(No Model.) 2 Sheets—Sheet 1.

J. B. & O. B. JOHNSON.

MAGNETO ELECTRIC RAILWAY SIGNAL.

No. 250,443. Patented Dec. 6, 1881.

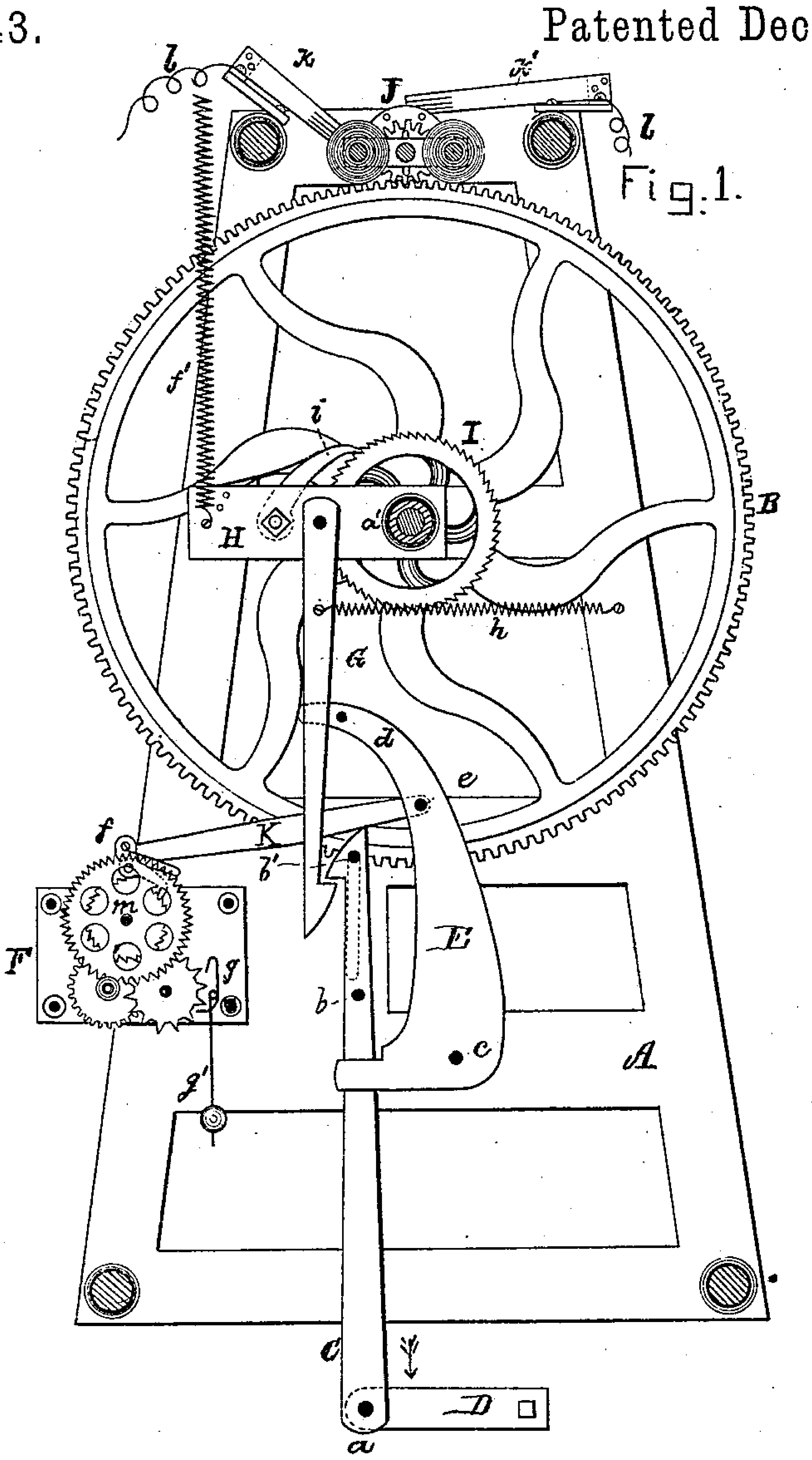

Fig. 1.

Witnesses.

J. Ahearne

W. P. Preble Jr

Inventor.

J. B. Johnson

O. B. Johnson

N. PETERS. Photo-Lithographer. Washington. D. C.

(No Model.)

2 Sheets—Sheet 2

J. B. & O. B. JOHNSON

MAGNETO ELECTRIC RAILWAY SIGNAL.

No. 250,443. Patented Dec. 6, 1881.

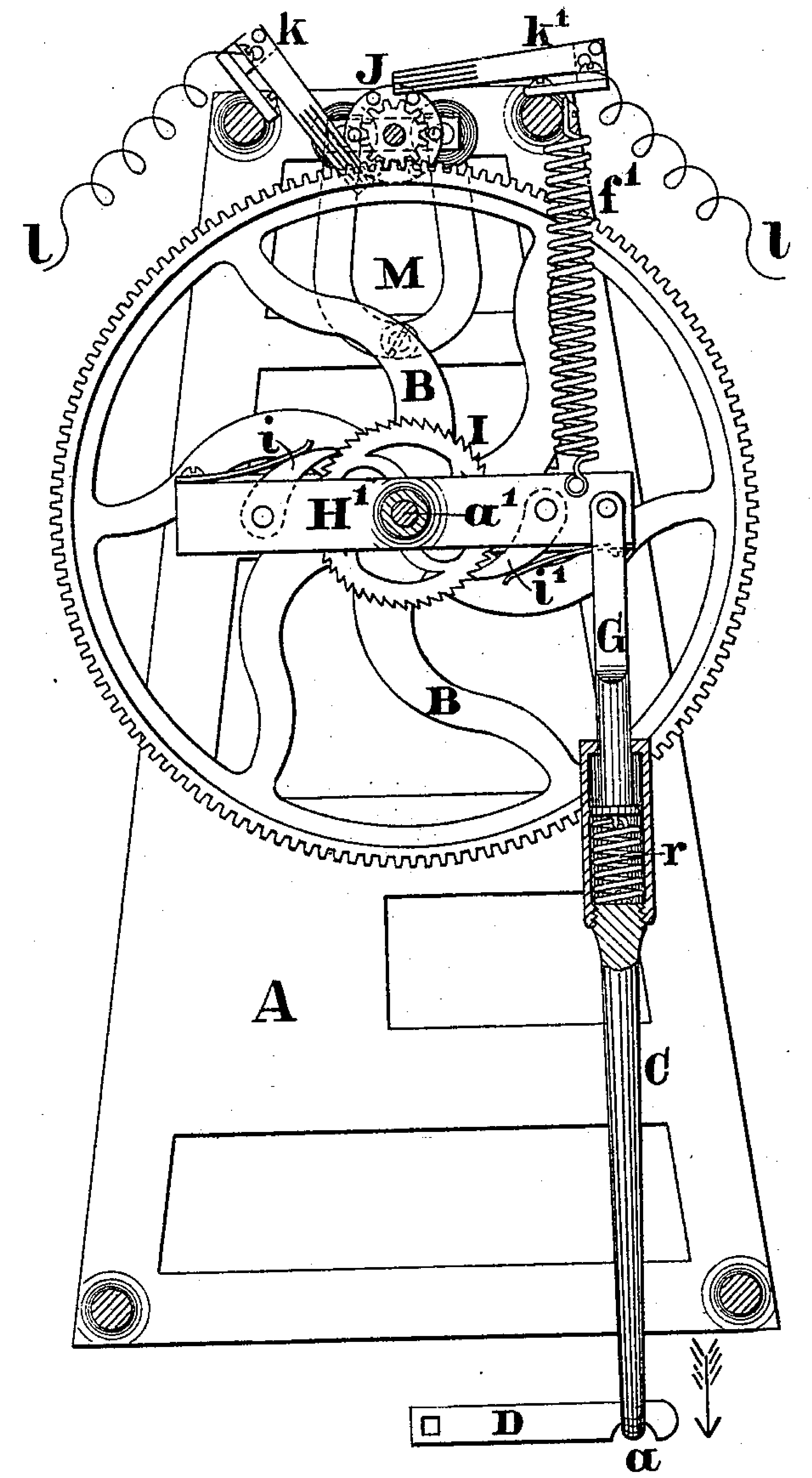

Fig. 2

Witnesses:
J. Ahearne
W. P. Preble Jr

Inventor:
J. B. Johnson
O. B. Johnson

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN B. JOHNSON AND ORVILLE B. JOHNSON, OF BOSTON, MASS., ASSIGNORS TO THE NATIONAL RAILWAY SIGNAL COMPANY, OF NASHUA, N. H.

MAGNETO-ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 250,443, dated December 6, 1881.

Application filed September 9, 1881. (No model.)

To all whom it may concern:

Be it known that we, JOHN B. JOHNSON and ORVILLE B. JOHNSON, both of Boston, county of Suffolk, Massachusetts, have invented certain new and useful Improvements in Magneto-Electric Railway-Signals, of which the following is a specification.

Magneto-electric railway-signals consist generally of, first, a visible or audible signaling apparatus with its actuating devices; second, a magneto-generator and actuating devices for producing an electric current or impulse to work the signal; and, third, mechanism connected with a railroad-track to receive the blow given by the wheels of a passing train and communicate it to the actuating devices of the signal or generator, or both.

Our invention relates to that part of the mechanism of such signals which receives this blow and communicates its force to the actuating mechanism, and is more particularly intended for use in connection with the generator, though applicable to the signaling device, if desired.

It has been found advantageous in practice to avoid the wear and tear consequent upon receiving the blow from the train directly upon the actuating mechanism, and apparatus has been arranged in such way that the force of the blow is used to displace from its normal position an auxiliary device, which, by returning to its normal position, drives the actuating mechanism. This has sometimes been called "setting" the mechanism for action; but we prefer to call it a "displacing" mechanism.

A serious difficulty attending the use of most devices heretofore made for accomplishing this object is that no action takes place until the train has left the apparatus, so that if the train is very long the warning is not given soon enough, and if the train stops with a wheel upon the generator-lever no signal at all is given. Our apparatus avoids this difficulty by causing the generator or signal to act the moment the first wheel of the train reaches it. The effects of the direct blow referred to may also be avoided, without this displacement of an auxiliary device, by introducing a cushion or retarding device in such way that the blow is communicated gradually but still directly from the train. This arrangement possesses some great advantages, as will be hereinafter explained, and, so far as we know, was never tried before our invention thereof.

Our invention then consists, first, in providing a device which is thrown out of its normal position by a passing train, and which begins its action in transmitting the force of the blow received immediately without waiting for the wheel to leave it, and which is prevented from being again operated till the train has passed said mechanism or ceased to act upon it. This we call our "cut-off" mechanism. Second, in providing a device by which the blow given by the train is retarded and made gradual in its action upon the driving mechanism of the generator or signal. This we call our "retarding" mechanism. These two mechanisms may be used separately or together in the same apparatus, according to the work required of the signal. The mechanism by which we accomplish these results is shown in the accompanying drawings, in which—

Figure 1 represents our cut-off mechanism applied to a generator, the displacement of the auxiliary device being downward; and Fig. 2 represents our retarding mechanism applied to a generator, and imparting a downward motion to the actuating devices, there being no displacement of an auxiliary device. If an upward motion is preferred in either of these mechanisms, slight changes will be required, as hereinafter explained.

The same letters refer to similar parts in the different drawings.

A is the frame-work which supports the moving parts of the machine. B is a large driving-wheel on the shaft a'. C is a vertical rod, which is connected with one arm D of a rock-shaft by the pin or hook a. This rock-shaft is of ordinary construction, with two equal arms, and is placed upon bearings, (not shown,) the arms, one of which is shown, being parallel with the track. When the arm nearer the track is driven down by the wheels of the train the other arm D moves down at the same time and carries with it the rod C, as indicated by the arrow.

In Fig. 1, E is a bent lever, pivoted to the frame-work at c, and carries a pin, d, on its upper arm. The rod C is provided with a pin, b, which strikes the lower arm of the bent lever E as the rod C moves downward, and thus throws the upper arm of E out of line. The downward motion of the rod C is guided by the pin b', which slides in a slot (shown by dotted lines) in the frame-work. The upper end of the rod C terminates in a hook, which interlocks with a corresponding hook at the lower end of another vertical rod, G, which is pivoted on the arm H.

In Fig. 2 the rods C and G, instead of ending in hooks which interlock, as in Fig. 1, are fastened together by the spring r, which plays in a hollow chamber of the rod C, as hereinafter explained, the rod G being fastened to the arm H′. This arm H or H′ is hung upon the shaft a', which carries a ratchet-wheel, I, and, as before stated, also carries the driving-wheel B. In the mechanism shown in Fig. 1, where the strain upon the machinery is less, this arm is made what is called a "single" or "half" arm, and carries a single pawl, i, to drive the ratchet-wheel I. In Fig. 2, where the strain is greater, this arm is made a whole or double arm, and carries two pawls, i, one at each side, to move the ratchet-wheel I. These pawls in both cases are held against the teeth of the ratchet-wheel by steel springs, in the usual way. The spring f' serves to draw the arm H or H′ back to the horizontal position when moved out of it by the rod G. In Fig. 1 this pulling back of the arm turns the driving-wheel, and so operates the generator, as hereinafter explained. In Fig. 2 the generator is operated by the arm in its downward motion, and the spring simply brings the arm back into a position to engage the ratchet-wheel, so that the next downward motion of the arm will again operate the generator.

J is a rotary armature, consisting of an electro-magnet with two coils, which rotates near the poles of a U-shaped permanent magnet, M, Fig. 2. This rotation is produced by the teeth of a small gear upon the shaft which carries the armature engaging with the teeth of the wheel B. The rotary armature is provided with a rubber disk, which is provided with two insulated metallic plates on its surface, and from these plates the positive and negative impulses are taken by the commutators k k' and conveyed to the line-wires l l. The arrangement and construction of these devices connected with the rotating armature are well known and do not seem to require further explanation.

In Fig. 1, F is a train of clock-work, fastened on the frame-work and provided with the escapement g and pendulum g', by which its motion is controlled. The rod K is fastened at one end to the bent lever E at e, and at its other end to an arm carrying the pawl f. This pawl engages with the teeth of a ratchet-wheel, m, of the clock-work F, the arm and ratchet-wheel being on the same shaft. When the upper end of E is thrown out of line, as before stated, by the pin b in its downward motion, the pin d strikes the rod G and disconnects it from the rod C. At the same time the rod K is pushed back, carrying the pawl past several teeth of the ratchet-wheel m. When K has reached the end of its throw the pawl f engages the ratchet-wheel and prevents the rod G and bent lever E from falling back until released by the escapement g. The spring h, fastened to the frame-work and to the rod G, pulls the rod G and bent lever E back toward their normal positions, and thus drives the clock-work slowly under the control of the pendulum and escapement. Meanwhile the rod C is driven freely up and down by each wheel of the passing train; but this motion is not communicated to the generator, which is wholly cut off by severing the connection between C and G. If at any time during the passing of the train the bent lever E should have so far regained its usual position that the lower end comes into the path of the pin b, it is immediately driven out again and one or two teeth gained upon the ratchet-wheel m. It is obvious that the clock-work F will thus be kept wound until the train has fully passed. Meanwhile the generator is being operated at a steady rate by the spring f', as before stated, and the signal is given at the other end of the line. When the train has passed, the rod G and bent lever E fall back into their usual places by the running down of the clock-work F, and the rod G interlocking with C, the generator is in condition to be operated by the next train of cars.

The operation of the retarding device shown in Fig. 2 is as follows: The downward motion imparted to the rod C, as before explained, first extends the spring r until the flange at the end of the rod G strikes the top of the hollow chamber, after which the rods C G are drawn down together as a solid rod, turning the ratchet-wheel I and driving-wheel B. This latter rotates the armature J, as before explained, and a current is sent over the wires l l to operate the signal at the other end of the line. As soon as a wheel of the passing train releases the rock-shaft D, the spring f' pulls the arm H′ back toward the horizontal position, to be again pulled down by the next wheel of the train. In this way it is obvious that the generator will continue to operate until the train has passed.

It is evident that an upward instead of downward motion may be communicated to the generator by using a simple lever pivoted at any desired point between a and the track, so that when the end nearer the track is driven down the other end will be raised.

In the retarding mechanism of Fig. 2 the only other changes required would be to reverse the positions of the pawls i and spring f, so that their operation would be in the opposite direction.

In the cut-off mechanism of Fig. 1 the direction of operation of the pawl i and spring f' would be reversed, the rods C and G be made a solid rod pressing against a pin on the arm H, instead of fastened rigidly to it, and the bent lever E, being placed on the same side of the rod as the clock-work F, would pull the rod C G out of line, instead of pushing it, as in the figure. The pin b would then be below the arm of E, instead of above. We prefer the downward displacement, as shown, as it brings less strain upon the clock-work than the upward.

When we desire to combine our retarding device with the cut-off mechanism of Fig. 1 we merely introduce a spring or cushion in the rod C, as shown in Fig. 2, the hook being upon the upper part of the rod, and all the other parts of the apparatus remaining the same. In this way the hooked rod G is subjected to no more strain than comes upon the generator of Fig. 2.

One advantage which the retarding device, when used alone, has over the cut-off device used alone is that if the spring r breaks, or for any reason refuses to act, the only result is that the machine suffers extra wear and tear, while if the spring f' in Fig. 1 refuses to act, or breaks, the instrument does not operate at all, and no signal is given. The danger of the spring f' getting out of order in this way is almost wholly avoided by using the retarding device in connection with the cut-off mechanism. On the other hand, the retarding device, when used alone, subjects the generator to the inconvenience of depending for the amount of current produced upon the speed with which the rod C is driven, so that if the train moves very slowly the current is comparatively feeble, while in the cut-off mechanism and displacement shown in Fig. 1 it is immaterial how slowly the rod C is moved, because it is always disconnected from G at the same point, and the retractile force of the spring f', which drives the generator, is constant. The weight of the car passing over the rock-shaft D, however slowly, is always sufficient to draw C down far enough to be cut off by E. This inconvenience in the retarding device, however, is very slight, because only a very small current is required to operate the signal, and in practice a train could hardly be found to move so slowly as not to operate the signal. For these reasons it is preferable to use both our retarding device and our cut-off mechanism in the same apparatus, though when used alone they produce highly satisfactory results, and we do not confine ourselves to the use of either alone or of both together, but claim the use of either or both, as desired.

We claim—

1. In magneto-electric railway-signals, a cut-off mechanism consisting of interlocking hooks arranged to disconnect the generator or signal from the mechanism connected with the track, at the first blow received from the same, and provided with clock-work or other suitable devices to prolong said disconnection by preventing said hooks from interlocking until the signal has been given and the train has passed said mechanism, as hereinbefore described.

2. A magneto-generator provided with a cushion or spring, r, to diminish the suddenness of the blows imparted to the actuating mechanism by passing trains of cars, and with an auxiliary device for severing the connection between the track and said actuating devices, and thereby prevent them from receiving more than one of said blows, as herein described, and for the purposes specified.

3. In magneto-electric signaling apparatus, the above-described cut-off mechanism, consisting of two interlocking hooked rods, C and G, for displacing the driving mechanism from its normal position, and a bent lever, E, operated by one of said rods to separate said rods, provided with a clock-work, F, and connecting-rod K, to hold said rods apart, and with a spring, h, to drive said clock and to interlock said rods when released by said clock, as herein shown and described.

JOHN B. JOHNSON.
ORVILLE B. JOHNSON.

Witnesses:
J. SHEARNE,
W. P. PREBLE, Jr.