2 Sheets—Sheet 1.

T. S. HALL & G. H. SNOW.

ELECTRO MAGNETIC RAILROAD SIGNALS.

No. 181,435. Patented Aug. 22, 1876.

Fig. 1.

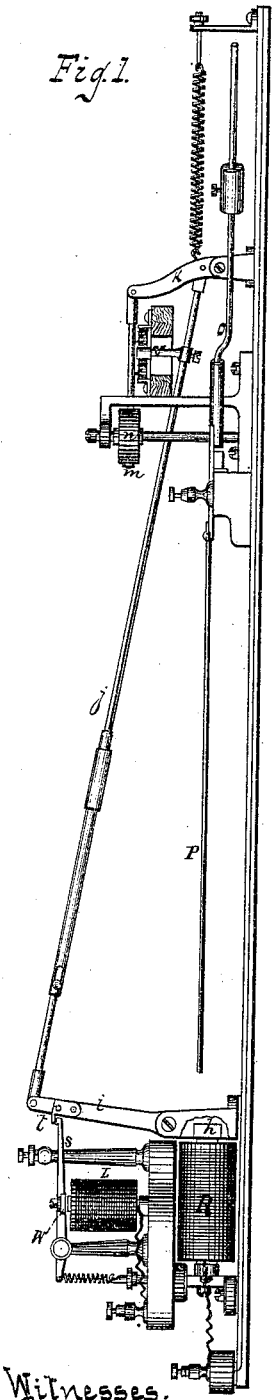
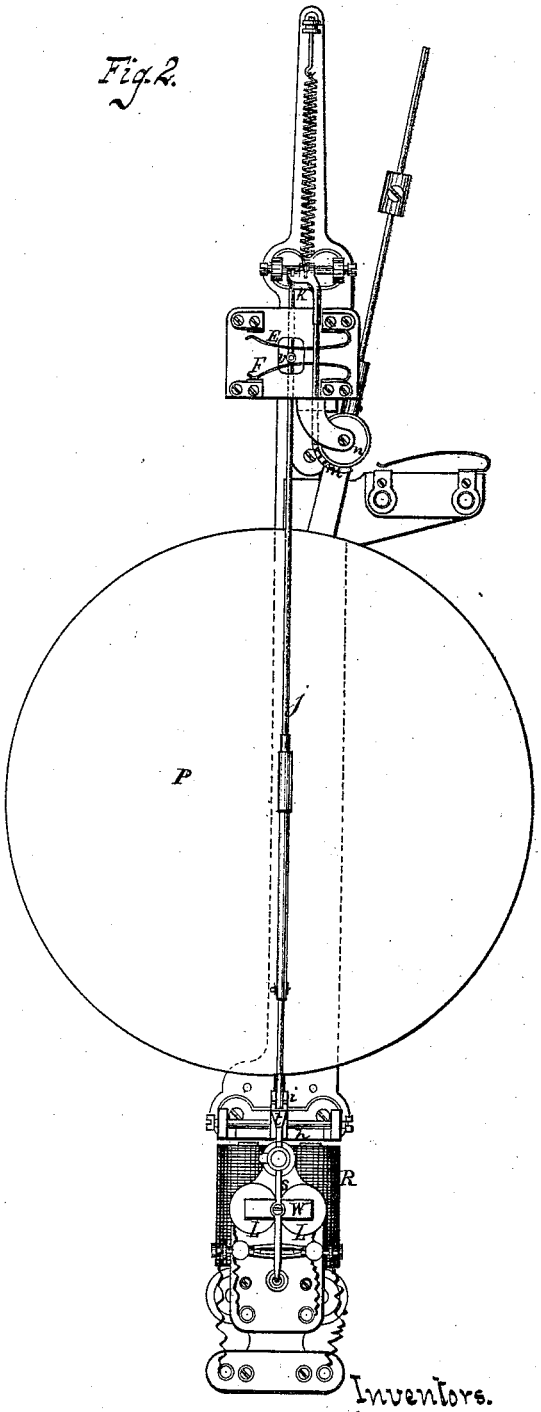


Fig. 2.



Witnesses.
Otto Stufeland
Chas. Wahlers.

Inventors.
Thomas S. Hall
George H. Snow
per
Van Santwood & Hauff
attorneys

2 Sheets—Sheet 2.

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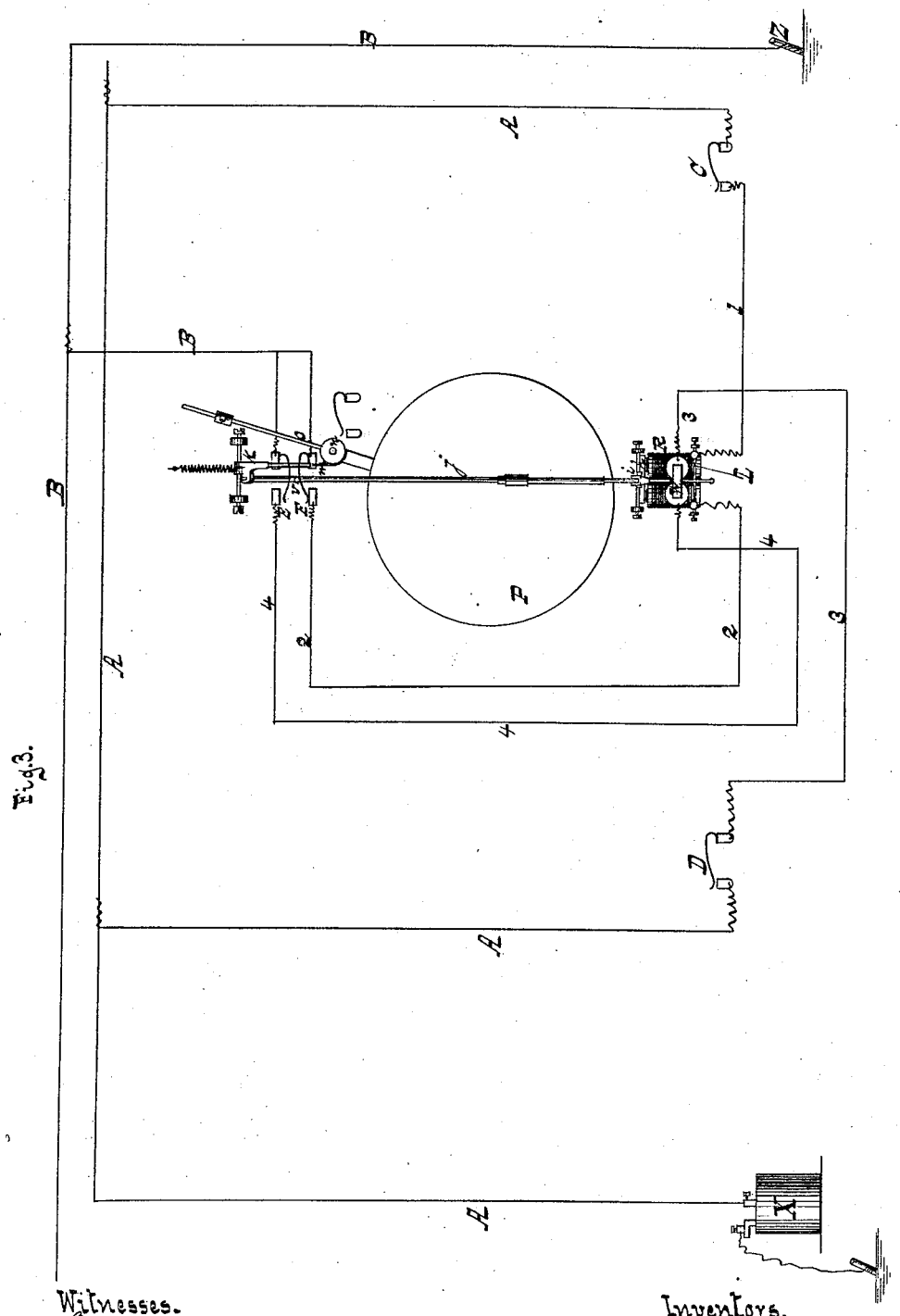

Fig. 3.

Witnesses.
Otto Hufland.
Chas. Wahlers.

Inventors.
Thomas S. Hall
George H. Snow per
Van Santvoord & Hauff
Attorneys

UNITED STATES PATENT OFFICE.

THOMAS S. HALL AND GEORGE H. SNOW, OF WEST MERIDEN, CONNECTICUT, ASSIGNORS TO THE HALL RAILWAY SIGNAL COMPANY.

IMPROVEMENT IN ELECTRO-MAGNETIC RAILROAD-SIGNALS.

Specification forming part of Letters Patent No. **181,435**, dated August 22, 1876; application filed January 21, 1876.

To all whom it may concern:

Be it known that we, THOMAS S. HALL and GEORGE H. SNOW, both of West Meriden, county of New Haven, and State of Connecticut, have invented a new and useful Improvement in Electro-Magnetic Railroad-Signals, which improvement is fully set forth in the following specification, reference being had to the accompanying drawing, in which—

Figure 1 represents a sectional side view. Fig. 2 is a front view of the same. Fig. 3 is a diagram, showing the connection of the signal with the battery.

Similar letters indicate corresponding parts.

This invention relates to certain improvements in electro-magnetic railroad-signals; and consists in the combination, with an electro-magnet and signal operated thereby, and two circuits, one from the entrance and one from the exit end of a section, of two circuit-controlling keys, one in each circuit, located near and mechanically operated by the lever of the signal, so that the circuit from the point operating the signal at one time is broken by the movement of the lever opening one key, and the circuit is closed from the point whence the lever is next to be operated by the closing of the other key, or vice versa, as will be more fully hereinafter described.

In the drawing, the letter R designates the electro-magnet, which, when vitalized, serves to raise the signal P by attracting the armature *h*, which is connected to the lever *i*, by which motion is transmitted to the rod *j*, lever *k*, chain *m*, and chain-wheel *n*, which wheel is revolved one-quarter of a revolution so as to bring the arm *o*, to which the signal-disk P is attached, in a position at right angles to its normal position, which position the signal occupies in the drawing.

The rod *j* is made in two parts, one being fitted into the other and exposed to the action of a spring, so that when the armature *h* is suddenly attracted this spring is compressed, and the signal P is raised gradually.

On the rod *j* is secured a pin, *v*, which, when the signal is down, acts on a spring-key, F, and holds the same down on its anvil.

C, Fig. 3, is a circuit-closer, which, when closed, completes a circuit from the battery X, through wire A, circuit-closer C, wire 1, raising-magnet R, wire 2, key F, wire B, to the ground Z. As soon as the circuit is closed the magnet R is vitalized, and the armature *h* is suddenly attracted, the spring in the rod *j* is instantly compressed before the inertia of the signal P and its other connections are overcome, and as the outer end of the lever *i* rises the retaining-lever S (see Fig. 1) catches under the projection *t* of the lever *i* before the signal-disk moves, and this lever is firmly retained in position. As the spring in the rod *j* expands the signal-disk rises, and the pin *v* on the rod *j* releases the key F, and the circuit through the raising-magnet is broken almost immediately after it had been closed through the circuit-closer C. After the signal has been raised, the current cannot again be closed through the circuit-closer C, and no battery-power is wasted if this circuit-closer should be closed many times in succession.

If the circuit-closer C is acted on, for instance, by the wheels of a railroad-train, and if such train contains two hundred wheels on each side, the circuit-closer would be closed two hundred times in succession. By the action of the first wheel, however, the electromagnet R is vitalized, the signal is raised, the circuit is broken at the key F, and the remaining one hundred and ninety-nine wheels have no effect on the battery, the magnet, or the signal, though each of these wheels closes the spring of the circuit-closer C, and consequently one hundred and ninety-nine out of two hundred impulses of the battery are saved.

It will also be seen from this description that, if the circuit-closer C should become permanently closed, or the wires A and 1 be crossed, the effect would be to raise the signal, and to break the circuit through the raising-magnet R.

This invention is of great importance where twenty, forty, or more signals are operated by one and the same battery. Suppose there are forty signals, and two trains of two hundred wheels each on a side, and the circuit to be closed by each wheel in passing each signal, as heretofore: the current would have to pass ($2 \times 200 \times 40$) sixteen thousand times through

the section formed by the battery X, wire A, signal-wire B, and ground Z Y; but if the signals are constructed according to our present improvement, the circuit will be closed only eighty times, once for each signal by each train, and all the remaining impulses of the battery will be saved.

The same effect takes place in reversing the signals. On the retaining-lever S is secured the armature W of the reversing-magnet L, and in the circuit of this reversing-magnet is placed a key, E, which is closed by the action of the pin *v* when the signal is raised. If the circuit-closer D, Fig. 3, is closed by the action of the wheel of a passing train, or otherwise, the circuit through the reversing-magnet is closed through wires A, circuit-closer D, wire 3, magnet L, wire 4, key E, and wire B, to the ground Z, the armature W is attracted, the lever *i* is released by the retaining-lever S, and the signal descends to its normal position. As soon as the signal begins to descend the key E is opened, and the circuit through the reversing-magnet is broken, so that the remaining wheels of the train will pass the circuit-closer D without wasting any battery-power.

In case of any disorder—for instance, if the wires A and 1, or the circuit-closer C, should become permanently closed—the signal would go up, and stay up. If it should be let down while the circuit-closer C or wires A and 1 are in this condition, it would immediately go up again. If wires A and 3 or circuit-closer D become permanently closed, the signal would go down, and stay down, and if it should be raised while the circuit-closer D or wires A and 3 are in this condition, it would immediately go down; and if both these last-named conditions should be in effect at the same time, the signal would keep going up and down.

If the circuit becomes permanently closed at one point in a signal apparatus not provided with our present improvement, the current is rendered permanently weak when wanted to be used at other points on the section or main circuit of the battery, and the battery-power must be increased to the utmost limit.

With our present improvement a comparatively weak battery will be sufficient to work a large number of signals in a long circuit, since the circuits required for moving the signals are closed only for very short periods of time, and consequently whenever the spring of one of the circuit-closers C or D along the line is closed the appropriate signal-magnet receives the benefit of the full battery-power.

We do not claim a signal connected metallically with an operating electro-magnet, and alternately with one or two circuit-closers, as such an arrangement has before been used.

What we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with an electro-magnet and signal operated thereby, and two circuits, one from the entrance end and one from the exit-end of a section, of two circuit-controlling keys, one in each circuit, located near and mechanically operated by the lever of the signal, so that the circuit from the point operating the signal at one time is broken by the movement of the lever opening one key, and the circuit is closed to the point from whence the lever is next to be operated by the closing of the other key, or vice-versa, substantially as described.

2. The combination of an elastic rod, *j*, with electro-magnet R, stop-lever S, signal P, and key F in the circuit of said electro-magnet, substantially as and for the purpose set forth.

3. The combination of a key, E, with the releasing-magnet L, stop-lever S, and signal P, said key being situated in the circuit of the releasing-magnet, substantially as and for the purpose set forth.

In testimony that we claim the foregoing we have hereunto set our hands and seals this 7th day of January, 1876.

THOMAS S. HALL. [L. S.]
GEORGE H. SNOW. [L. S.]

Witnesses:
C. P. IVES,
JOHN L. MERRIAM.