D. L. SALOMONS.

ELECTRO-MAGNETIC TRAIN-SIGNALS.

No. 182,038. Patented Sept. 12, 1876.

FIG. 1

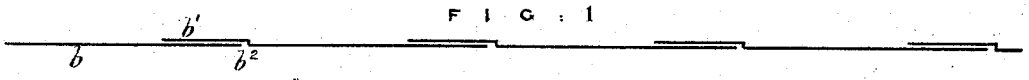


FIG. 2.

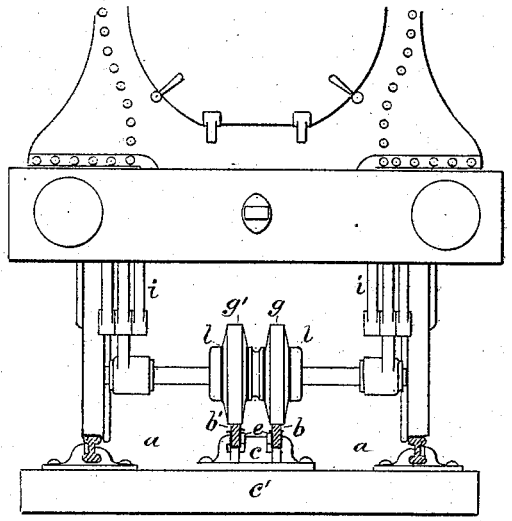


FIG. 3.

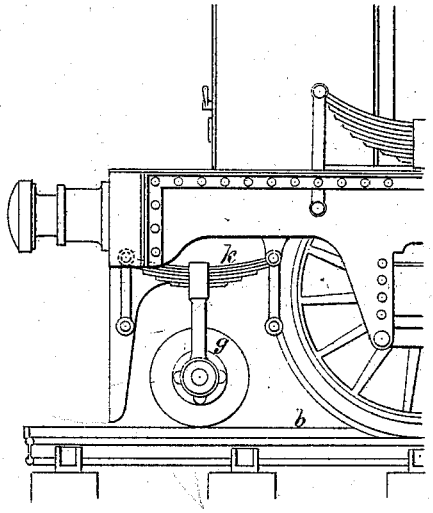


FIG. 6.

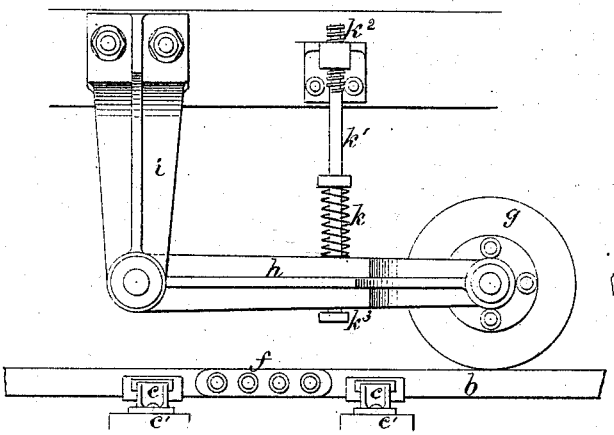


FIG. 8.

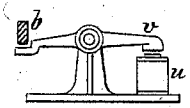


FIG. 4.

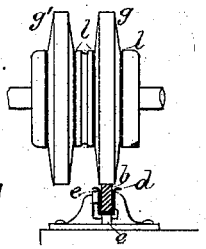


FIG. 7.

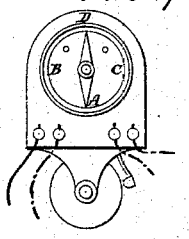
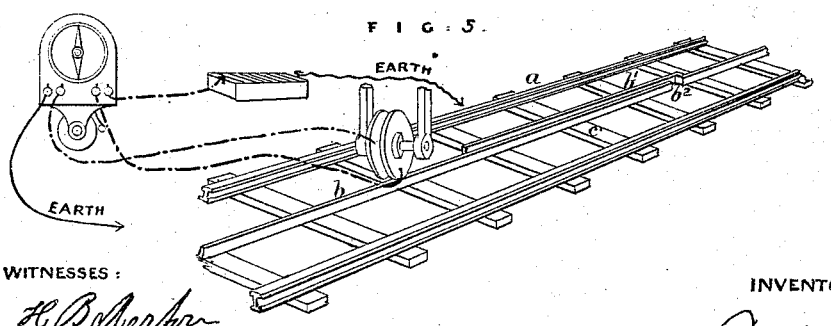


FIG. 5.



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UNITED STATES PATENT OFFICE.

DAVID LIONEL SALOMONS, OF BROOM HILL, TUNBRIDGE WELLS, ENGLAND.

IMPROVEMENT IN ELECTRO-MAGNETIC TRAIN-SIGNALS.

Specification forming part of Letters Patent No. **182,038**, dated September 12, 1876; application filed December 4, 1875.

To all whom it may concern:

Be it known that I, Sir DAVID LIONEL SALOMONS, baronet, of Broom Hill, Tunbridge Wells, in the county of Kent, England, have invented an improved electric communication between railway-trains in transit, or otherwise, and signals, stations, or termini, and in the apparatus employed therefor, of which the following is a specification:

The invention is designed for the purpose of enabling railway-trains to communicate one with another, whether traveling or stationary, on the same track, by means of suitable electro-magnetic arrangements actuating signal-bells and indicators, which will warn a train in the rear or advance of the one signaling of its position or proximity thereto.

The improvements relate to an arrangement of apparatus forming electric communication between the trains and the signals, stations, or other places on the line of route, the novelty of which consists in providing the permanent way with a third or electric rail, laid in sections or blocks, each section or block at its commencement and termination overlapping, so as to run in parallel lines, and in a position which will admit of metallic signal-wheels connected with the engine and train, as hereinafter described, to run thereupon in a manner which will allow a constant and perfect electric contact to be maintained between the trains and such electric or third rail. The signal-wheels are insulated from each other, and are provided with insulated electric conductors. One communicates, for instance, with a battery, and the other with an electric bell. One wire from each, viz., the battery and the bell, are taken to earth by simply being attached to the engine. These wheels will hereinafter be called "battery signal-wheel" and "bell signal-wheel."

On reference to the drawings annexed it will be understood how the invention can be carried into practical effect, similar letters of reference being marked on corresponding parts on all the figures alike.

Figure 1 represents a diagram view of the sections or blocks of electric rail. Figs. 2 and 3 represent, respectively, in front and end elevations, detail views of the battery signal-wheel and bell signal-wheel, together with the line of electric rail and the manner of supporting and insulating the same. Fig. 4 represents the position of the electric wheels when running on the single rail. Fig. 5 represents a perspective diagram, showing how the electric circuit is established between the apparatus on the train and the earth; and Fig. 6 represents another modification and arrangement of the electric wheels.

In these figures, *a a* is the permanent way, supplied with the third or middle rail *b* b^1, supported on chairs *c c*, secured to the sleepers *c'*. This third rail *b* b^1 is insulated by means of ebonite or other suitable non-conducting material *d*, placed between its surfaces and their contact with the supporting-chairs *c c*, the adjustment and true position of such rail being maintained by means of the wooden wedges *e e*, the connection between each length of rail and the next being made by fish-plates *f*, as seen in Fig. 6, or by other equivalent and suitable means. The length of the rail *b* b^1 is laid in sections or blocks, (see Fig. 1,) every block overlapping the other. For example, instead of simply cutting, and so disconnecting the rail where one block or section terminates, a considerable length of the next, before continuing the same line, though disconnected, is caused to bend, and then run parallel therewith. For instance, *b* is the continuous length or front signal-rail, and b^1 the overlap or back signal-rail, and b^2 is the point of disconnection between each section or block.

To the engines running on the line of route *a* two metal wheels, *g* g^1, are attached (see Figs. 2, 3, and 4) by means of supporting-arms *h* and bracket *i*, the said wheels being kept in contact with the rails *b* b^1 by means of the spring *k* and its central pin k^1, the elevation or depression of such wheels being accomplished by raising or lowering the central pin k^1 through the medium of the screw k^2 and collar k^3.

These wheels *g* g^1 are insulated one from the other by the ebonite or other non-conducting disks *l l*, and are situated on their central axis at a distance apart corresponding with the parallel distance of the rails *b* b^1. Facing the direction in which the train is going, on arriving at the termination of one block and commencement of the next, the wheel *g* will

run on the front signal-rail b, and the wheel g^1 will run on the back signal-rail b^1; but at other places where the rails do not run in parallel lengths the wheel g^1 will run free. (See Fig. 4.)

The signaling apparatus carried by the engine, (supposing the engine for the purpose of illustration to represent the train,) consists of a battery and an electric bell. (See Fig. 5.) One wire from the battery and one from the electric bell are taken to "earth" by being simply attached to the engine, the current passing through the same to the ordinary railway lines connected with the ground. The other wire, g^2, of the battery is connected with the battery signal-wheel g, and is insulated from the engine. The second wire, g^4, from the electric bell is also insulated from the engine, and connected with the bell signal-wheel g^1. Now, suppose a train to be in a block in a position between its two terminations, the battery signal-wheel g will be running on the front signal-line b. The wire g^2 connects this wheel with one pole of the battery, the other pole being connected by a wire with the earth in manner before mentioned, and as the battery-wheel g is in connection with the insulated rail b, no current can pass, as the circuit is broken; therefore, it will be seen that before signaling can be effected it will be necessary to form circuit by putting the insulated rail to earth. This can be accomplished in several ways. In the first place, suppose, for instance, another train enters the same block upon which the train before mentioned is traveling, the circuit is completed by means of the wire passing to the bell signal-wheel of such train, as before mentioned. No sooner is this circuit complete than the current of electricity rings the electric bells on both engines, and continues to do so so long as there is a train in the block. Therefore, it will be necessary that the driver entering the block shall pull up his train until his signal-bell ceases ringing. Moreover, this train, which has been signaled to stop, has control over all the block it has run over, because its battery signal-wheel remains on the line of this block, so that if another train were to enter behind this one its bell would announce a train in front, and so on all down the line.

The overlaps of the rail b^1 should be of considerable length, so that control may always be maintained over the block just passed over, notwithstanding the distance the train has run in pulling up. By this arrangement every front train has control over a train behind.

Fig. 5 represents the indicator and signaling apparatus connected with the battery on the train. One coil in this indicator is placed in the circuit of the battery signal-wheel g, and the other coil in that of the bell signal-wheel g^1, so that when the circuit is complete the needle deflects right or left, according to the negative or positive current passing through the same.

The deflection of the needle will be to one side or the other, according as a train is in the block in front or entering the block behind; but if both these events occur at the same time, then the needle will have a tremulous motion slightly to one side and then the other, according to the different qualities of the electric currents passing through the coils. The needle of the indicator, where so acted upon, is readily understood, for ordinarily when the needle is at rest in its vertical position it indicates "safe;" but when at rest in this position by reason of a train in the block in front, and one waiting to enter the block behind, the electric bell would be ringing; therefore no misunderstanding or confusion could arise as to the meaning of the same.

The dial of the indicator could have marked upon it (see Fig. 7) at the bottom at A "signals;" on the left hand at B "train behind;" at the right side at C "train in front;" and at the point where the needle stands when at D "bell ringing; train behind and in front." The magnetic needle could be balanced so as to keep it vertical when not acted upon as an ordinary "detector." The bell-signal and indicator-signal may be employed separately or together. The loss or resistance to electric influence in consequence of wet or dampness of the insulators would be small and imperceptible as employed in this system, because of the short lengths of line and its large transverse sectional area. The underneath and sides of the line of electric rail might, by preference, be dipped in asphalt, (which is a non-conductor,) and could then partly lie in water without affecting the system.

Intercommunication can be established between persons in authority at stations and a train in motion, especially near stations, in the following manner: This may be effected by simply placing at some desired distance upon the line a lever-armature, (shown in Fig. 8,) which is actuated by the magnet u in connection by means of an insulator-wire with a battery at the station, the opposite pole of which goes to earth; thus when the electric magnet u is magnetized the armature v forms contact with the signal-rail b, and so form circuit with a passing train through the medium of the battery signal-wheel g, the continuous action of which stops the train, and the intermittent action sends messages only.

It is not necessary further to elaborate the system herein specified, as it will readily be understood by those conversant with electric apparatus and their manifold arrangements that many forms of signaling could be adopted through the medium of the electric system herein described; therefore I do not want to confine myself to the actual detail and precise configuration of the parts shown, as the same may be modified and still retain the essential features of the invention; but

What I desire to claim is—

1. The combination, with the sectional electric rails, constructed and arranged as de-

scribed, and the ordinary track of a railway, of the adjustable battery and signal wheels g g^1, and their metallic communications with a suitable battery and an electric signal dial or index, substantially as shown, and for the purpose specified.

2. The combination, with the electric rails b b^1, of the signal and battery wheels g g^1, and their communications with a suitable battery and an electric signal-bell, substantially as and for the purposes specified.

3. The combination, with the electric rails b b^1, the battery and signal wheels g g^1, and their metallic communications with a suitable electric battery, an electric bell, or an electric index-dial, or both, of a lever-armature and its electric communications with a battery and suitable signal apparatus at a distant station, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my name in the presence of two subscribing witnesses.

November 19, 1874.

DAVID L. SALOMONS.

Witnesses:

H. B. MERTOR,

JOHN CRATES.