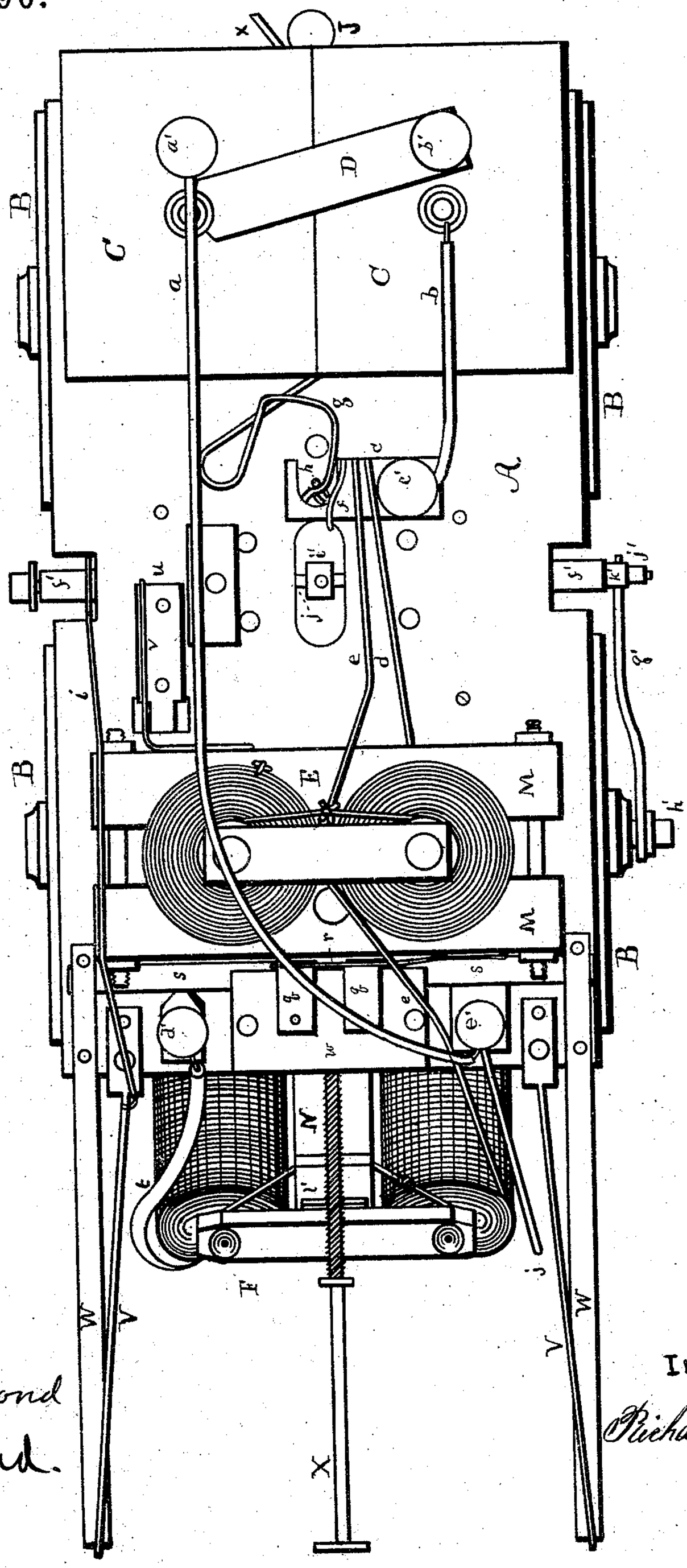
3 Sheets--Sheet 1.

R. A. STEUDELL.

Electro-Signalling Apparatus for Railways.

No. 155,596. Patented Oct. 6, 1874.

Fig. 1.



Witnesses
L. L. Bond
C. W. Bond.

Inventor.
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3 Sheets--Sheet 2.

R. A. STEUDELL.

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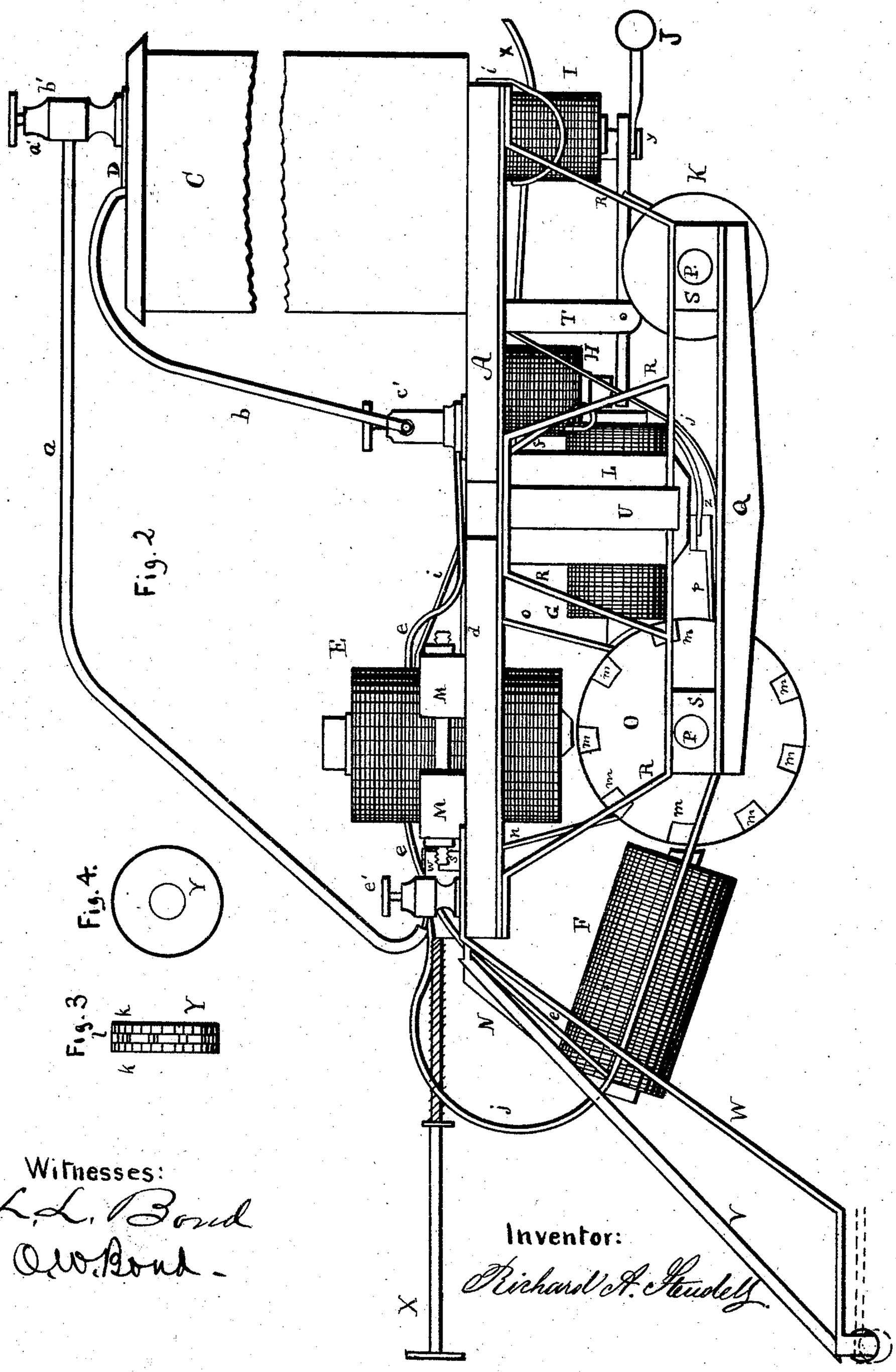

Fig. 2

Fig. 4.

Fig. 3

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3 Sheets--Sheet 3.

R. A. STEUDELL.

Electro-Signalling Apparatus for Railways.

No. 155,596. Patented Oct. 6, 1874.

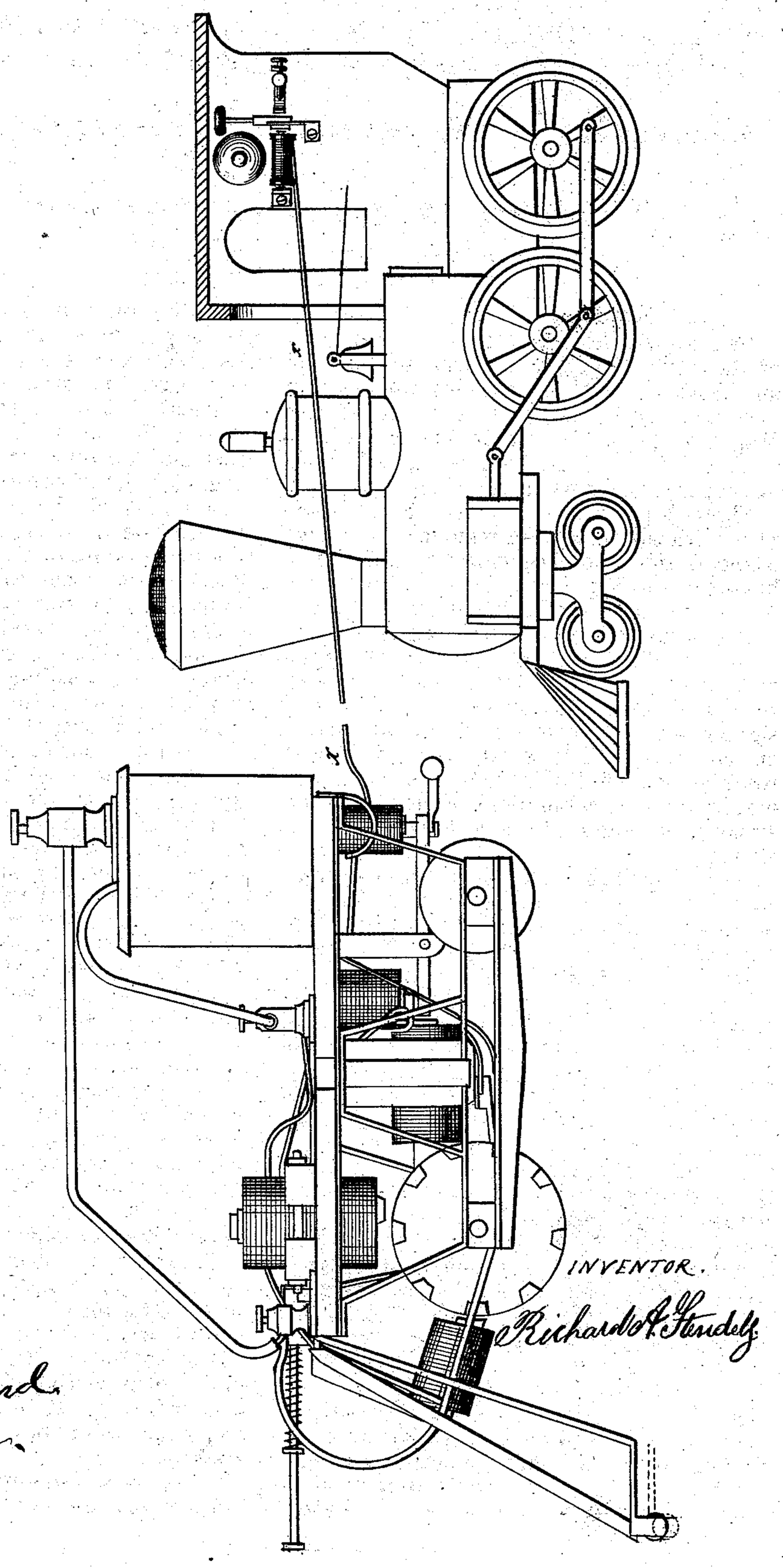

Fig. 5.

WITNESSES:

L. L. Bond.

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UNITED STATES PATENT OFFICE.

RICHARD A. STEUDELL, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF HIS RIGHT TO HERMANN G. NUSCHELER, OF SAME PLACE.

IMPROVEMENT IN ELECTRIC SIGNALING APPARATUS FOR RAILWAYS.

Specification forming part of Letters Patent No. **155,596,** dated October 6, 1874; application filed May 11, 1874.

To all whom it may concern:

Be it known that I, RICHARD A. STEUDELL, of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electro-Magnetic Engines, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a top or plan view; Fig. 2, a side view with the wheels all removed; and Figs. 3 and 4, side and face views of the circuit-breaker; and Fig. 6 is a side elevation, showing the connection with the engine.

The nature of my invention consists in providing a self-acting electro-magnetic engine to be connected with each passenger or other train, and in advance thereof, so as to convey signals back to the engineer, or other person on the train, in time to stop the train before reaching the point of danger, and in the several improved combinations of devices for operating the engine, hereinafter set forth and claimed.

In the drawings, A represents the bed-frame; B, the wheels; C, the battery; D, the connecting-bar between the several cups or sections of the battery; E, F, and G, the electro-magnets for operating the driving-wheels; H I, the electro-magnets for operating the brake; J, the brake-bar; K, the brake-wheel; L, the frame-work for connecting the truck with the bed or platform, and for supporting the magnet G; M, the frame-work for supporting the magnet E; N, the frame-work for supporting the magnet F; O, the cylindrical armature for operating the driving-wheels; P, the axles; Q, the truck; R, the brace-bars or frame-work connecting the truck and the platform; S, the journal-boxes; T, the bar or post for supporting and pivoting the brake-bar; U, the brace or supporting bar of the frame L; V W, the outrunners for detecting broken rails; X, the projecting bar for signaling obstructions; Y, the circuit-breaker; *a*, the wire for connecting the rail-indicator V W with the battery; *b*, the wire connecting the electro-magnets with the battery, and extending as a single wire to the binding-post *c'*, and through that to the plate *c*; *c*, the plate; *d*, the wire extending from the plate *c* to one side of the magnet E; *e*, the wire extending from the same plate to one side of the magnet F; *f*, the wire extending from the same plate to one side of the magnet G; *g*, the wire extending from the same plate to the magnet I; *h*, the wire extending from the same plate to the magnet H; *i*, the wire extending from the outrunner or track-indicator to the magnet I; *j*, the wire extending from the binding-post *e'* to the bar T, and through that and the brake-lever to the magnet H; *k*, the non-conducting sides of the circuit-breaker; *l*, the metal center of the same; *m*, the cross-bars connecting the two heads of the cylindrical armature; *n*, the spring-arm connecting the magnet F with the circuit-breaker; *o*, the spring-arm connecting the magnet E with the circuit-breaker; *p*, the spring-arm connecting the magnet G with the circuit-breaker; *q*, copper plates; *r*, spring connecting the plates *q*; *s*, copper plate or spring connecting the binding-post *e'* with the wire *i*; *t*, the wire connecting the magnet F with the binding-post *d'*; *u*, plate forming part of the spring *o*; *v*, the wire connecting the said spring with the magnet E; *w*, the head-block; *x*, the wire extending back to connect this engine with the train; the other connecting-wire is connected with the binding-post *c'*, and is not shown; *a'*, *b'*, *c'*, *d'*, and *e'*, the binding-posts; *y*, the spring or rest for changing the current when the lever or armature J drops at the rear end; *z*, the wire connecting the magnet G with the spring *p*; *f'*, the journal-bearings for the rock-shaft; *g'*, the pitman; *h'*, the wrist or crank-pin connecting the pitman with one of the driving-wheels; *i'*, socket in the rock-shaft for connecting a bell-hammer; *j'*, the rock-shaft; *k'*, descending arm connecting the rock-shaft with the pitman *g'*.

The platform A is made of wood or of metal, provided with suitable non-conducting surfaces. The wheels B are made of any of the well-known forms, and provided with a flange to fit the rails. The battery C is made, as shown, of two cups, which are of an operating size, and are, therefore, shown much larger in proportion than they will be in a full-sized machine.

I propose to use any of the well-known batteries which are suitable, and to use a num-

ber of cups with part of them, so arranged that they can be thrown on or off to increase or diminish the speed of the engine. As shown, the wire *b* is connected with the positive pole; but in use, the connection may be made either way—that is, with the positive or negative poles, as may be desired.

E F G are modified forms of the horseshoe or double magnets, and are made with the usual coils and connections. H and I are single magnets, and do not operate in the movement of the engine further than the brake is concerned. The lever J is made of metal, and is a double-acting armature, one end acting upon the magnet H, and the other upon the magnet I; and in its operation, when the rear end is depressed, as shown at Fig. 2, it presses upon the wheel or drum K, which is attached to the rear axle, and is the brake for the engine. L, M, and N are frames, which support their respective magnets, and are made of wood, as at L M, or of metal, as at N, and when made of metal they are to be provided with some suitable non-conducting material, as shown at *l'*, Fig. 1.

The revolving armature is permanently attached to the front axle, which carries the driving-wheels, and is made of two circular plates, which are attached by means of a hub, or otherwise, and are connected together at the outer edges by means of metal cross-bars *m*, which are sufficiently long to separate the circular plates O far enough to bring them outside of the cores of the magnets E F G.

The truck-frame Q is made of metal and supported upon the axles P in any suitable manner, and the platform is supported above it by means of the bars R. But this part of the machine may be constructed in any suitable manner. Both pairs of wheels may be driving-wheels, if desired, and in order to do this it will only be necessary to duplicate the revolving armature upon the rear axle, and provide the necessary magnets for operating it. In this event the brake will require a different adjustment, as it will then be necessary to place one or more of them at the sides instead of at the center, as here shown. The outrunner or broken-rail indicator V W is made of two metal bars. The lower one, W, is made to spring or yield, so that in case of a broken or misplaced rail it will drop down, as indicated by the dotted lines in Fig. 2, and break the connection between it and the bar V, which is rigid. The connection between the two bars is simply one of contact, and is only maintained when the bar W, with its little wheel, is in proper position on a rail. The bar X is located centrally, and is held in position by means of a coil-spring, as shown, and is supported in the head-block *w*. It may be provided in front with a button, as shown, or with a vertical bar, which will give it a greater range of operation.

As this machine is to be self-moving or an electro-magnetic engine, as well as a signaling-engine, a considerable proportion of the devices are used in propelling it. For effecting this movement the magnetic current is passed to the magnets E F G, and from them to the circuit-breaker Y, which is placed on the axle on the end of the revolving armature opposite to the one shown. This circuit-breaker is made of an outer section or walls, *k*, of hard rubber or other suitable non-conducting substance, and an inner section, *l*, of metal cut away at its periphery, so as only to leave points or small sections on a line with the walls *k*. These metal points are arranged with reference to the bars *m* on the revolving armature, so that by the successive action of the three magnets E F G the armature will be advanced to the extent of one of the bars *m*, and thereby revolving the driving-wheels to that extent. The current is passed from the magnets to the circuit-breaker Y by the springs *n o p*, which will press upon it when the parts are in position. By this arrangement a very rapid motion can be given to the wheels, if desired, and the strength or rapidity of this motion is increased or diminished by the number of batteries thrown into or out of use, so that the speed can be easily and rapidly controlled. For the purpose of stopping the engine I have arranged the brake J K. The brake-bar J, which also serves as an armature, is pivoted to the bar T, and when the driving mechanism is in operation the rear end is held up against and by the magnet I. Whenever the dropping of the bar W breaks the circuit, by destroying the contact between it and the bar V, or whenever the bar X meets any obstruction sufficient to crowd back the spring *r*, the current is broken and by means of suitable connections passes from the magnet I to the magnet H, so that the bar J will drop into the position shown at Fig. 2, and press upon the brake-drum K, not only with the force of its own weight and that of the weight of the ball attached, but also with the power of the magnet H applied at the opposite end. Whenever the bar J drops it comes in contact with the spring *y*, which connects the current with the wire *x*, which is connected with the steam-engine or with the train, and there sounds an alarm. When the machine is in order on a proper track the current passes through the driving-magnets, and its power is expended in running the machine, but if from any cause the current is broken it is then shifted to the brake and alarm magnets H I, so that the machine ceases to run, and conveys an instant alarm to the rear, the brake being used to overcome the momentum after the power has ceased to be applied. When the machine is built of a sufficient size to run upon an ordinary railway-track, it will be evident that a larger number of driving-magnets can be applied, if desired, and there will also be duplicate brake and alarm magnets, so that an alarm will be conveyed from any obstruction which affects one of the bars W without affecting the other. In the machine, as shown, a broken rail will only be in-

dicated on the side connected with the wire *i*. In use, two wires connecting this engine with the train will be necessary, but they can be twisted into a single coil, with as many more as may be needed, for operating the indicators and attaching or detaching the cups in the battery.

It is designed to run this engine from three to five hundred feet in advance of the train, or sufficiently far to enable the engineer to stop his train, in case an alarm is sounded from this engine, before reaching the obstruction or break which caused the alarm. It will also be necessary to provide the steam-engine or car, where the connection is made with the train, with a drum operated by springs or weights to take up slack or pay out additional wire, in order to overcome any inequalities between their movements, and keep the wires from dragging on the ground. The wire will be connected at the train with any suitable alarm-bell, and such other devices as may be desired for giving alarms, and also for indicating the speed, which is to be under the control of the engineer or other person on the train.

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

1. The combination, with a signaling instrument situated upon a railroad-train, of an electro-magnetic engine, running in advance of such upon the same track, and of conductors electrically connecting such engine and signal apparatus, the latter being controlled by the electro-magnetic engine, and caused to signal an approach to danger, substantially as herein shown and described.

2. The combination of the signaling-magnets H and I with the armature-lever J and brake-drum K, constructed and operating substantially as set forth.

3. The combination, in a magnetic-engine, of the driving-magnets E, F, and G, with the signaling and brake magnets H and I, all connected with and operated by a single battery, substantially as specified.

4. The outrunner or broken-rail detecter, composed of the bars V W, supported and kept in contact by the rail, in combination with the wire *i* and magnets H and I, substantially as described.

5. The bar *x* in combination with the head-block *w* or other support, the spring *r* and plates *q* for indicating obstructions, substantially as specified.

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Witnesses:
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