch, the fingers being immediately disengaged by the expansion of the spring when the pull is released. The auxiliary switch carried within a housing 76 is attached to the lower end of the hose or tube 74 by means of a tube 78 secured in the upper end of the housing and projecting into the lower end of the hose. The auxiliary switch which is of the jack and plug type comprises a contact finger block 80 mounted within the housing 76 and carrying two pairs of spring contact fingers 82, 84 and 86, 88, and a plug key 90 adapted to pass through a hole in the block 80. The contact fingers 82, 84 are normally in contact while the pair of contact fingers 86, 88 are out of contact and spaced apart. The block is provided with a sleeve of insulating material 92 which, when the plug is inserted, passes between the contacts 82, 84 and disengages and separates them and is also provided with a metallic collar 94 which, when the plug is inserted, engages the pair of contacts 86, 88 and thus brings them into electrical connection.

The lower contacts 42, 44 of the main switch are provided with binding screws 96 by which they are connected to the wire 8 leading from the supply conductor 10. The lower contact 46 is provided with a binding screw 98 by which it is connected to the wire 16 leading to the conductor 18 of the call circuit and the lower contact 48 is provided with a binding screw 100 by which it is connected to the wire 20 leading to the conductor 22 of the cage moving signal circuit. The upper contacts 52, 54 which engage the supply contacts 42, 44 are connected by binding nuts 102 with the upper ends of a wire 104, the lower ends of which are connected by binding screws 106 with the spring contacts 82 and 86 of the auxiliary switch. The upper contact 56 which engages the call contact 46 is connected by a binding nut 108 with the upper end of a wire 110, the lower end of which is connected by a binding screw 112 with the spring contact finger 84 of the auxiliary switch. The upper contact 58 which engages the cage moving signal contact 48 is connected by a binding nut 114 with the upper end of a wire 116, the lower end of which is connected by a binding screw 118 to the spring contact finger 88 of the auxiliary switch. The wires connecting the upper contacts of the main switch and the spring contacts of the auxiliary switch pass down through the hollow

rod 64, flexible pipe 74, and hollow tube 78 of the main switch pull.

Under normal conditions with the plug 90 of the auxiliary switch withdrawn, the main switch is in the call circuit since the spring contact fingers 82 and 84 are in engagement, and is cut out of the cage moving signal circuit since the spring contact fingers 86, 88 are out of engagement and break the circuit at this point when the main switch is operated to bring its two sets of contact fingers into engagement. Upon engagement of the contacts of the main switch, the electric current flows from the supply wire 8 through contacts 42, 44 and 52, 54, through the wire 104, contact fingers 82, 84, wire 110, contacts 46, 56, and through wire 16 to the conductor 18 of the call circuit so that the call signals are operated at the different stations. When the cage tender inserts his key plug 90 into the jack of the auxiliary switch, the spring contact fingers 82, 84 are separated and electrically disengaged, thus cutting the main switch out of the call circuit while the spring contact fingers 86 and 88 are electrically connected, thus bringing the main switch into the cage moving signal circuit. Now when the cage tender operates the main switch to bring its contact fingers into engagement, the current flows from the supply wire 8 through the contacts 42, 52 and 44, 54 and through the wire 104 to the contact 86, thence through the metallic sleeve 94 to the contact 88 from which it flows up through the wire 116 to the contact 58 and thence through the contact 48 and through the wire 20 to the conductor 22 of the cage moving signal circuit so that the cage moving signal is operated in the hoist room. When the plug is removed, the main switch is returned to normal condition in the call circuit and is cut out of the cage moving signal circuit.

The switch may be provided with a flash signal in the form of an electric lamp indicated at 120 and wired to flash each time the switch is operated to close the cage moving signal circuit. The front of the switch casing is provided with a window 122 through which the flash signal is visible to the tender and indicates to him that the switch is operating properly.

While the invention has been illustrated and described in connection with its application to a single compartment shaft in which a single cage operates, it can be readily applied to multiple compartment shafts by the installation of additional switches connected to the supply conductor and controlling the supply of current to additional call and cage moving signal circuits.

What is claimed is:

1. A mine hoist signal system comprising a cage call circuit, a cage moving signal circuit, a manually operable signal switch at each level normally in the call circuit, and means connected with each switch and under the control of the cage tender for cutting that switch out of the call circuit and including it in the cage moving signal circuit.

2. A mine hoist signal system comprising a cage call circuit, a cage moving signal circuit, a manually operable signal switch at each level normally in the call circuit, and an auxliary switch for each call switch under the control of the cage tender for cutting the signal switch out of the call circuit and including it in the cage moving signal circuit.

3. A mine hoist signal system comprising a cage call circuit, a cage moving signal circuit, a signal pull switch at each level and a jack and plug auxiliary switch for each signal switch, means connecting the signal switch and the jack and plug switch to include the signal switch in the call circuit and cut it out of the cage moving signal circuit when the plug is out and to include the signal switch in the cage moving signal circuit and to cut it out of the call circuit when the plug is in.

4. A mine hoist signal system comprising a cage call circuit, a cage moving signal circuit, a signal switch at each level, having a switch pull to actuate it, a jack and plug switch at the end of the switch pull, means connecting the signal switch and the jack and plug switch to include the signal switch in the call circuit and cut it out of the cage moving signal circuit when the plug is out and to include the signal switch in the cage moving signal circuit and to cut it out of the call circuit when the plug is in.

5. A mine hoist signal system comprising a cage call circuit, a cage moving signal circuit, a signal switch at each level normally disconnected from the cage moving signal circuit, means including a jack and plug for connecting the signal switch with the cage moving signal circuit, and flexible means for supporting the jack to permit the plug, if moving with the cage, to be withdrawn by the movement of the cage.

6. A mine hoist signal system comprising a cage call circuit, a cage moving signal circuit, a signal switch at each level having a switch pull to actuate it, an auxiliary jack and plug switch at the end of the signal switch pull, and electrical connections between the signal switch and the jack and plug switch to include the signal switch in the circuit when the plug is in and to cut it out of the circuit when the plug is out.

7. A signal switch comprising a main switch having a pair of relatively movable contacts, an auxiliary plug and jack switch having a pair of contacts which are closed when the plug is out and open when the plug is in, an electrical connection between one of the contacts of the main switch and one of the contacts of the auxiliary switch, an additional contact for the auxiliary switch

which is out of engagement with the first named contacts thereof, and means for electrically connecting the additional contact of the auxiliary switch with said electrical connection between the main switch and the auxiliary switch when the plug is in.

8. A signal switch organization comprising a main switch including a set of four stationary and a set of four cooperating movable contacts, pull means for moving said movable contacts into engagement with said stationary contacts, an auxiliary plug and jack switch at the end of pull means including a set of normally closed contacts and a set of normally open contacts, a plurality of conductors in said pull, one connecting two of said movable contacts of said main switch with one contact of each of said sets of contacts of said plug switch, one connecting the other of said normally closed contacts to the third movable contacts of the main switch and one connecting the other of said normally open contacts of said plug switch to the fourth movable contact.

9. The combination with a supply conductor and two separate circuit conductors of a signal switch comprising a main switch having contacts connected with said conductors, normally disengaged cooperating contacts, a pull for engaging the two sets of contacts, an auxiliary switch at the end of the pull comprising a pair of normally engaged contacts, connections between said contacts and the contacts of the main switch which cooperate with a supply contact and one of the circuit contacts, a pair of normally disengaged contacts, connections between said contacts and the contacts of the main switch which cooperate with a supply contact and the other circuit contact, and a plug key for separating the normally engaged contacts and electrically connecting the normally disengaged contacts.

10. In a signal switch the combination with a supply conductor of a main switch connected therewith, an auxiliary plug and jack switch having a pair of contacts which are closed when the plug is out and open when the plug is in, and a second pair of contacts which are open when the plug is out and closed when the plug is in, an electrical connection between one of the contacts of each pair and the main switch, and a pair of separate conductors one connected to the other contact of the first pair and the other conductor connected to the other contact of the second pair.

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