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A. W. HALL.

ELECTRIC SWITCH AND SIGNAL APPARATUS.

No. 284,841. Patented Sept. 11, 1883.

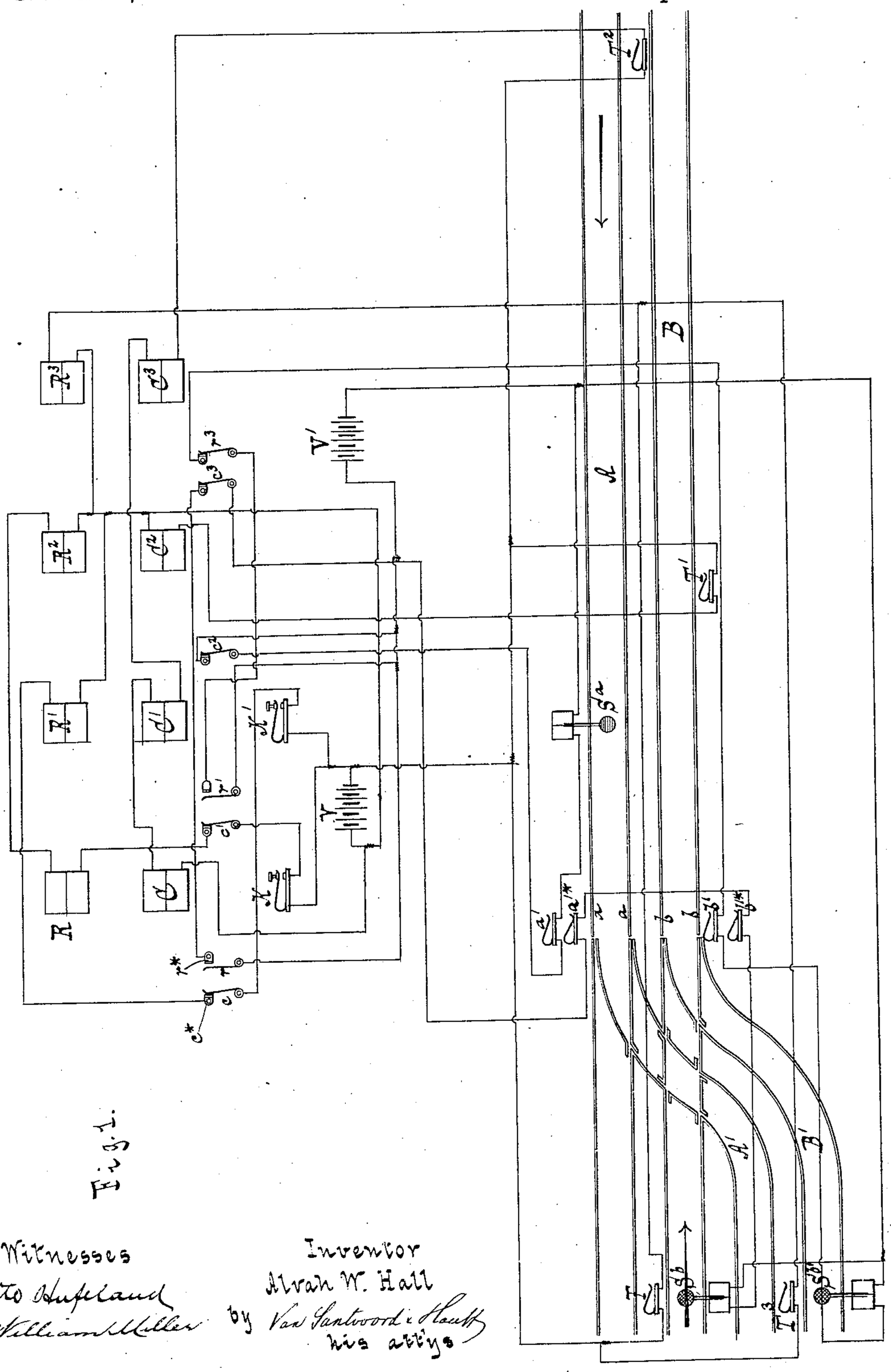

Fig. 1.

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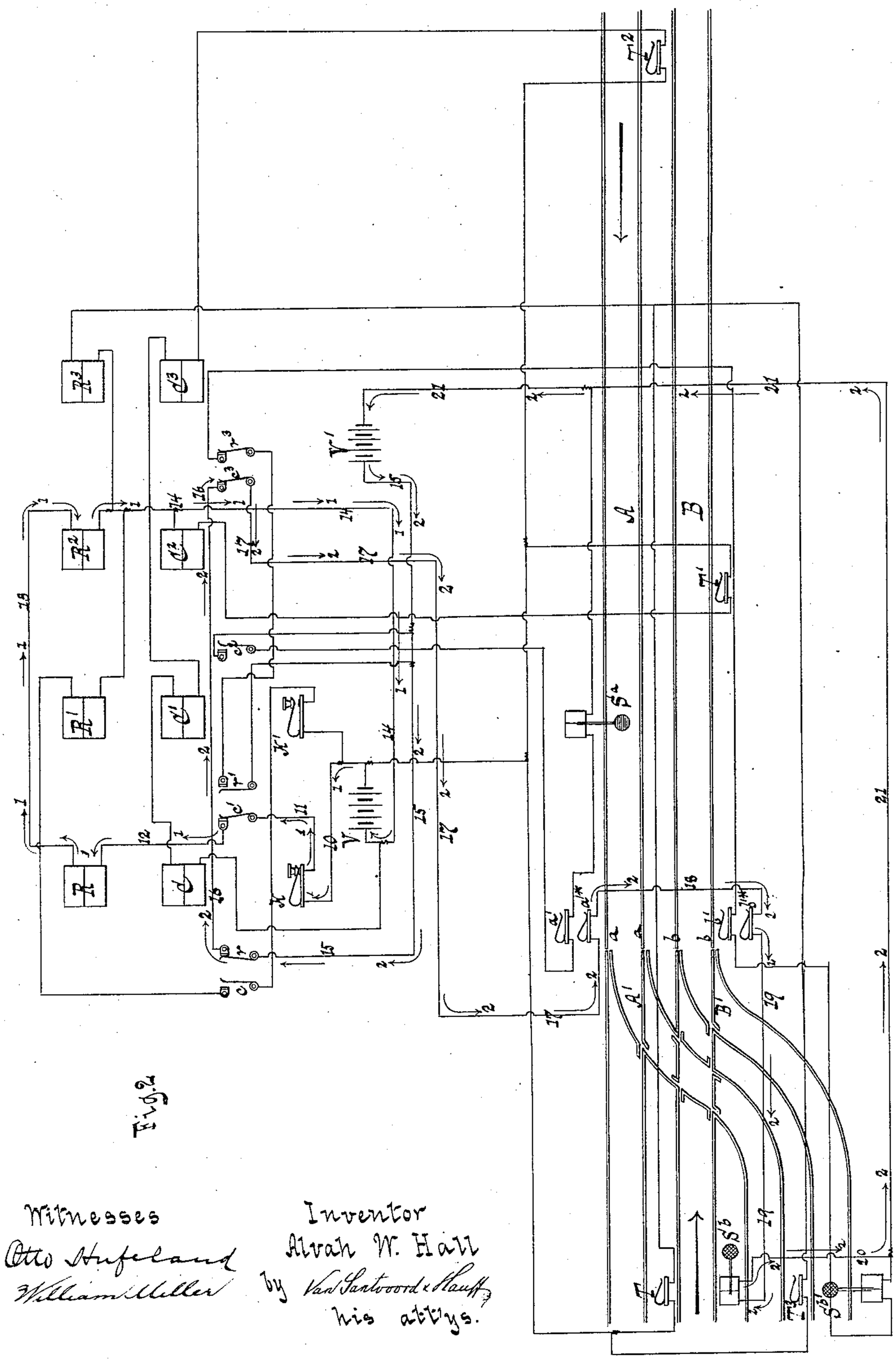

Fig. 2.

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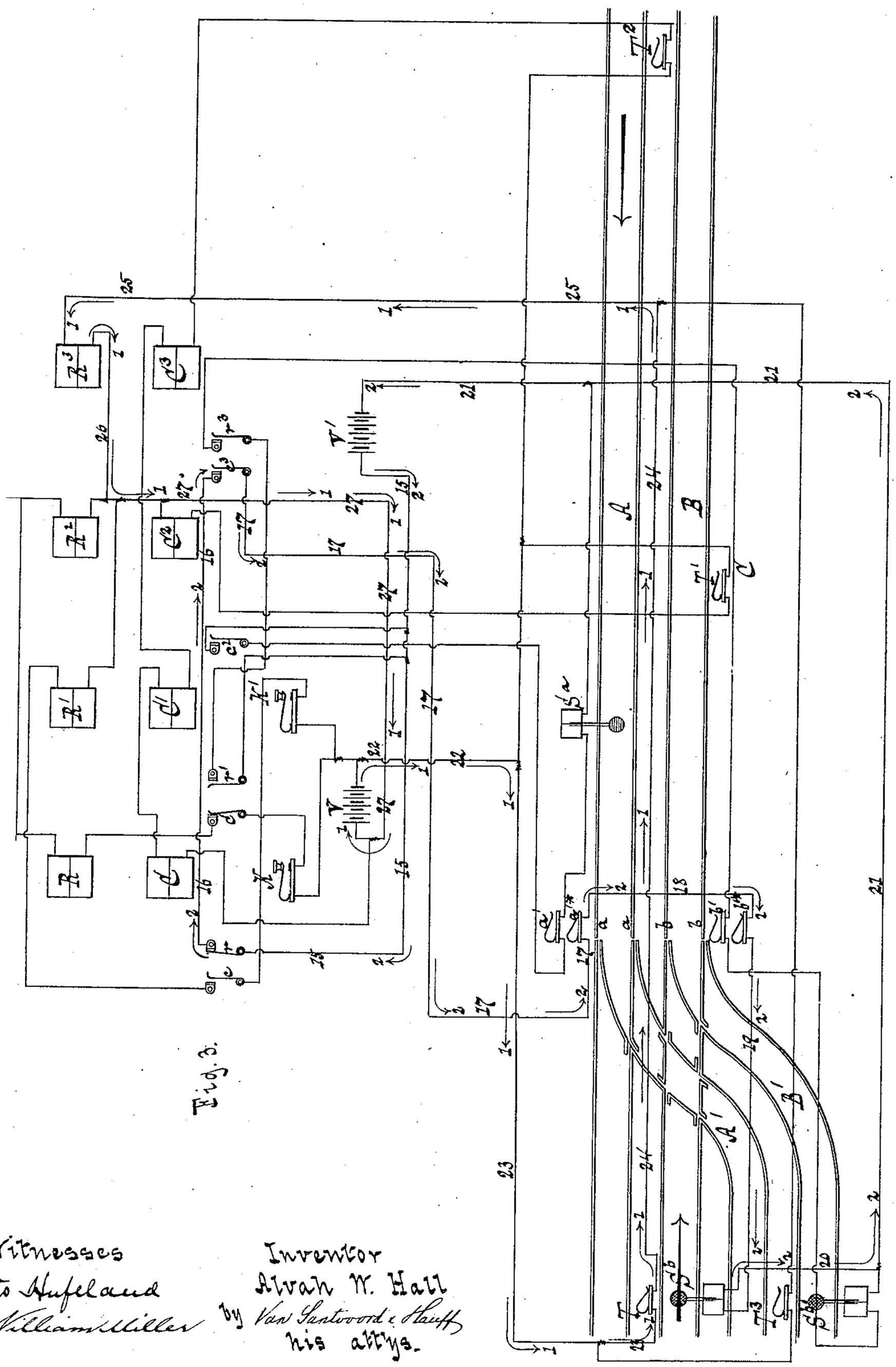

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ELECTRIC SWITCH AND SIGNAL APPARATUS.

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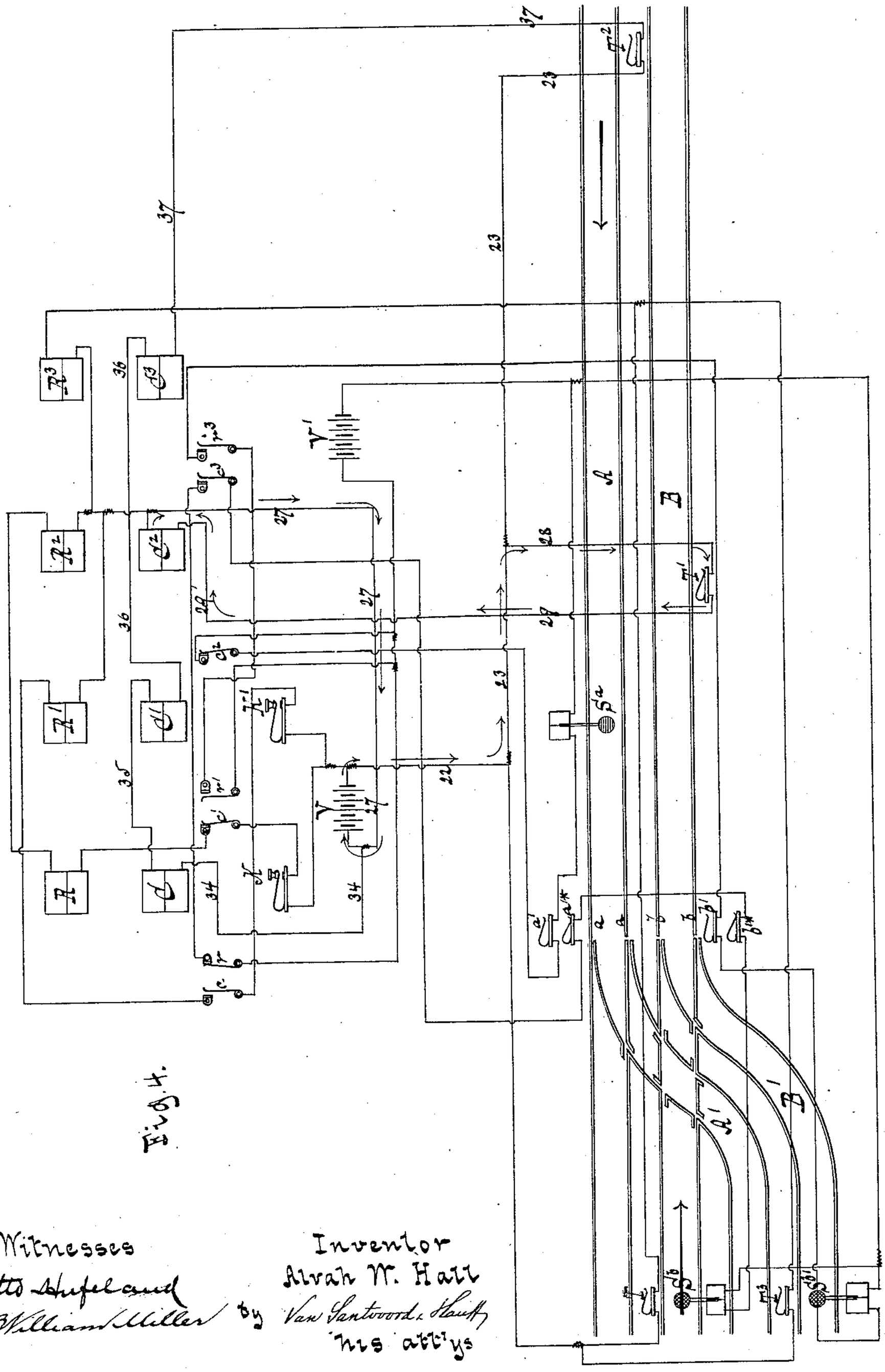

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ELECTRIC SWITCH AND SIGNAL APPARATUS.

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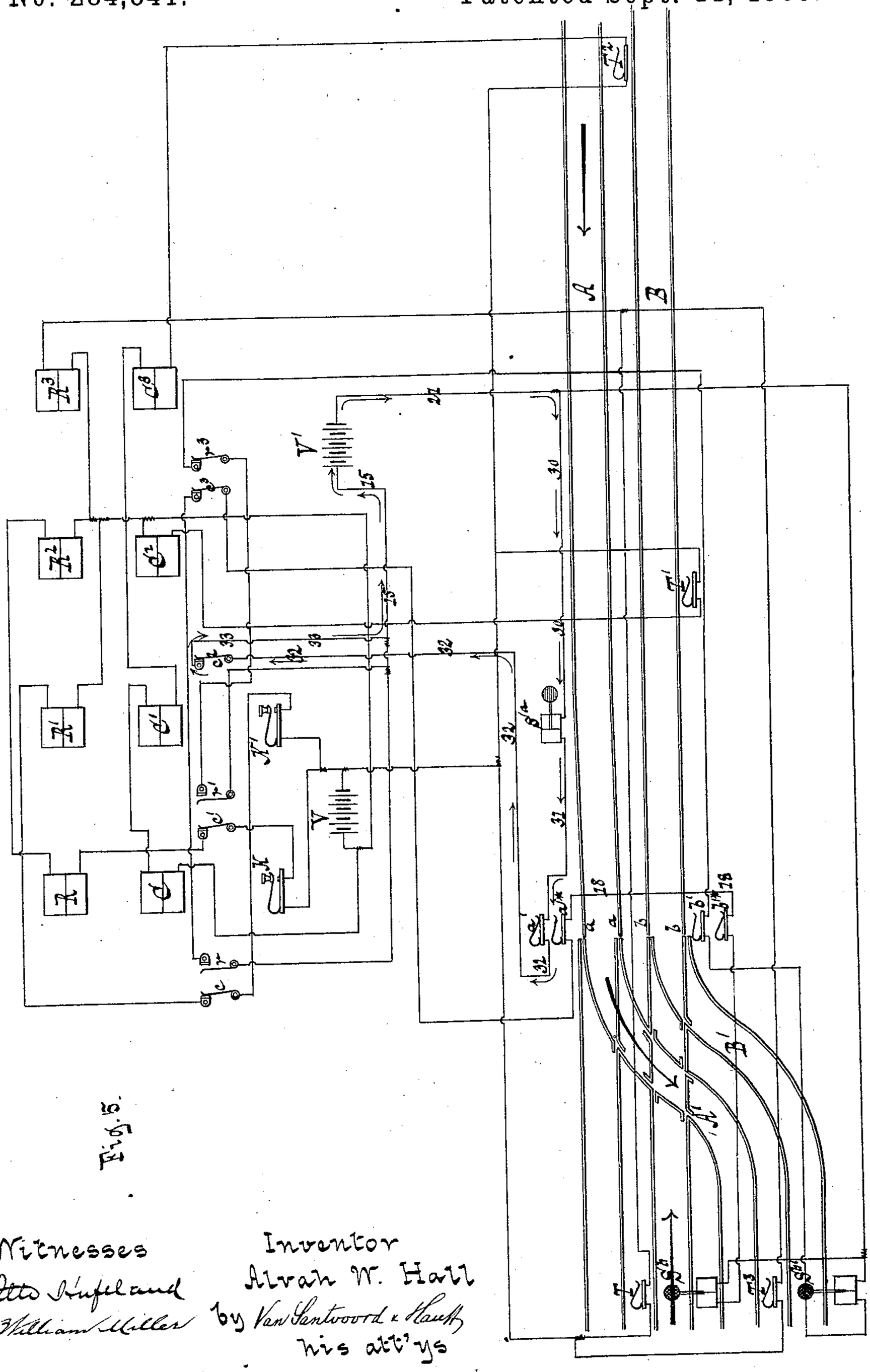

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ELECTRIC SWITCH AND SIGNAL APPARATUS.

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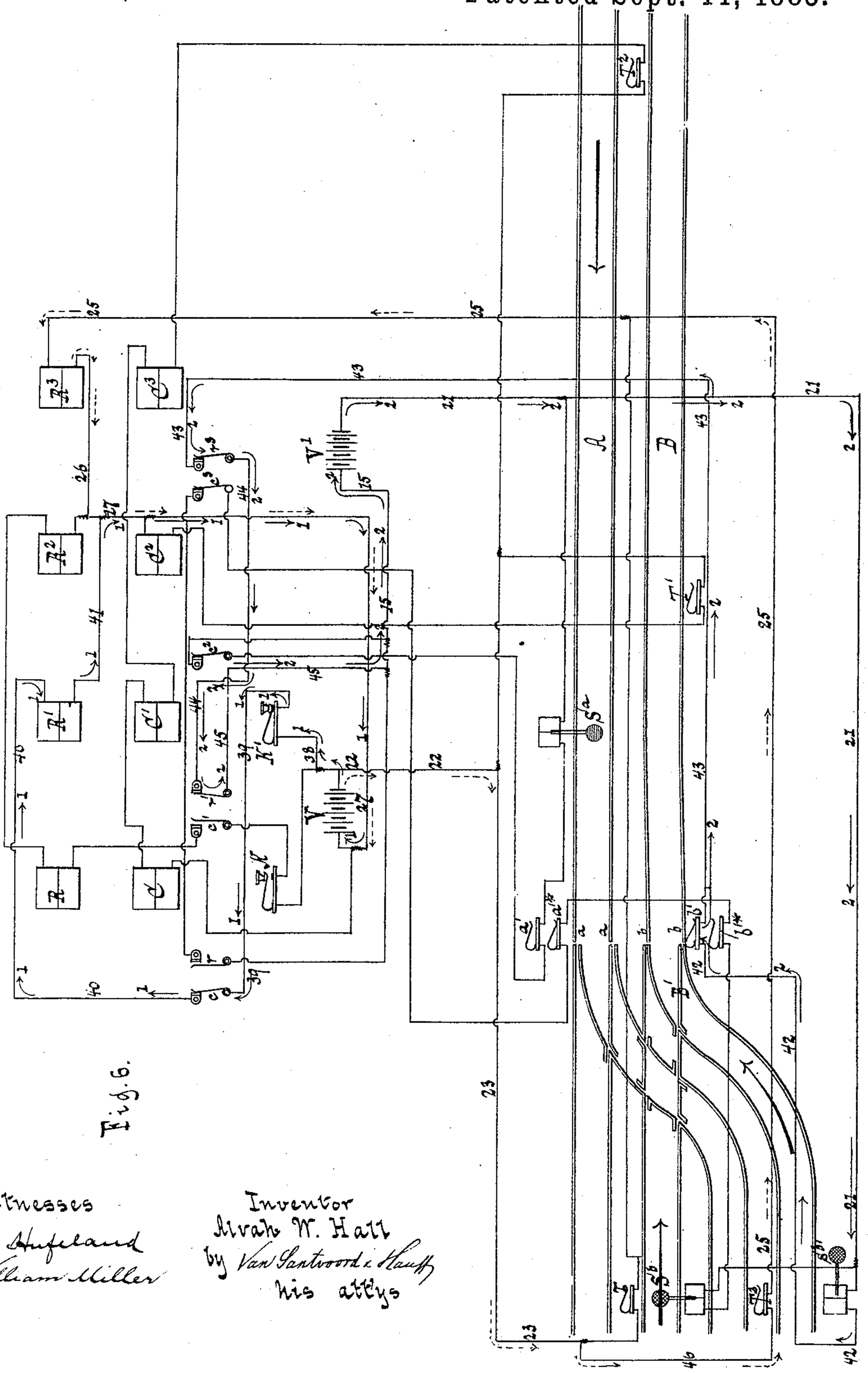

Fig. 6.

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ELECTRIC SWITCH AND SIGNAL APPARATUS.

No. 284,841. Patented Sept. 11, 1883.

Fig. 7.

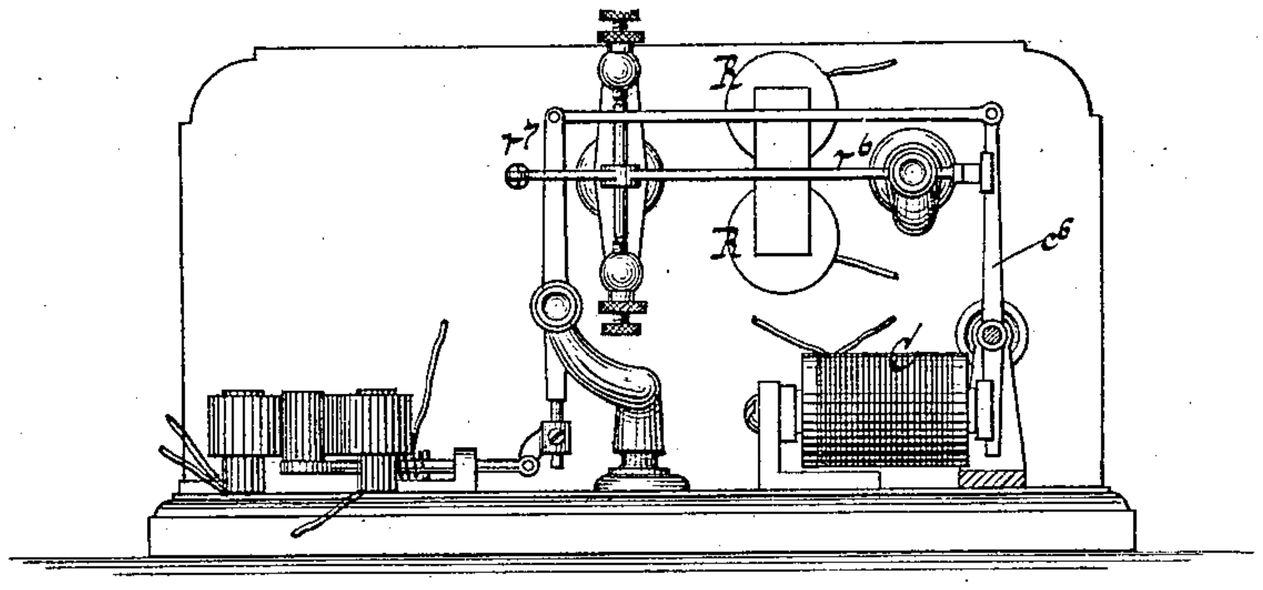


Fig. 8.

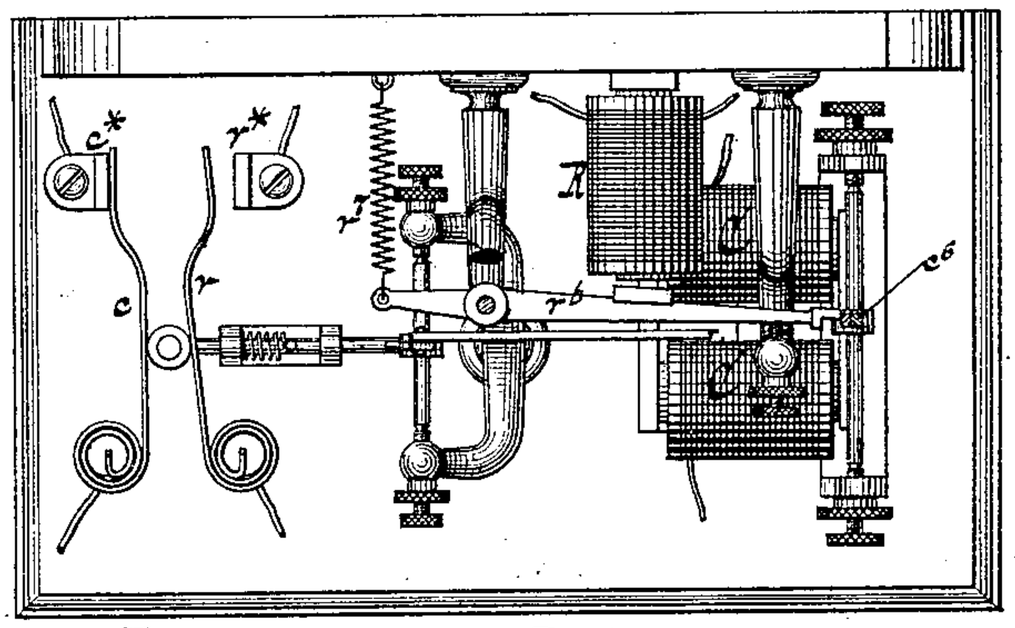


Fig. 9.

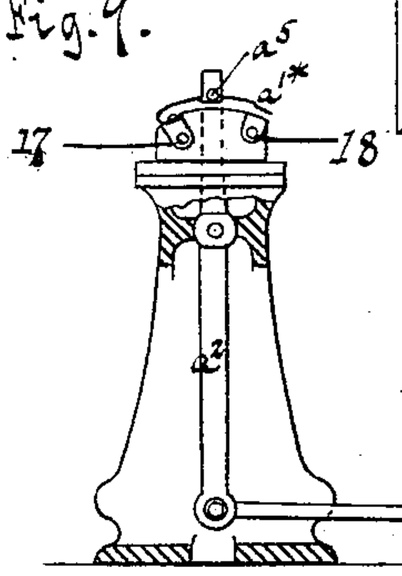


Fig. 10.

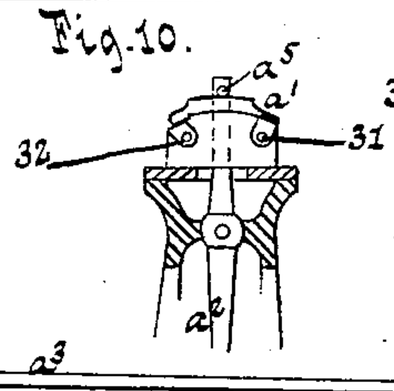
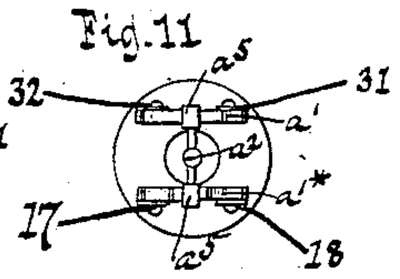
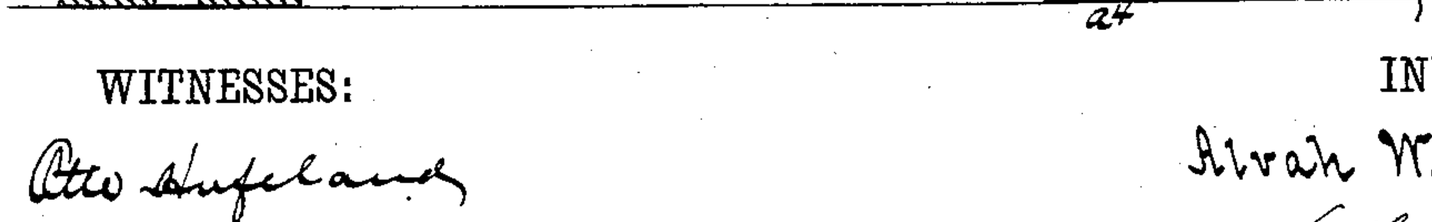


Fig. 11





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ATTORNEYS

UNITED STATES PATENT OFFICE.

ALVAH W. HALL, OF MERIDEN, CONNECTICUT.

ELECTRIC SWITCH AND SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 284,841, dated September 11, 1883.

Application filed May 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALVAH W. HALL, a citizen of the United States, residing at Meriden, in the county of New Haven and State of Connecticut, have invented new and useful Improvements in Electric Switch and Signal Apparatus, of which the following is a specification.

This invention relates to an interlocking switch and signal apparatus which is under the control of two keys, all in such manner that no two safety-signals that might interfere with each other can be given.

The peculiar construction of my apparatus is pointed out in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 is a diagram of the entire apparatus in its normal position. Fig. 2 is a diagram of the same when one of the keys is depressed and both the up and down main tracks are clear. Fig. 3 is a diagram of the same when both keys are in their normal position, the signal on the uptrack is set to "danger" by the passing train, and all but the main downtrack are blocked. Fig. 4 is a diagram of the same at the time the train on the uptrack passes out of the section, permitting a safety-signal on either main or branch track. Fig. 5 is a diagram of the same when the branch downtrack is clear. Fig. 6 is a diagram of the same when the branch uptrack is clear. Fig. 7 is a side view of one of the double-circuit instruments which I use in my signal apparatus. Fig. 8 is a plan or top view of the same. Fig. 9 is a side view of one of the switch-instruments connected with the switch-rails in my apparatus. Fig. 10 is a partial section of the same. Fig. 11 is a plan or top view of the same.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates the main downtrack, B the main uptrack, A′ a branch downtrack, and B′ a branch uptrack.

a a are the switch-rails for the branch track A′; *b b*, the switch-rails for the branch track B′.

S^a is the signal for all the downtracks. S^b is the signal for the main uptrack B, and $S^{b'}$ is the signal for the branch uptrack B′. The signal S^a is a green disk, and when in view it shows "safety" for the main downtrack A and "danger" for the branch downtrack A′, and vice versa. The signals S^b and $S^{b'}$ are red disks, which, when in view, show "danger," and when out of view they show "safety." All these signals are controlled by electro-magnets, so that when the electric circuit through one of the signal-magnets is closed the corresponding signal is moved out of sight, and when the circuit is broken the signal drops in sight by its own gravity. Signals of that kind are well known to those acquainted with electric railroad-signals, and require no further description.

On the side of the tracks is a switch-house, which contains four double-circuit instruments, C R, C′ R′, C^2 R^2, C^3 R^3, and two keys, K K′, said circuit-instruments being inclosed in a box, so that they cannot be tampered with, while the keys are accessible to the switchman.

The construction of the double-circuit instruments which I use is shown in Figs. 7 and 8. In these figures, C C are the circuit-closing magnets, and R R the releasing-magnets. Whenever the armature of the magnets C is attracted, the locking-lever r^6 is carried behind the armature-lever c^6 by the spring r^7, and the spring *c* is brought in contact with the anvil c^*, and retained in that position until the releasing-magnets R are vitalized and their armature, which is secured to the locking-lever r^6, is attracted. When the armature-lever c^6 falls back, the spring *r* is brought in contact with the anvil r^*.

By referring to Fig. 1, it will be seen that the double-circuit instrument C R acts upon the circuit-closers *c r*, the double-circuit instrument C′ R′ upon the circuit-closers *c′ r′*, the double-circuit instrument C^2 R^2 upon the circuit-closer c^2, (no r^2 being required,) and the double-circuit instrument C^3 R^3 upon the circuit-closers c^3 r^3, which, however, are so arranged that both open and close simultaneously, which is effected by changing the position of the anvil r^*, Fig. 8, in relation to the spring *r*.

V V′ are two batteries, and T T′ T^2 T^3 are track-instruments or circuit-closers which are actuated by the wheels of passing trains. *a′* a'^* are circuit-closers which are actuated by the switch-rails *a a*, and *b′* b'^* are circuit-closers which are actuated by the switch-rails *b b*. These devices I have termed "switch-instruments." The manner in which these switch-instruments operate will be understood

by referring to Figs. 9, 10, and 11. The circuit-closers a' a'^* (or b' b'^*) are secured on the top of a hollow standard, which forms the bearing for the pivot of a lever, a^2, one arm of which connects by a rod, a^3, with the movable chair a^4, which supports the switch-rails a a, (only one such rail being shown in Fig. 9.) The other arm of the lever a^2 carries two rollers, a^5, which act upon the circuit-closers a' a'^* in such a manner that when the switch-rails a a are in line with the main track A the circuit-closer a' is open and the circuit-closer a'^* is closed, Fig. 1; but if the switch-rails a a are in line with the branch track A′, the circuit-closer a' is closed and the circuit-closer a'^* is open, Figs. 9, 10, and 11. This circuit-closing mechanism or switch-instrument forms no part of my present invention, and I have illustrated and described the same only for the purpose of being able to explain fully my present invention.

In the diagram Fig. 1 all the signals, S^a, S^b, and $S^{b'}$, are in sight, and consequently all the tracks with the exception of the main track A are blocked. If the switchman depresses the key K, as shown in Fig. 2, a circuit (indicated by arrows 1) is closed from battery V through wire 10, key K, wire 11, circuit-closer c', wire 12, releasing-magnet R, wire 13, releasing-magnet R^2, and wire 14, back to the battery, the circuit-closer c is opened and circuit-closer r is closed, and a circuit (indicated by arrows 2) is closed from battery V′ through wire 15, circuit-closer r, wire 16, circuit-closer c^3, wire 17, circuit-closer a'^*, wire 18, circuit-closer b'^*, wire 19, electro-magnet of signal S^b, wires 20 and 21, back to battery. The electro-magnet of signal S^b is vitalized and the signal S^b is moved out of sight. Both the main tracks are now clear, while both branch tracks are blocked. At the same time, by closing the circuit through magnet R^2, the circuit-closer c^2 is opened.

In Fig. 3 I have shown the position of the parts during the time the up train moving on the track B passes the track-instrument T. As soon as this track-instrument is closed by the wheels of the passing train, a circuit (indicated by arrow 1 in Fig. 3) is closed from battery V through wires 22 23, track-instrument T, wires 24 25, releasing-magnet R^3, wires 26 and 27, back to the battery, by the action of the releasing-magnet R^3, the circuit-closers c^3 and r^3 are opened, the circuit of battery V′, (indicated by arrows 2 in Figs. 2 and 3) through the electro-magnet of the signal S^b is broken, and the signal S^b drops back into its position of danger, the main uptrack B is thereby blocked and only the main downtrack A remains clear. As the train which has entered the section on the uptrack proceeds, it reaches the track-instrument T′, and the apparatus assumes the condition indicated in Fig. 4. When this track-instrument is closed by the action of the wheels of the passing train, a circuit is closed, as indicated in full arrows, from battery V through wires 22 23 28, track-instrument T′, wire 29, circuit-closing magnet C^2, and wire 27, back to the battery, the circuit-closing magnet C^2 is vitalized, and the circuit-closer c^2 is attracted. By these means the apparatus is left in condition to switch off a down train from the main track A to the branch track A′, which crosses the main up-track B, rendering it necessary to block this track in order to allow the train on the branch track A′ to proceed with safety. When the up train reaches the track-instrument T^2, so as to close the same, all the parts are returned to their normal position, because a circuit is closed from battery V through wire 34, Fig. 4, circuit-closing magnet C, wire 35, circuit-closing magnet C′, wire 36, circuit-closing magnet C^3, wire 37, track-instrument T^2, (which at the time is closed,) and wires 23 22, back to the battery.

The condition of the apparatus when the switch-rails a a are moved in line with the branch downtrack A′ is shown in Fig. 5. A circuit is closed from battery V′ through wires 21 30, electro-magnet of signal S^a, wire 31, circuit-closer a', wire 32, circuit-closer c^2, and wires 33 15, back to the battery, the signal S^a is moved out of sight by its electro-magnet, the main downtrack A is blocked, and the branch downtrack A′ is cleared. When the switch-rails a a are returned to their normal position, the circuit through the electro-magnet of the signal S^a is broken at a', the signal S^a drops into sight, the main downtrack A is opened, and the branch downtrack A′ is blocked. If the switchman desires to open the branch up-track B′, he moves the switch-rails b b in line with the branch track B′, and depresses the key K′. (See Fig. 6.) By depressing this key, a circuit is closed from battery V, wire 38, key K′, wire 39, circuit-closer c, wire 40, releasing-magnet R′, and wires 41 27, back to the battery, as indicated by arrows 1, Fig. 6. By the vitalization of magnet R′, the spring c' is opened and the spring r' is closed, and a circuit is closed from battery V′, through wire 21, electro-magnet of signal $S^{b'}$, wire 42, circuit-closer b', wire 43, circuit-closer r^3, wire 44, circuit-closer r', and wires 45 15, back to the battery, as indicated by arrow 2 in Fig. 6, the signal $S^{b'}$ is moved out of sight, and the branch up-track B′ is cleared, while the main uptrack remains blocked. When the train on track B′ passes the track-instrument T^3, a circuit is closed from battery V through wires 22 23 46, track-instrument T^3, wire 25, releasing-magnet R^3, and wires 26 27, back to the battery, as indicated by dotted arrows in Fig. 6, the springs c^3 r^3 are opened, the circuit of battery V, through magnet of signal $S^{b'}$, is broken, and the signal $S^{b'}$ drops back, so as to block the track B′ behind the train. When this train passes the track-instrument T^2, all the springs c r, c' r', c^2, c^3 r^3 are returned to their normal position, as already explained; and in order to admit a second train to the branch uptrack, the switchman has again to depress the key K′. If he desires to open the main track B,

he restores the switch-rails *b b* to their normal position and depresses the key K, as stated in the description of Fig. 2.

By examining the connections of the different parts of my apparatus, it will be seen that no two safety-signals can be given which would open tracks for trains that might interfere with each other. For instance, if the signal S^b of the main track is set to "safety," as shown in Fig. 2, the signal S^a cannot be set to "safety" for the branch downtrack A'; neither can the signal $S^{b'}$ be set to "safety" for the branch uptrack B', since neither the circuit through the electro-magnet of signal S^a nor that through the electro-magnet of signal $S^{b'}$ can be closed. In the same manner, while the signal S^a is set to "safety" for the down branch track A' the signal S^b cannot be changed to "safety" for the main uptrack, (see Fig. 5,) and while the signal S^b is set to "safety" for the main uptrack (see Fig. 2) neither the signal S^a nor the signal $S^{b'}$ can be disturbed. This will be readily understood from the various diagrams referred to, and fully described in the foregoing specification.

It will also be seen that in order to open the main uptrack B the switchman has to depress the key K, and in order to open the branch uptrack B' he has to depress the key K', and since these keys will produce no effect unless the switch-rails are in the required position, the worst that can happen is that the trains are delayed if the switchman fails to give the required signals. The battery V, by its action upon the double-circuit instruments C R, C' R', C^2 R^2, C^3 R^3, serves to change the position of the various circuit-closing springs *c r*, *c' r'*, c^2 r^2, c^3 r^3, so as to enable the signal-battery V' to act upon the electro-magnets of the several signals in the required manner.

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

1. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instruments controlling the circuit-closing springs *c r*, *c' r'*, c^2, c^3 r^3, the signals S^a S^b $S^{b'}$, the switch-rails *a a*, *b b*, the switch-instruments *a' a'**, *b' b'**, and electrical connections.

2. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instruments controlling the circuit-closing springs *c r* c^2, the signal S^b, the switch-rails *a a*, *b b*, the switch-instruments *a' a'**, *b' b'**, the keys K, and electrical connections.

3. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instrument controlling the circuit-closing springs *c' r'*, the signal $S^{b'}$, the switch-rails *b b*, the switch-instruments *b' b'**, the key K', and electrical connections.

4. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instrument controlling the circuit-closing springs *c r* c^2, the signal S^b, the switch-rails *a a*, *b b*, the switch-instruments *a' a'**, *b' b'**, the track-instrument T, and electrical connections.

5. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instrument controlling the circuit-closing springs *c r* c^2, the signal S^a, the switch-rails *a a*, the switch-instrument *a' a'**, the track-instrument T', and electrical connections.

6. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instrument controlling the circuit-closing springs *c' r'*, the signal $S^{b'}$, the switch-rails *b b*, the switch-instrument *b' b'**, the track-instrument T^3, and electrical connections.

7. The combination, substantially as hereinbefore described, of the two batteries V V', the double-circuit instruments controlling the circuit-closing springs *c r*, *c' r'*, c^2, c^3 r^3, the signals S^a S^b $S^{b'}$, the switch-rails *a a*, *b b*, the switch-instruments *a' a'**, *b' b'**, the track-instrument T^2, and electrical connections.

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

ALVAH W. HALL. [L. S.]

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W. HAUFF,
E. F. KASTENHUBER.