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I. KITSEE.

METHOD OF AND APPARATUS FOR COMMUNICATING BETWEEN STATIONARY POINTS AND MOVING OBJECTS.

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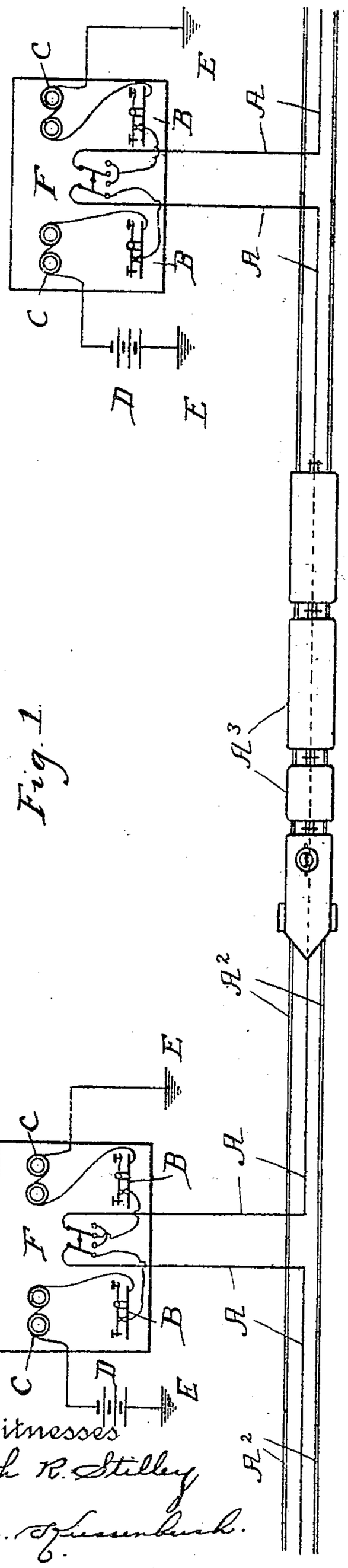

Fig. 1.

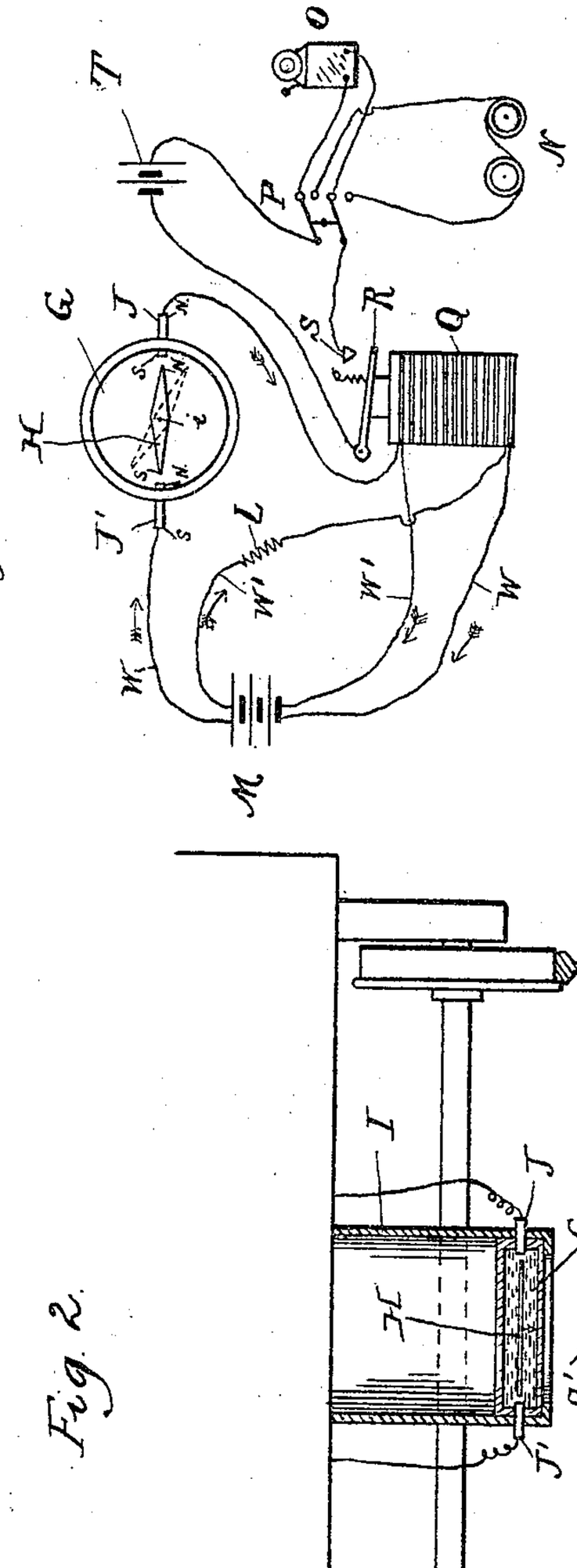

Fig. 3.

Fig. 2.

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METHOD OF AND APPARATUS FOR COMMUNICATING BETWEEN STATIONARY POINTS AND MOVING OBJECTS.

No. 800,653. Specification of Letters Patent. Patented Oct. 3, 1905.

Application filed February 8, 1902. Serial No. 93,246.

To all whom it may concern:

Be it known that I, ISIDOR KITSEE, of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Methods of and Apparatus for Communicating Between Stationary Points and Moving Objects, of which the following is a specification.

My invention relates to the method of and apparatus for signaling from stationary points to moving objects, and has more special reference to communication between moving trains and stations along the line of travel.

The object of my invention is to provide means whereby the operator or other person in charge at the station can communicate with a moving train without direct electrical contact between the moving train and station.

The prevention of accidents, specially on single-track roads, necessarily includes an arrangement whereby the person in charge of the train should be notified if a second train is on his block or if the orders given to him are not correct or if the road itself is unsafe for travel. In providing the road of travel with devices for such purpose six points should be taken into consideration: First, the device should be such that elementary influence—such as heat, cold, rain, snow, &c.—should not affect its working. Second, the device should be of such simplicity that, as far as human foresight can perceive, its working should always be positive and no mechanism shall be included to make its operativeness a matter of uncertainty. Third, all parts should be excluded from view, so as not to invite voluntary destruction by mischievous or criminal act. Fourth, the person in charge of the car should be able to discern its signals during the night as well as day-time and during foggy as well as clear weather, and his attention should be called to any danger-signal even if he omitted to inspect. Fifth, any derangement of the system should at once be brought automatically to the attention of the proper official on the train. Sixth, as cheapness of construction is of great advantage, this device must not include any expensive installation. I believe that the invention as illustrated and described herewith embodies all these vital features, and that its employment is an effectual bar against accidents due to collision, &c., on the road.

Referring to the drawings, Figure 1 is a diagrammatic view showing the road of travel, two stations along said road, and a moving train on said road equipped with my device. Fig. 2 is a cross-section of a train or locomotive, showing the receiving device. Fig. 3 is a diagram of the receiving device with its mechanism on the train.

A is an insulated electric conductor, such as a common telegraph-wire, placed along the road of travel and preferably laid on the ground midway between the rails A^2, on which the train consisting of the cars A^3 is adapted to travel. This conductor is insulated throughout and covered up so as to be entirely out of view. This covering is designated in the drawings by the letter A′. It is preferred that this conductor, which I in this specification and in the claims following this specification will simply call the "line," should start in the operating-room of one station and terminate in the operating-room of the station following. It is also preferred that this conductor or, as I always call it, "line" should be provided in each of these stations with a switching device, so as to enable the operator to make an electrical connection between the line ending at this station and the line starting at this station, and it is also preferred that each line should be provided at each of the stations with a key and a sounder or receiver. Each of the "lines" should be grounded at the station commencing and at the station ending and should be provided at the station commencing with a source of electricity, such as a battery. In the drawings the right-hand station is designated by the numeral 1 and the left-hand station by the numeral 2. In each of these stations E is the ground connection; C, the sounder; B, the key; F, the switching arrangement, and D the source of electric current. The key B differs from the key normally employed in telegraphy, in that the key illustrated normally closes and is adapted to open the circuit through the manipulation of the operator. In other words, the operator in sending his signals or messages operates the key as usual; but whereas in the normal key through the depression of the lever the normally broken circuit is made with this key the depression of the lever results therein that the normally closed circuit is broken. It is obvious that the manipulation of this key will affect the sounder in the usual way. The operator in telegraphing will hear his sounder and will actuate the sounder at the distant station, and both operators will be able to communicate with each other in re-

ceiving and sending messages in the usual manner; but whereas the circuits of the common telegraph-wires are normally open and the wires therefore normally not charged the circuit of the line, as illustrated, is normally closed, and the line therefore is normally charged through the source of electricity D.

I will now describe the receiving instrument placed on the car, caboose, or engine, so that the conductor or other person in charge shall also be able to receive the messages sent from one station to the other, or, correctly speaking, the messages intended for him but sent from one station to the other. Before going into a detailed description of this receiving device it will not be amiss to first explain the principles on which the working of the device is based.

To persons versed in the art it is well known that if a magnetic needle—such, for instance, as is used in a compass—is placed parallel to a circuit in which an electric current is flowing the same tends to gravitate in a direction at right angles to said circuit. It is not necessary that the needle should be touching the wire or even be in very close proximity to it, and the influence of the current on the needle is in inverse proportion to the square of the distance. The distance of the needle from the conductor may therefore be a foot or more if the current flowing is of proper strength, the needle of the proper magnetic pull, and the pivoting-point does not offer too great a resistance. Then the phenomenon above referred to will always take place. In reality a straight conductor and the needle in proximity to same constitute the simplest form of galvanometer, and persons versed in the art are or can be readily made acquainted through any of the well-known text-books not only with the working, but also with the rules governing this arrangement. The second part embraces an electromagnetic device the coil of which consists of two wires, each connected to a source of current, but the current-flow in one wire opposing the influence of the current-flow in the second wire on the soft-iron core. The third part is based thereon, that the circuit of one of the wires includes a permanent magnet adapted to change the resistance of said circuit through a change in its position.

The receiving device consists, then, of the magnetic needle H, inclosed in the receptacle I. This magnetic needle is pivoted at *i* and is provided with the conducting liquid G. This conducting liquid may consist of very diluted sulfuric acid or of any of the dissolved metallic salts. The receptacle is also provided with the two permanent magnets J and J′. These magnets perform the threefold function of, first, counteracting the directive tendency of the needle; second, overcoming the fluctuation of the needle due to the shaking of the train, and third, forming the terminals of the circuit W. The strength of these magnets should be such as to overcome the directive tendency and stress due to the shaking, but should not be great enough to seriously impair the inductive influence of the current flowing. It is preferred that the receptacle I should be made of iron and should surround the needle on all parts, with the exception of the base, so as to shield the needle from the external magnetic field. The magnets J and J′ should be electrically insulated from the casing and should be in close proximity to the needle-points without touching the same. The magnets J and J′ are electrically connected to the circuit-wires W W. To this circuit is connected in the usual manner the source of current M, which source of current is also connected to the circuit W′ W′. The electromagnetic device Q is provided with the armature R. In proximity to this armature is placed the contact S, connected to the alarm O, and through the switch P with the source of electric energy T, one pole of which is connected with the armature. The sounder N is connected to the other terminals of the switch P. In practice the combined resistance of the magnets J and J′, needle H, and conducting liquid between the extreme points of the needle and magnets is first ascertained and then an equal resistance placed in the second circuit W′ W′, so as to equalize the resistance of both circuits. As long as the needle will retain its normal position—that is, as long as the needle will stand parallel to magnets J and J′—the resistance of both circuits W, as well as W′, will be equal, and the magnetizing effect of the circuit W will be neutralized by the magnetizing effect of the circuit W′ on the core of the electromagnet Q; but as soon as the needle is deflected either to the right or left the resistance of the circuit W will be increased and the balance of the two circuits W and W′ will be destroyed, thereby allowing a greater flow of current through W′ than through W. I have illustrated this device as to consist of the electromagnet provided with an armature held by a spring; but in practice a very sensitive device must be used for the reason that the current flowing may not be sufficient to actuate one of the ordinary electromagnets. The person installing such device will readily find out what degree of resistance is necessary for such a device and how sensitive the same shall be made for the purpose of working satisfactorily, and I have only illustrated this device in the conventional sign for an electromagnet to show the mode of making and breaking a second circuit through the same. The receptacle including the needle and conducting liquid is lowered, preferably, through the bottom of the car, so as to be in as close proximity to the line as possible without interfering with the travel. The device should be placed in such a position that the needle should be parallel with the line.

If no current is flowing through the line, the needle will retain its position as illustrated in the drawings—that is, the two ends of the needle will point toward the magnets J and J′, respectively; but as soon as a current-flow is established in the line the needle will tend to place itself at right angles to said line and this tendency will be in proportion to the strength of the current flowing and in inverse proportion to the square of the distance. As soon as the needle deviates from its first position the balance of the two circuits will be destroyed, and the current-flow through W′ will be greater than the current-flow through W.

The *modus operandi* of practicing this my invention is as follows: The engine, car, or caboose of the train designed to travel on the road provided with the line is equipped with the device as described. At the station the operator allows the line to be normally closed through the key B. The current therefore will normally flow through this line. The train speeding past this station will have its needle H deviated from the normal position, and therefore the current-flow in the receiving device on the car will be such as to energize the device Q, thereby breaking the circuit containing the alarm O. If now the operator at the station just passed or the operator at the far-off station wishes to communicate with the proper official on the train, he simply opens the key B, thereby breaking the circuit of the line. Through the breaking of this circuit, or rather through the ceasing of the current-flow in the line, the needle will be able to assume its normal position, thereby reducing the resistance of the circuit of which it is part to such an extent that this resistance will be equal to the resistance of the other circuit. As a result of this equalizing action the electromagnet Q will be demagnetized and the armature R will come in contact with the contact S, closing the circuit containing the alarm. The conductor or other proper officer will thereby be notified that one of the operators wants to communicate with him. He therefore operates the switch in a manner so that he cuts out the alarm O and cuts in the sounder N. If it was only the intention of the operator to bring the train to a stop and not to communicate with the conductor or other proper officer, he will leave the circuit open, and the conductor will thereby be notified that he has to look out for danger. If, on the contrary, the operator wishes to transmit a message to the conductor, he operates the key in the usual manner, producing what is called in the Morse alphabet "dots and dashes," and as the opening of the key will always result therein that the needle will assume its normal position and as the closing of the key will always result in the needle assuming a position more or less at angles to the line it follows that the sounder or other receiving instrument N will be actuated in accordance with the making and breaking of the circuit through the key. No doubt the operation of the key should be slower than the operation of the key in usual telegraphy. If through accident or even through design the electric continuation of the line between two stations is broken, the flow of the current through said line will naturally cease and the conductor in the car will be notified of such occurrence through the sounding of the alarm O, assuming that in the normal state this alarm is electrically connected in the circuit including the battery F.

I have illustrated and described the receiving instruments N and C as to be sounders; but if it is preferred the receiving instruments N and C can consist of any electromagnetic device capable of producing a permanent record, or a recording device may be added to the sounder. In this connection I may add that with the aid of the arrangement as described quotations of stock or other intelligence useful for the traveler on the car can be transmitted, and for that reason one or the other of said cars may be equipped with a receiving instrument. I have also illustrated and described the line as placed midway between the rails; but it is obvious that this conductor can be placed nearer to one or the other of the rails or can be placed outside of the rails entirely. This matter must be decided for each case by the engineer who is superintending the installation of the system; but in each case the movable magnet should be as much as possible parallel to the line.

I am well aware that the line can be carried overhead and the movable magnet may then be placed on top of the car; but I do not favor such arrangement and believe that in practice the overhead system will not be carried out.

In some cases it may be advantageous to use one of the telegraph-wires strung on poles along the road as part of the circuit and to use the rail as the return and in this instance to place the magnet parallel with the rail. It is true that as the rail is uninsulated from the ground a leak will be through the ground; but as that part of the circuit which is strung on the poles is carefully insulated from the ground the greatest part of the current will seek as a return rather the rail than the ground, and therefore enough of the current will flow through the rails for the purpose of actuating the magnet. In this case the great disadvantage arises that the wires strung on the poles are subject to derangement due to the storms or other atmospheric disturbances.

It is impossible to give a strict rule for the location of the line, as this location may have to differ according to the different circumstances to which the road of travel is subject. If economy in installing is an important object and the loss of current only secondary, then it would be possible to make the rails

part of the circuit; but it is obvious that if the line could be made independently of the rails a more perfect insulation could be secured. It is also obvious that should the rail be used as a return the different parts of said rails would have to be in electrical contact with each other.

The system as described is of great advantage for the train despatcher. He has it in his power to reach every train on the road of travel, to communicate with the proper officer on the train, and to give or countermand orders. As is well known to persons versed in the art of railroading, each train is designated by its own number, and in telegraphing the train despatcher prefaces each telegram with the number of the train for which the message is intended. For the purpose of enabling the train despatcher to reach directly every train on the road the lines may normally be connected through the different stations in a manner as is well known in telegraphy, so that the train despatcher may reach out directly to the terminus of the line from his own office.

I have not in this specification described the system of communicating from the train to the station, as this will form the subject-matter of another application.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A system of electrically transmitting intelligence through space between a stationary point and a moving object, embracing the following elements: a conducting-line placed along the road of said moving object, one or more stations connected electrically to said conducting-line and provided each with transmitting device, a receiving device located on the moving object, said receiving device embracing a free-moving magnet, such as a magnetic needle, an electric circuit, the resistance of which is dependent on the position of said magnet, said electric circuit embracing means to annunciate the change in position of said free-moving magnet.

2. In a system of electric communication between a stationary point and a moving object, the following instrumentalities: one or more transmitting-stations, an electric line operatively connected to said transmitting-stations, a receiving device located on the moving object, said receiving device consisting of a receptacle, a magnetic needle adapted to move freely in said receptacle, a conducting fluid in said receptacle, two stationary contacts secured to said receptacle, a local circuit connected to said stationary contacts, said local circuit embracing a generator of electricity and a translating device.

3. In a system of electric communication between a stationary point and a moving object, a line of transmission, one or more transmitting-stations and one or more receiving-stations, the receiving-stations located on the moving objects and consisting essentially of a local circuit, a translating device or devices, a source of current, a liquid resistance in said circuit and a movable magnet, the liquid resistance in electrical contact with the terminals of said circuit and the movable magnet adapted to vary the resistance of said circuit through its different positions.

In testimony whereof I hereby sign my name, in the presence of two subscribing witnesses, this 27th day of December, A. D. 1901.

ISIDOR KITSEE.

Witnesses:
EDITH P. STILLEY,
CHAS. KRESSENBUCH.