

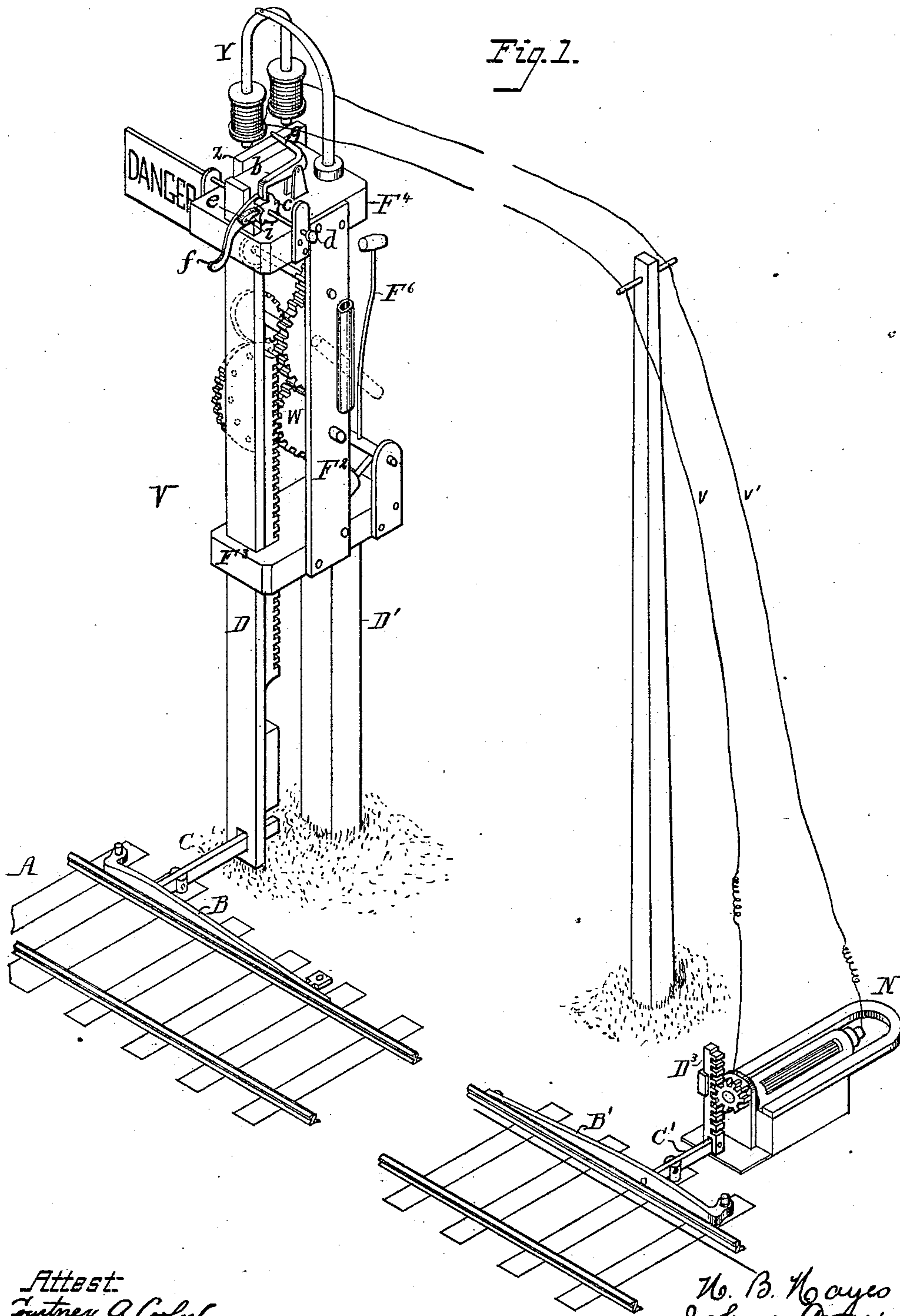
(No Model.)

2 Sheets—Sheet 1.

H. B. HAYES & J. GRAY.  
Electrical Railroad Signal.

No. 236,493.

Patented Jan. 11, 1881.



Attest:  
Frederick A. Cooper,  
William Barton

H. B. Hayes  
Joshua Gray  
By their attorneys  
Charles E. Foster

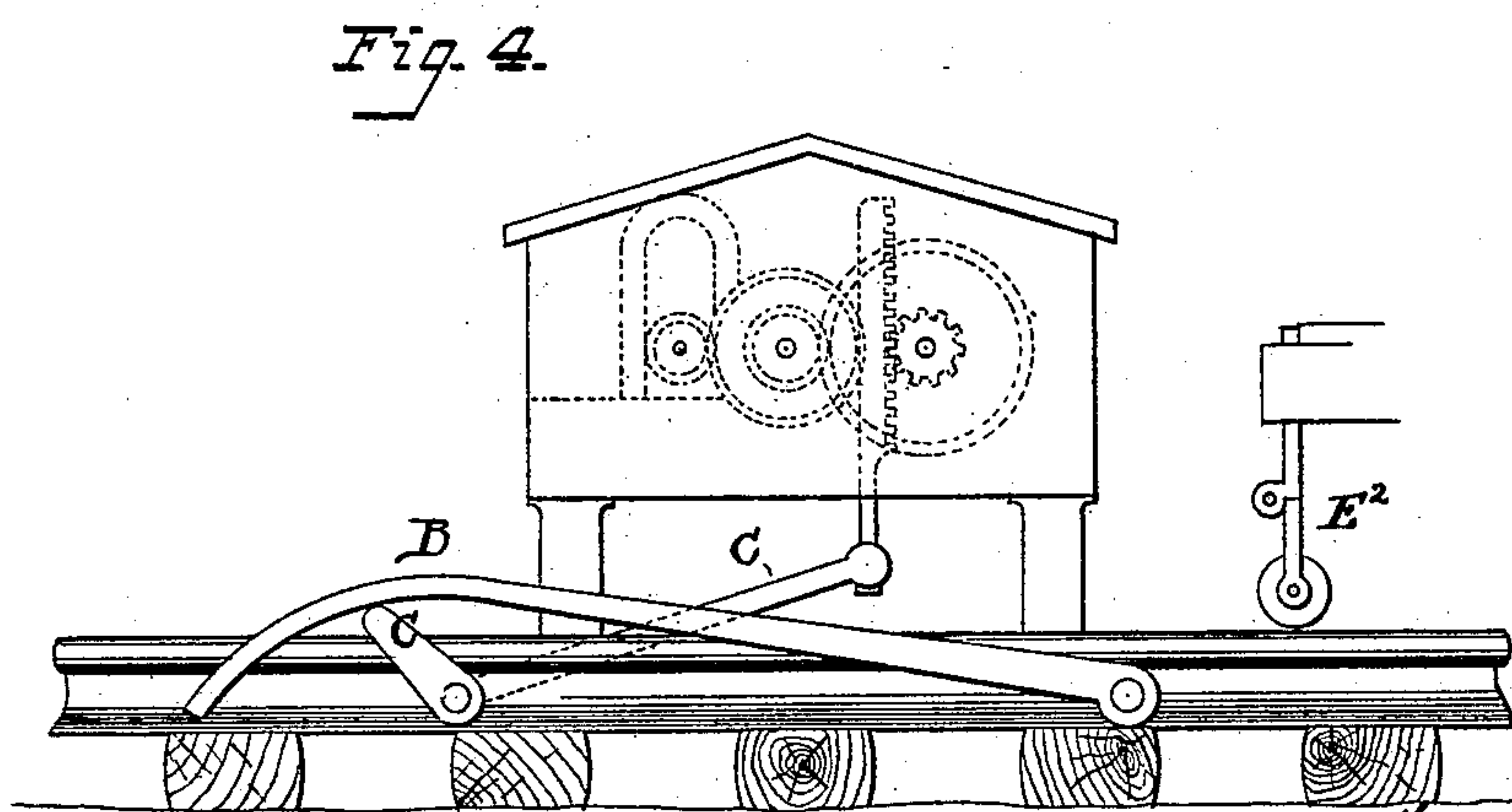
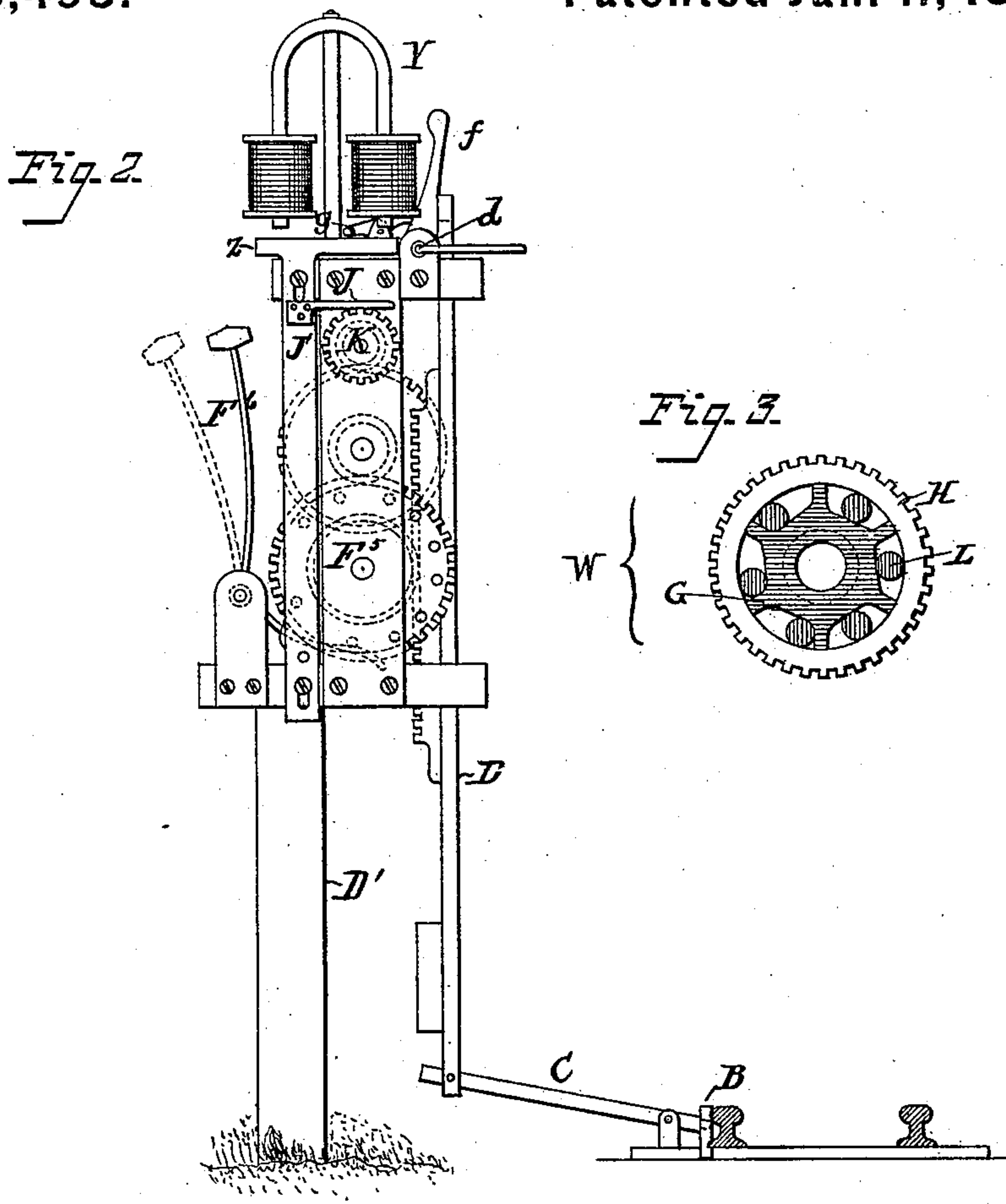
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2 Sheets—Sheet 2.

H. B. HAYES & J. GRAY.  
Electrical Railroad Signal.

No. 236,493.

Patented Jan. 11, 1881.



*Attest:*  
*Courtney A. Cooper.*  
*William Paxton*

*H. B. Hayes*  
*Joshua Gray*  
*By their attorney*  
*Charles E. Foster*



# UNITED STATES PATENT OFFICE.

HENRY B. HAYES, OF WOBURN, AND JOSHUA GRAY, OF MEDFORD, MASS.

## ELECTRICAL RAILROAD-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 236,493, dated January 11, 1881.

Application filed November 17, 1880. (No model.)

*To all whom it may concern:*

Be it known that we, HENRY BOSTWICK HAYES and JOSHUA GRAY, residing, respectively, at Woburn and Medford, in the county of Middlesex, State of Massachusetts, have jointly invented certain Improvements in Railway-Signal Devices, of which the following is a specification.

Our invention relates to that class of railway-signals in which the signal at a distant point from the train is controlled by means of an electrical current generated by the movement of the railway-train through the medium of an electro-magnet; and our invention consists in the construction and arrangement of the devices whereby said result is effected.

In the drawings, Figure 1 is a perspective view of a section of railway with our improved signaling apparatus. Fig. 2 is a sectional elevation of part of the signaling apparatus. Fig. 3 is a detached section; Fig. 4, a longitudinal section illustrating a modification.

In a prior application for Letters Patent we have illustrated devices in most respects corresponding with those embodied in the above-described figures, and have therein claimed certain methods of operation to the exclusion of the claims for the specific devices which constitute the subject of the present application, and which we will now proceed to describe.

A represents a railway-track; V, a signal apparatus, and N a magneto-electric machine.

The signal apparatus is arranged at any point upon or adjacent to the line where it may be necessary to display or sound a signal, and the magneto-electric apparatus is arranged adjacent to the track at whatever point, however distant from the signal, that the train should occupy at the time the signal is to be displayed. The signal apparatus is so constructed that it will be set or arranged for operation by the passage of a train.

The magneto-electric apparatus is so constructed as to be operated by the passage of a train, and wires V V' conduct the current thus generated to the signal apparatus, where the action of the current releases the mechanism and causes the alarm-signal to be displayed or sounded.

The signal apparatus consists of a frame

composed of plates or blocks F<sup>3</sup> F<sup>4</sup> and side pieces, F<sup>2</sup> F<sup>5</sup>, supported by a standard, D', or otherwise, and supporting a train of wheels, constructed by their movement to operate a hammer, F<sup>6</sup>, and sound an alarm. The train is driven by means of a weight, D, formed into a rack, the teeth of which gear with the driving-wheel W of the train, so that the latter is set in motion as the rack descends by its weight, the said rack passing through openings in and being guided by the plates F<sup>3</sup> F<sup>4</sup>.

To permit the rack to be elevated without moving the gear, the driving-wheel W is made in two sections, G H, the outer annular section, H, when the rack is elevated, turning freely on the inner section, G, Fig. 3, but being clamped to the latter when its motion is reversed by the wedge-like action of balls or rolls L, occupying recesses in the periphery of the section G. These recesses are each shallower at one end than the other, and as the balls roll toward the shallow end they will become wedged between the two sections, thereby connecting them immovably together until the reversed movement of the outer section, H, throws the balls into the deeper portions of the recesses.

The rack D is elevated from a passing train through the medium of levers B C, the former pivoted near the track in a position to be depressed by the tread of a wheel, or by an arm, E<sup>2</sup>, on the tender or other part of the train, Fig. 4, and the lever C connecting the lever B and rack-bar, so that the latter shall be raised when the lever B is depressed.

The levers B and C may be jointed together, as shown in Fig. 1; or the lever C may have two arms, the lever B resting upon the shorter of said arms, as shown in Fig. 4.

A pawl or detent, J, engages with a toothed wheel, K, of the train to lock the latter, the said pawl being connected to a slide, J', which supports the armature z of an electro-magnet, Y, constructed to be excited by a current from the magneto-electric machine N, and conducted to and from the said magnet by the wires V V'.

The magneto-electric machine consists of one or more suitable magnets and a revolving armature, which is set in motion by a descending weight-rack, D<sup>3</sup>, through the medium of



levers B' C', in the same manner as the gears are rotated in the signal mechanism, no provision, however, being made, as in the signal mechanism, to prevent a backward rotation of the shaft.

As a train passes with its wheels in rapid succession over the lever B' of the magneto apparatus, or as the projection E<sup>2</sup> of the train is carried over said lever, it is depressed, and the weighted rack D<sup>3</sup> raised to a position from which it gradually descends after the pressure upon the lever is released, thereby rotating the armature in both directions, and sending a prolonged continuous current to the magnet Y, which then elevates the armature *z* and detent J, thereby unlocking the train of wheels. As the rack D descends and drives the gears it sounds an alarm which indicates the approach of the train, and as the latter passes the signal the rack-bar D is again elevated, and the pawl J' locks the same in position until the passage of a succeeding train opposite the magneto-electric machine causes the said operations to be repeated. The armature is apt to adhere to the magnet. To remove it therefrom when the rack-bar D is raised, we use a lever or arm bearing upon said armature and depressed by the upward movement of the bar. Thus the lever *b*, pivoted between standards on the plate F<sup>4</sup>, overhangs a ratchet-wheel, *c*, on a spindle, *d*, with the teeth of which wheel engages the pawl *e* of arm *f*, fastened to the spindle *d*, and extending over a shoulder, *i*, of the rack-bar D. The end *g* of the lever *b* extends over the armature *z*, and depresses the latter when the rotation of the ratchet *c* elevates the opposite end of the lever. The ratchet, which turns freely on the spindle, is rotated one tooth each time the rack-bar D rises, bringing one tooth beneath and elevating, and then away from and lowering, the outer end of the lever B, so as to tilt the lever momentarily and break the contact of the armature with the magnet, but instantly release it for operation by succeeding currents.

A danger-sign may be secured to the spindle *d*, as shown, so that the elevation of the arm *f*, when the rack-bar is raised and set, will turn the lever to a horizontal position. Owing to the curved form of the arm *f* it will descend rapidly to a horizontal position and expose the danger-sign as the rack-bar D begins to descend.

We are aware that a signal has heretofore been operated by a weight through a train of wheels and raised by a rack-bar. Our invention must be distinguished from this, as we make the rack-bar perform the double duty of rack-bar and weight.

We claim—

1. The combination, with a railroad-signal, of a train of wheels, a signal operated thereby, a rack-bar, and devices whereby said bar may be raised without moving, but in descending will drive said train, and levers B C, arranged adjacent to the track, to be operated from the train to elevate said bar, all as set forth.

2. The combination, with the signal mechanism, rack-bar, detent, armature, and magnet, of appliances for throwing the armature away from the magnet when the bar is raised, substantially as set forth.

3. The combination of the electro-magnet Y, bar D, spindle *d*, ratchet *c*, arm *f*, pawl *e*, and lever *b*, substantially as set forth.

4. The combination, with the weighted train, driving rack-bar D, and train of wheels, of a driving gear-wheel, W, consisting of two sections, the innermost having inclined recesses containing balls or rolls L, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY BOSTWICK HAYES.  
JOSHUA GRAY.

Witnesses:

ARTHUR R. POTTER,  
FRANCIS L. HAYES.