

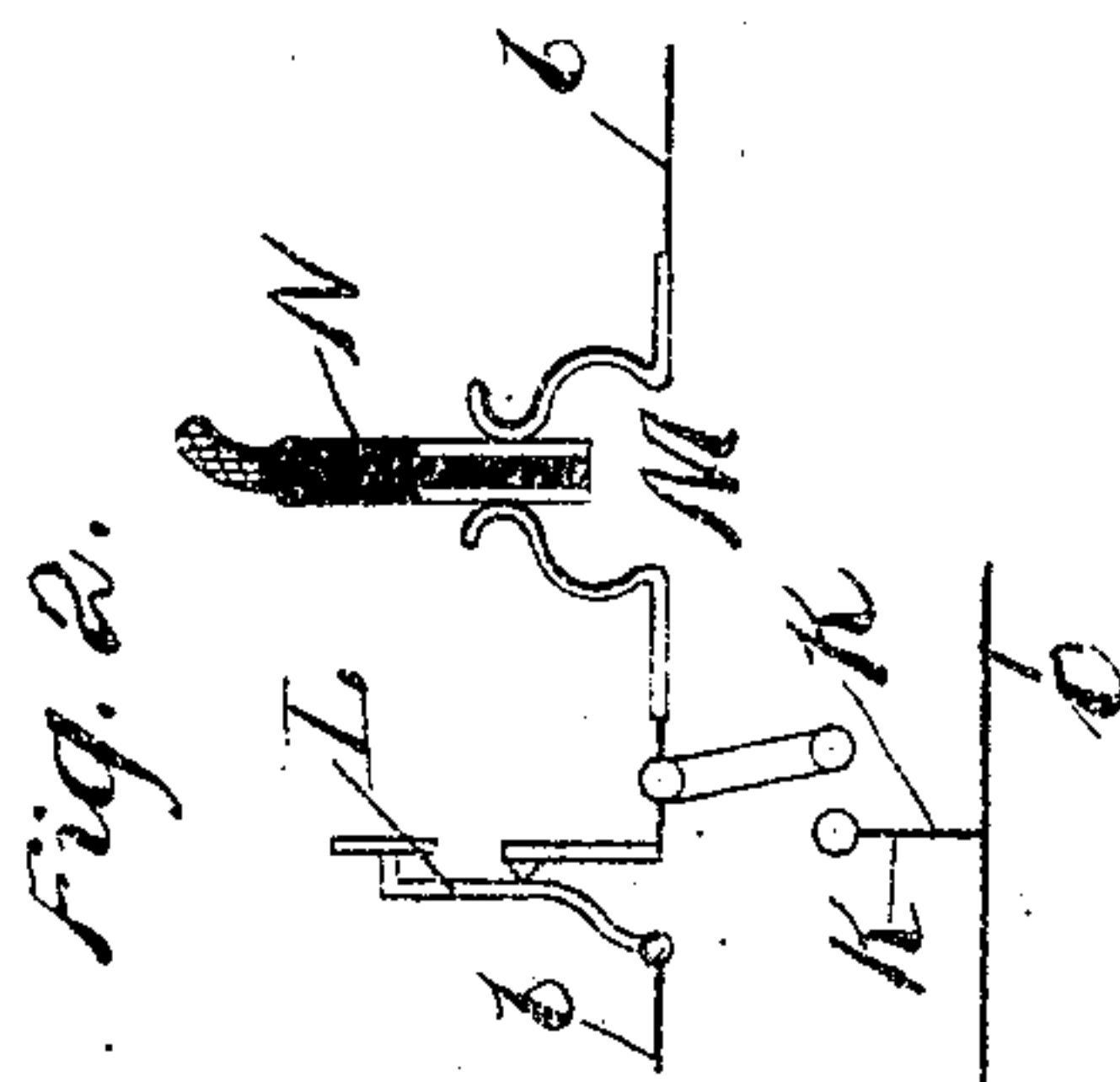
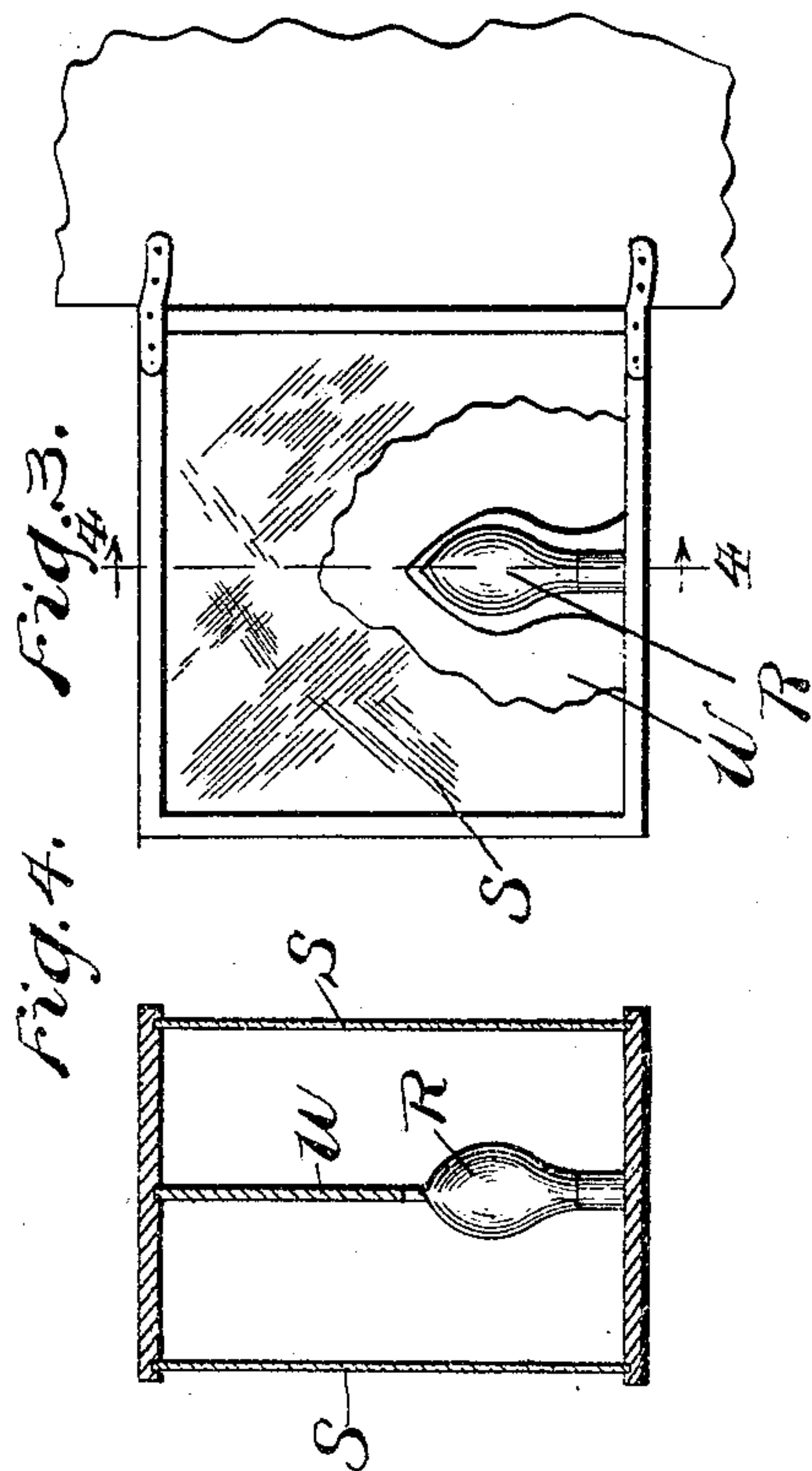
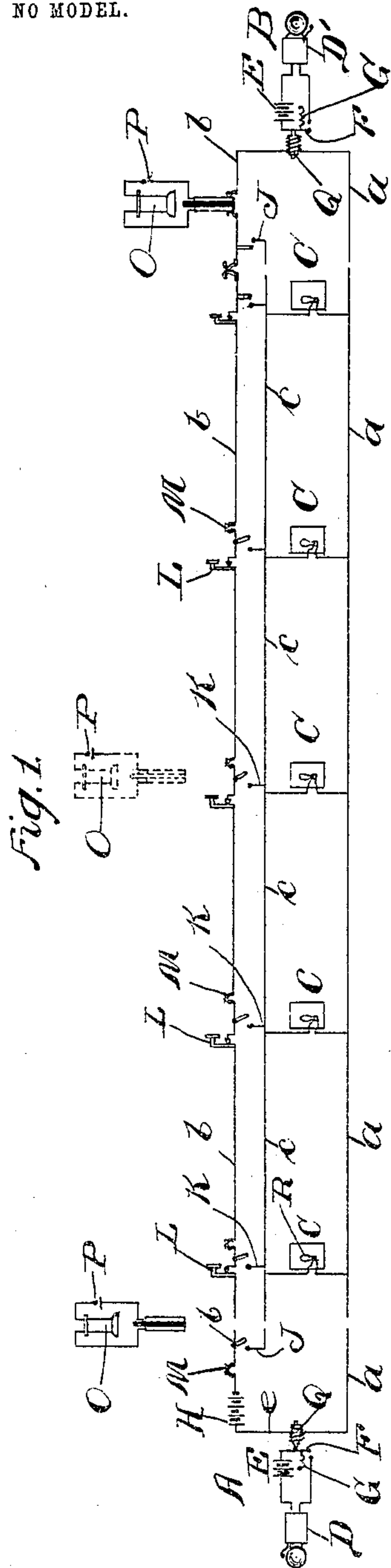
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PATENTED NOV. 8, 1904.

O. J. LEE & M. H. RICHARDSON.
RAILWAY SIGNAL SYSTEM.

APPLICATION FILED JUNE 2, 1902.

NO MODEL.



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UNITED STATES PATENT OFFICE.

OSCAR J. LEE AND MYRON H. RICHARDSON, OF CHICAGO, ILLINOIS.

RAILWAY SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 774,481, dated November 8, 1904.

Application filed June 2, 1902. Serial No. 109,879. (No model.)

To all whom it may concern:

Be it known that we, OSCAR J. LEE and MYRON H. RICHARDSON, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Railway Signal System, of which the following is a specification.

This invention relates to railway signal systems.

The object of the invention is to provide a railway signaling system which is simple, inexpensive, and efficient.

A further object of the invention is to provide a railway signaling system wherein communication may be quickly established with stations from any desired intermediate point between stations.

A further object of the invention is to provide a railway signaling system in which a series of signals placed, for instance, along a railway-line may be operated from adjacent stations or from intermediate points between the stations, so as to warn engineers or trainmen of danger, and hence reduce the possibility of collisions and accidents.

Other objects of the invention will appear more fully hereinafter.

The invention consists, substantially, in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, and to the various views and reference-signs appearing thereon, Figure 1 is a diagram showing the construction, arrangement, and application of the principles of our invention, the line-wires being broken to indicate that the stations A and B may be any desired distance apart. Fig. 2 is a broken enlarged diagrammatic detail of the arrangement of switches and telephone connections at any desired signaling-point. Fig. 3 is a broken detail view, parts broken out, of a form of signal-box employed in connection with our invention. Fig. 4 is a transverse section of the same on the line 4-4 of Fig. 3.

The same part is designated by the same

reference-sign wherever it occurs throughout the several views.

In the operation of railroad systems it is exceedingly desirable to provide a signaling system whereby the engineer or train crew of a train may be warned of any danger of collision at any desired point along the road-bed. It is also desirable to provide means whereby communication may be established to or from a train which has met with an accident or has been delayed for any cause between stations to adjacent stations. It frequently happens that disastrous and fatal accidents occur in collisions or in misplaced switches and between stations by reason of the fact that knowledge of the existence of the danger cannot be communicated to the engineers or trainmen in sufficient time, and especially in the case of express service, where high speeds are maintained. For instance, in case of a breakdown or for other cause a train is required to stop between stations and out of communication with either adjacent station it is necessary under the present system to send out some of the train force frequently as far as two or three miles in front of or to the rear of the stalled or broken-down train, so as to flag any other train which might be due along the same track. If, however, a train is due on the same track running at the rate of fifty or sixty miles or more, even if such a train is flagged one or two miles away from the stalled train it would be exceedingly difficult to stop the high-speed train within the space of a minute or two to avoid a collision which might be attended with disastrous and fatal results.

It is the special purpose of our present invention to provide a signaling and communicating system along a railway-line whereby signals may be displayed at suitable intervals along the roadway and between stations and whereby communication may be established from any point intermediate stations to the station in either direction and the signals controlled not only from the stations, but also from convenient points along the line of the road. This idea may be carried out in many specifically different ways.

In the drawings we have shown one form of application of our idea; but we do not desire to be limited or restricted thereto, as many changes therefrom and in the details thereof would readily occur to persons skilled in the art and still fall within the spirit and scope of our invention.

In the drawings reference-signs A and B designate diagrammatically adjacent stations on a railway-line.

C designates signal devices, which may be arranged a mile, a half-mile, a quarter-mile, or other convenient distance apart between the stations and in suitable position to be seen by the locomotive engineer of a train.

D D' designate signal-bells at the stations. It is to be understood that a signal-bell is to be arranged at each station or central station throughout the system. Each signal-bell is arranged in a local circuit which includes a battery E and a movable armature F, normally operated upon by a spring or other retractile G, the tension of which is exerted in a direction to normally close the switch-armature F to close the circuit containing the signal-bell and battery.

H designates the main source of current for the signaling and communicating system and may be a battery, generator, or other source of electric current.

Reference-signs *a*, *b*, and *c* designate line wires or conductors, one of which, if desired, may be the ground; but for the sake of convenience in illustration and description we have shown three distinct conductors.

The signals C, spaced suitable distances apart between the stations A B, are arranged in multiple relation with respect to each other and between the conductors *a* and *c*. At each station is arranged a switch J, which when suitably manipulated will open or close the circuit connection of conductor *c* to conductor *b*. Similarly, at convenient points intermediate the stations A and B and at suitable intervals or distances apart are switches K, any one of which when manipulated will open or close electrical connection between conductors *c* and *b*.

L designates a series of switches the manipulation of which serves to open or close the circuit-conductor *b*. These switches, which we will designate "calling-switches," are similarly placed at convenient points and intervals and at suitable distances apart between stations.

M designates suitable sockets or other convenient form of plug or other connection placed in circuit-conductor *b* at suitable intermediate points and at suitable distances apart and also at the stations, in which sockets, plug, or other connections are adapted to be received plugs N, carrying the terminals of a telephone-circuit in which is included a telephone-receiver O and transmitter P, arranged in series with each other in an ordinary and

well-known manner, the arrangement being such that when a plug N is inserted in a socket or connection M the associated telephone receiver and transmitter are included in series with each other and with circuit-conductor *b*, and when the plug N is withdrawn the circuit-conductor *b* is closed through the socket or connection M.

With this explanation of the arrangement of circuits, switches, signals, and call and telephone devices we will now explain the operation thereof, tracing first the circuit of the current source H from one pole thereof and assuming that all the switches J K are open. This circuit is traced as follows: from one pole of the current source H through wire *b*, thence through the coils of an electromagnet Q, operating on the switch-armature F of the circuit of bell D at station A, thence through wire *a*, the coils of an electromagnet Q, arranged at the distant station B and operating on the armature-switch F, which controls the circuit of bell D' at such distant station, thence through conductor *c* to the other pole of the source of current-supply. Under these conditions the electromagnets Q are energized and the armature-switches F are attracted and the call-bell circuits are broken. This condition continues until the circuit just above traced is broken. This break may occur at any point at which is located a call-switch L. As above indicated, these call-switches are placed at convenient intervals along the line of the road, so that if an accident happens to a train at a point between stations, necessitating the stoppage of the train, all that is required to notify each adjacent station is for a trainman to proceed to the location of a call-switch L along the line and manipulate the same to break the circuit-wire connection *b*. When this occurs from any point at which a call-switch L is located or manipulated, the circuit above traced and which includes the electromagnets Q will be broken, and the retractiles G will operate upon the armatures F of the local bell-circuits at the stations to close such local bell-circuits, and hence effect a signal or call, thereby attracting the attention of the station agent or other employee. Thereupon, if desired or at the same time, the trainman at the point from which the call proceeds, if supplied with a telephone outfit consisting of a telephone-receiver O, a transmitter P, and a plug connection N, may insert such plug into a convenient socket M in wire *b*, thereby introducing such telephone outfit in series in such circuit, and hence affording means for talking or communicating with either or both of the distant stations A B. If desired, such a telephone outfit may be arranged permanently in the circuit at the stations. In this manner communication is established between the train from any point between the stations to either or both stations and the proper re-

port made, from which assistance may be sent to the derailed or stalled train and other trains operating over the same tracks duly notified at the stations.

5 From the foregoing description it will be observed that the call-switches L may be only temporarily manipulated, and consequently the bell or signal-calls D D' at the stations need operate only until the desired communication has been established. Now, suppose it
10 be desired to notify the locomotive engineer of a train of danger ahead after his train has passed the station, whether such notification proceeds from the station or from any point
15 between the stations. In such case a signal-switch J at a station or a signal-switch K at a point intermediate the stations is closed, thus placing conductor *c* in electrical connection
20 with conductor *b*. Under this condition the circuits of all the signal devices C throughout the system are closed from conductor *a* to conductor *b*, and consequently all the signals are placed in operation, thereby notifying the
25 engineer of danger and enabling him to stop his train, and when stopped he may bring into use a telephone outfit and open communication with either or both stations and with the telephone outfit, which may be inserted in the
30 circuit at any point intermediate the stations, thus ascertaining the cause of the trouble and its location. Thus by locating the signal devices C and the signal-switches K and call-switches L and telephone sockets or connections M at convenient and suitable distances
35 apart—say a quarter of a mile, a half-mile, a mile, or the like apart throughout the entire line—convenient means are afforded not only for the calling and reporting to adjacent stations, but also for notifying the train crew of
40 any train which may be running intermediate the stations, for when an engineer sees a signal displayed he knows that there is danger somewhere. He stops his train and gets into communication with the distant station or with
45 the telephone outfit at any other point which may at the time be inserted in the circuit.

The signal device employed in connection with our system may be of many different constructions or types so far as our invention
50 is concerned in its broad application. It is desirable, however, to employ a signal which will give notice in the day-time as well as at night and also which will not give false signals. The signal device may be either visual
55 or audible. In the particular form shown, but to which our invention is not to be limited or restricted, we may employ a visual signal comprising an electric lamp R, placed in a suitable box or casing, the sides S of
60 which may be of glass or other transparent material through which the light of the lamps may be seen when the lamp-circuits are completed. In practice and preferably the glass sides S may be of colored glass—as, for instance, red—so that when the lamp-circuits

are completed a red light will be displayed in either direction. In order to prevent the sun or a reflected light from shining through the signal-box glasses and so displaying a false
70 signal, we prefer to arrange a central partition U of opaque material—such, for instance, as wood—in the signal-box and to place the lamp R in an opening V in said partition, as clearly indicated in Figs. 3 and 4, and danger
75 of false signals being given is avoided, and a signal is displayed only when the circuits of the signal-lamps R are completed.

The relative resistance of the conductor *b* and of the signal devices C and their circuit must be so proportioned that when any one
80 of the signal-switches K is closed all of the signals C are operated without interfering with the continued use of the conductor *b* for telephoning purposes. To the same end the telephone should be wound in such resistance
85 proportion to the signal devices C as not to interfere or to be interfered with in the operation thereof.

From the foregoing description it will be seen that we provide a simple railway signal
90 system in which every precaution is taken against loss or destruction through collision and wherein control of the signaling system or its operation may be effected from convenient and suitable intervals between sta-
95 tions, as well as from the stations. The signal devices C may be conveniently located on telegraph-poles or on posts erected adjacent to the road-bed in convenient position to be
100 readily seen by the locomotive-engineer, and, if desired, the calling-switches L and the signaling-switches K and telephone connections M may be inclosed in a suitable box or casing, also conveniently placed on a telegraph-pole
105 or other post, in which box may also, if desired, be placed a telephone outfit. In order to prevent the use of the system by unauthorized persons, these boxes may be kept locked and keys therefor supplied only to the trainmen.

Having now set forth the object and nature
110 of our invention and a construction and arrangement embodying the principles thereof, what we claim as new and useful and of our own invention, and desire to secure by Letters Patent of the United States, is—

1. In a railway signaling system, a pair of line conductors normally maintained at a difference of electric potential, a third conductor and a plurality of signal devices interposed in multiple between such conductor and one of
120 the first-named conductors, and a plurality of contacts arranged in multiple between said third conductor and the remaining one of the first-named conductors, and located at points corresponding to the said signal devices, as
125 and for the purpose set forth.

2. In a railway signaling system, a pair of line conductors normally maintained at a difference of electric potential, a third conductor and a plurality of signal devices interposed in
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multiple between such conductor and one of the first-named conductors, and a plurality of contacts arranged in multiple between said third conductor and the remaining one of the first-named conductors, and constituting the sole means of electric connection for said third conductor, as and for the purpose set forth.

3. In a railway signaling system, three line conductors, one having a plurality of electric contacts in series and connected to one terminal of a source of electric current, the second conductor connected to the other terminal and having a plurality of signal devices in series, a third conductor having a plurality of signal devices in multiple between it and the second conductor and connected at points between the two series signal devices in said second conductor, and a plurality of contacts in multiple between said first and second conductors, as and for the purpose set forth.

4. In a railway signal system, a series circuit containing a single source of electric current, a pair of signaling devices at each end and a series of contacts, and an additional conductor arranged to be solely connectable across the line-wires of said series circuit by a plurality of contacts, and a plurality of signaling devices, respectively extending to each such line-wire, as and for the purpose set forth.

5. In a railway signaling system, line-circuits connecting distant stations, a signal device at each station, and signaling devices arranged at suitable intervals intermediate the stations, a switch arranged at each station, each operating, when manipulated, to complete the circuits of all the signaling devices in the system, and a series of intermediate switches arranged at suitable intervals between the stations, and each also operating, when manipulated, to close the circuits of all the signaling devices in the system, a plurality of series contacts also interposed between the stations to signal thereto, as and for the purpose set forth.

6. In a railway signaling system, line-circuits, controlling-switches therefor, and signaling devices arranged in the line-circuit and at suitable intervals between the stations, each comprising a signal-box, an electric lamp arranged therein, said box having glass sides and a partition-plate arranged centrally in said box and having an opening, said electric lamp being placed in said opening, as and for the purpose set forth.

7. In a railway signaling system, line-circuits connecting the stations, calling devices arranged at each station, local circuits for said calling devices, means arranged in the line-circuit for controlling the local circuits of said calling devices, signaling devices also arranged in the line-circuits, a series of calling-switches and a series of signaling-switches arranged at each station and at suitable intervals between the stations, whereby signals throughout the entire system may be controlled from any de-

sired point and a call may be effected from any desired point in the system to either or both stations, as and for the purpose set forth.

8. In a railway signaling system, line-wires connecting distant stations and including telephone sockets or connections at suitable intervals, a call device located at each station, a local circuit for each calling device, means arranged in the line-circuit for controlling said local circuits, signal devices arranged in the line-circuit at suitable intervals between the stations, switches also arranged at suitable intervals and operating to open and close the line-circuit to control the calling-circuits, other switches arranged at each station and at suitable intervals between the stations and operating to control the signaling-circuits, and telephone devices adapted to be inserted in said sockets or connections, all combined and arranged as and for the purpose set forth.

9. In a railway signaling system, a source of current-supply, line-wires therefor and arranged to connect distant stations, electromagnets arranged in said line-wires, switch-armatures operated by said electromagnets, local circuits controlled by said switch-armatures, calling devices arranged in said local circuits, switches arranged in said line-wires and operating to break the main circuits, whereby said calling devices are operated, a series of signaling devices arranged at suitable intervals between the stations and in parallel relation with respect to each other and in multiple with respect to the line-wires, a series of switches each being arranged to control the circuits of all of said signaling devices, telephone sockets or connections, and telephone devices provided with a plug adapted to be received in said sockets or connections, all combined and arranged as and for the purpose set forth.

10. In a railway signal system, a line-circuit having a plurality of normally closed contacts constituting sockets, a plug having a telephone set for said sockets, an additional line conductor connected to a plurality of signal devices, and a plurality of contacts arranged to bridge said signal devices into said first-named electric circuit, as and for the purpose set forth.

11. In a railway signal system, two stations, a source of electric power at one station and line-wires extending from each terminal of the same, a plurality of signal devices connected to one of said line-wires and a plurality of switches connected to the other of said wires, said switches each arranged to bridge all of said signal devices across the line-wires, and a plurality of normally closed socket-contacts in series in the wire having the said switches and arranged at points corresponding to said switches and on the further side of said switches with respect to the source of electric power, and a telephone set and plug insertible in said sockets, as and for the purpose set forth.

12. In a railway signal system, a line-wire

having a normally raised electric potential, said wire being divided into spaced sections, a switch and a socket at each section, the switch at any section arranged to connect said raised
5 potential wire to signal devices constituting the other terminal of its electric circuit, the plug at such section arranged to receive a telephone set shunting said signal-circuit, as and for the purpose set forth.

In witness whereof we have hereunto set our hands, this 29th day of May, 1902, in the presence of the subscribing witnesses.

OSCAR J. LEE.

MYRON H. RICHARDSON.

Witnesses:

CHAS. H. SEEM,

S. E. DARBY.