3 Sheets—Sheet 1.

T. N. VAIL.

Electrical Signaling Apparatus.

No. 212,873. Patented Mar. 4, 1879.

Figure 1.

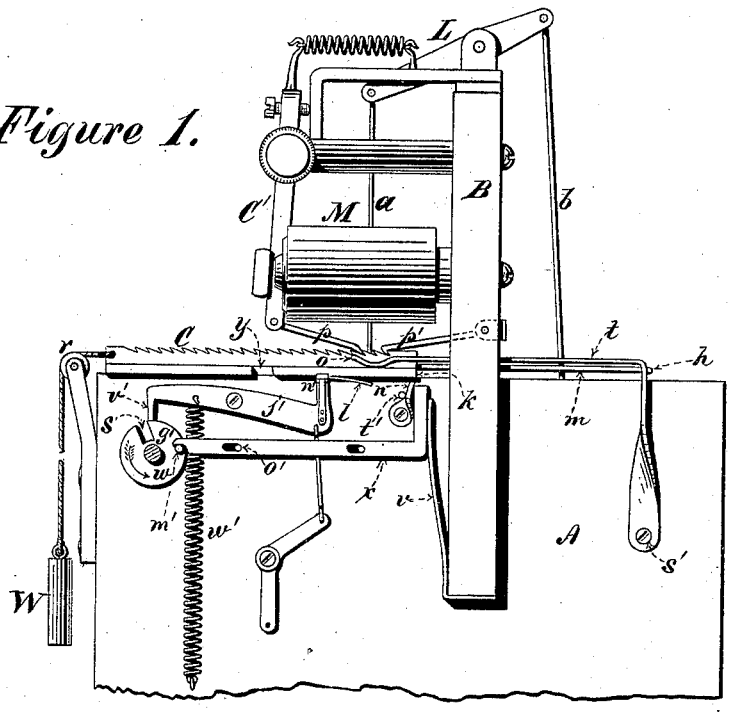

Figure 2.

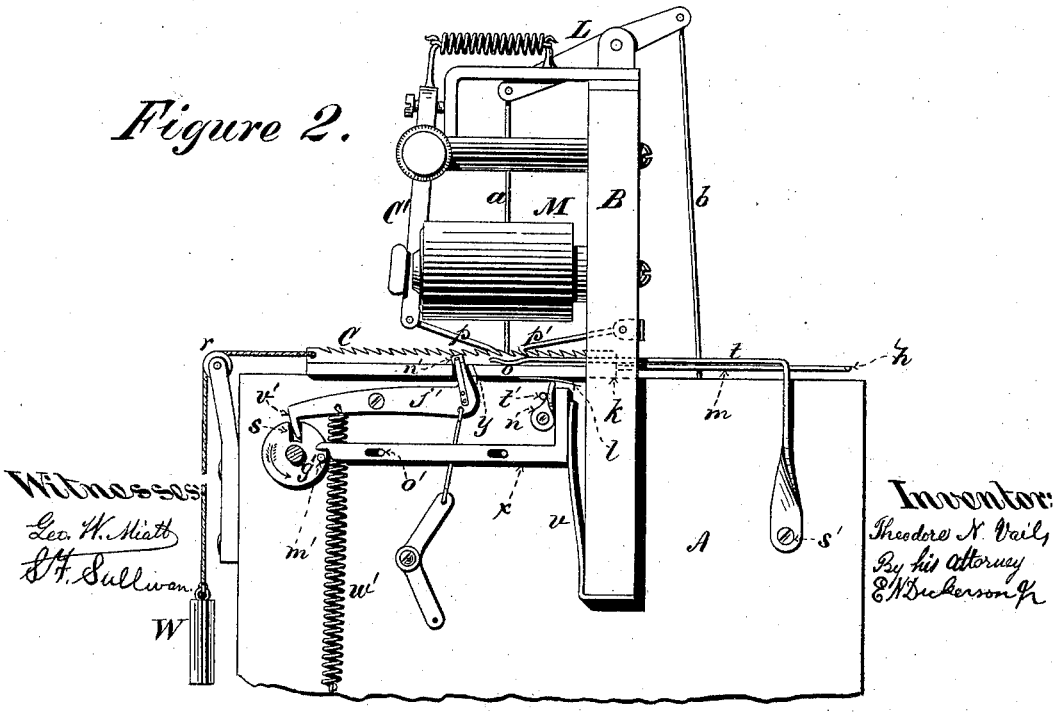

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Figure 3.

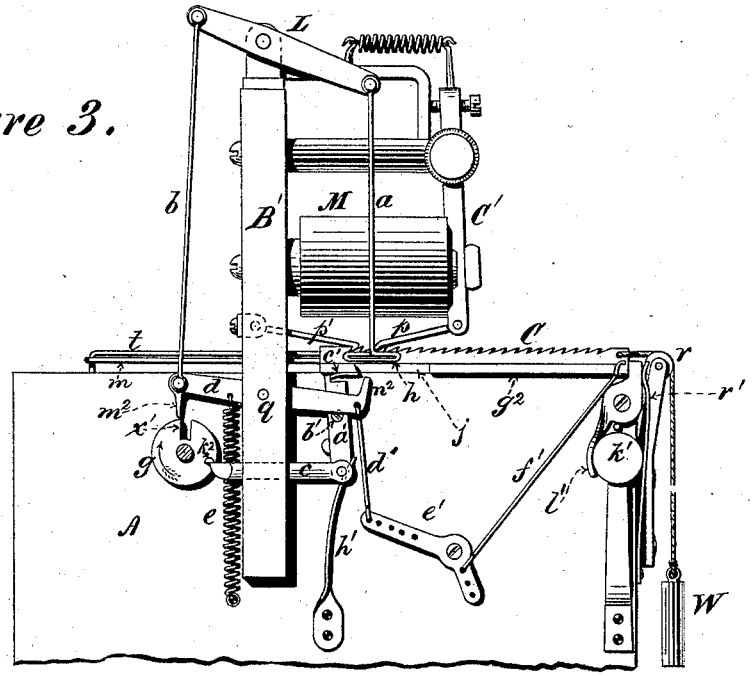

Figure 4.

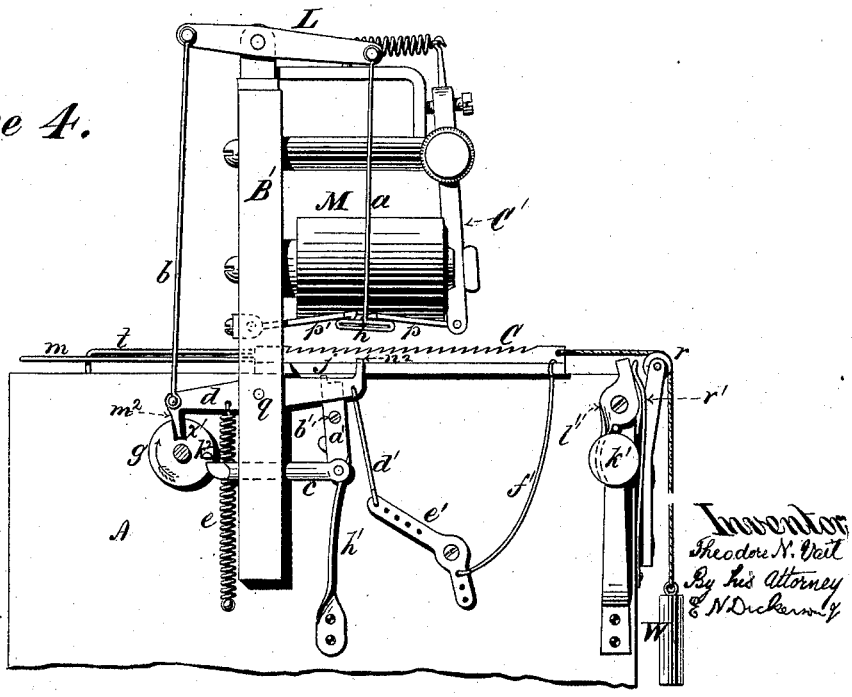

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Figure 5.

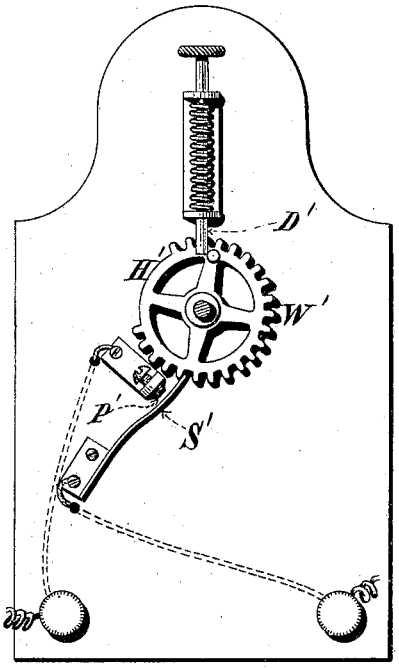
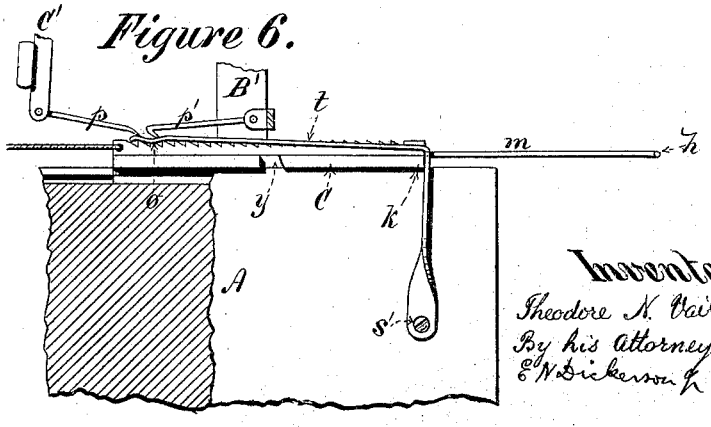


Figure 6.



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UNITED STATES PATENT OFFICE.

THEODORE N. VAIL, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRICAL SIGNALING APPARATUS.

Specification forming part of Letters Patent No. **212,873**, dated March 4, 1879; application filed November 8, 1878.

To all whom it may concern:

Be it known that I, THEODORE N. VAIL, of the city, county, and State of New York, have invented a new and useful Improvement in Signaling Apparatus, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

The object of my invention is to enable one station upon a line to call up at will another station without signaling any station except that with which the central office desires to communicate.

My invention also has for its object the locking out and preventing any office communicating with the main office except at the time when the apparatus is at rest before movement, or in the position which I shall denominate the "dead-point."

I have also devised a means of restoring any apparatus on the line to its original position in case of accidental disarrangement by an unintentional break in the current usually found upon a line.

The manner of carrying out my invention will be clearly understood from the accompanying drawings, in which—

Figures 1 and 2 represent perspective elevations of one side of my apparatus in different positions. Figs. 3 and 4, respectively, represent elevations of the other side of my apparatus in two positions. Fig. 5 represents a view of my circuit-breaking mechanism used in connection with the other apparatus. Fig. 6 represents a detailed view of my slide and pawl elevator.

My apparatus consists, generally, of a support, here shown as a thin plate of wood or metal. Sliding in the mortise upon the upper edge of this plate is a tongued slide, C, provided with racks or teeth upon its upper surface. This slide C is constantly drawn in one direction by a weight and cord, W, sliding over the pulley *r*, and is advanced in the other direction by means of the magnet.

Attached to the plate A are the vertical supports B B′, which carry the magnet M, provided with the armature C′, which is constructed and adjusted in the usual manner.

Attached to the lower end of the armature-bar is the pawl *p*, which engages with the ratchets on the edge of the plate C.

The armature magnet and slide are so arranged that at each stroke of the armature the slide C is advanced one notch or tooth. Another hook-pawl, *p′*, prevents its return except as hereinafter provided, so that it is obvious that for a given number of electric impulses sent out upon the line the slide C will be advanced from its position of rest or dead-point a certain determined distance. For instance, for six impulses the ratchet will be advanced six teeth, as shown in Fig. 2.

In Figs. 1 and 2 is shown the contrivance for signaling any desired office. The side of the slide C is provided with a slot, *y*, which is cut at a different place for each station on the line. Bearing against the bottom of the slide C is the vertical tooth *n′* of the pivoted arm *j′*. The tooth *n′* is constantly pressed against the sliding plate C by means of the spring *w′*. The arm *j′* is provided with another tooth, *v′*, which, at the dead-point, rests upon the circumference of the wheel *w*, which wheel has a tendency to rotate in the direction shown by the arrow, being put in motion by means of clock-work not shown. This wheel is provided with a slot, *s*, and with a stop-pin, *m′*, which brings up against a tooth, *g′*, formed at the end of the horizontal slide-bar *o′*, which bar is slotted and supported upon pins, as shown, and can slide horizontally, being constantly moved toward the wheel *w* by the spring *v*, attached to the support B, so that at the dead-point the wheel *w* is prevented from revolving, because the stop-pin *m′* is in contact with the tooth *g′* of the slide-bar *o′*. In this position the slot *s* is advanced from beneath the tooth *v′*, which tooth is consequently supported upon the circumference of the wheel.

Attached to the bottom of the slide C is a spring, *l*. Pivoted upon the plate A is a latch, *n*, the movement of which in the direction of the wheel *w* is prevented by a stop-pin, *t′*. It also acts against the vertical end of the slide-bar *o′*, and is itself tripped by the spring *l*, so that when the spring *l*, by the advancing motion of the slide C, comes in contact with and acts against the latch *n*, said latch acts against the slide-bar *o′*, compresses the spring *v*, and releases the pin *m′*, thereby allowing the wheel *w* to revolve.

The spring *l* and latch *n* are so arranged with reference to the slot *y* that the wheel *w* is tripped at that position of the slide C when

the vertical tooth n' of the arm j' is directly beneath the slot y. Therefore it will happen that if the slide C is advanced by electric impulses to the point at which the latch is dropped, and then allowed to remain at rest, the wheel w will revolve beneath the tooth v' of the arm j' until the slot s in said wheel comes beneath the tooth v of the arm j', when the spring w' will draw down said tooth v' into the slot s, and elevate the tooth n' into the slot y of the slide C, as shown in Fig. 2. This operation sets in motion an electric alarm-bell by means of circuits not shown. If, however, the slide C is advanced to the point at which the latch n is dropped, and is not stopped at that point, but advanced farther, it will happen that though the wheel w will revolve beneath the tooth v', yet the tooth v' cannot enter the slot s, the other tooth, n', of said arm j' being in contact with the under surface of the slide C; therefore the wheel w will continue to revolve until the pin m' brings up against the slide-bar o', when the apparatus will be in the position shown in Fig. 1, so that the pivoted bar j' will only be raised when the slide C has been advanced to a particular point, and then allowed there to remain for a period of time long enough to allow of the wheel w to make a revolution. By this means the central or controlling office is enabled to ring a bell at any of the several stations situated upon a line.

After any office has been summoned, as above shown, and communication with that office has ceased, it becomes necessary to restore all the offices on the line to the dead-point. This is done as follows: The tooth n' is depressed by the operator at the receiving-station, thereby allowing the wheel w to revolve into the position shown in Fig. 1, locking out such tooth. Then the controlling-office sends a sufficient number of impulses to advance the slide C to the last notch or to the end of its stroke into the position shown in Fig. 6. At this point the corner k of the slide C comes in contact with the pivoted lever t. This lever is pivoted at s' by a friction-screw, so that when swung to the right it will remain elevated until depressed by some other mechanism. This right-angled lever is provided at its free end with a curved end or plate, o, which is situated beneath the pawls p p', and is so arranged with reference to these pawls that when swung to the right it will drop these pawls and raise them from their engagement from the tooth of the ratchet, and allow the weight w to return the said ratchet to the dead-point, so that by advancing the slide until its corner k comes in contact with the vertical arm of the lever t said lever will drop the pawls and allow the slide C to return to the dead-point.

Attached to the slide C is a horizontal wire, m, provided with a hook, h, at its free end, which hook engages with the vertical arm of the lever t, and is so constructed as to swing the vertical arm of said lever to elevate or depress the horizontal arm and free pawls p p' at the same instant that the slide C arrives at the dead-point, so that on arriving at the dead-point the pawl is once more in engagement, and the apparatus is ready to repeat the operation described.

It may happen, however, that an accidental or unpremeditated impulse or impulses is sent out upon the line, so that the slide C is advanced a certain number of teeth. It is then obvious that if an attempt was made to send a call from the central office that such call or series of impulses would begin at the wrong position of the slide, so that if seventeen impulses were sent the slide would have been advanced seventeen notches plus the accidental impulses which had previously been sent. It is therefore important to automatically replace the slides which may have been thus accidentally advanced. This is done by the apparatus shown in Figs. 3 and 4. A vibrating arm, d, is pivoted on the face-plate A at the point q, and is provided with two right-angled teeth at opposite ends, m^2 and n^2. The point of the tooth n^2 when elevated enters a slot, j, cut in the side of the slide C. The other arm of the lever d is depressed by the spring e, and is provided with a tooth, m^2, which ordinarily rests upon the circumference of the wheel g, which has a tendency to advance in the direction shown by the arrow, by means of a train of clock-work therewith connected. This wheel is provided with a slot, x', and its general operation is similar to that of the wheel w, (shown in Figs. 1 and 2,) and need not be further described. Its time of revolution is, however, slower.

Supported upon the arm B′ is a vibrating beam, L, connected to the lever d by a connecting-link, b. The other end has a vertical link or rod, a, provided with a plate or horizontal elevating-piece, h, which acts against the pawls p p', so that when the tooth m^2 enters the slot x' the pawls will be raised free of the ratchet and the plate C will return to its dead-point.

A horizontal bar, c, is supported and slides through the vertical pillar B′ and engages with the pin k^2 on the wheel g in its normal position. As soon as the slide C advances one tooth, however, the spring c' engages with the upper arm of the pivoted lever a', pivoted at b', and slides c against spring h', thereby tripping the wheel g, which commences to revolve. If, now, the plate C is continued to be advanced, the horizontal portion g^2 of the slide C will be over the tooth n^2 before the wheel g has completed its revolution; but if advanced and then stopped the spring will depress the lever, and the tooth m^2 will enter the slot x', the pawls will be raised, and the apparatus will be in the position shown in Fig. 4, when the weight W will withdraw the slide to the dead-point.

Connected to the slide and to the lever d by cords d' f', as shown, is the bell-crank e', which is so contrived as to depress the tooth n^2 when the apparatus is at the dead-point, as

shown in Fig. 3. By such depression the wheel g is allowed to advance and to support the tooth m^2, as shown in Fig. 3. The electric current passing through the apparatus is controlled by a key, k^1. A vibrating plate, l', is so arranged as to be forced by the spring r' beneath said key, thereby elevating the same and preventing connection excepting at the dead-point. At the dead-point, however, as shown at Fig. 3, the slide C engages with the vibrating lock-piece l', and the key can be oparated. At the first movement, however, the key k^1 is locked out, as shown in Fig. 4.

The apparatus for sending the signals is shown in Fig. 5. A wheel, W′, is revolved by clock-work, as shown by the arrow, and is released by a pin, D′. This toothed wheel engages with the spring S′, which makes and breaks contact against a point, P′. The wheel is provided with a blank space, H′, as shown, so that on releasing this wheel a certain number of impulses will be sent, and then a rest will occur, and then a further succession will be sent.

Supposing the number of teeth between the position of rest and the blank space of the wheel W′ to correspond with the number of teeth of the ratchet, which is arranged to advance the plate C to the position in which the tooth n^1 will enter the slot y, then the operation would be as follows: The transmitter (shown in Fig. 5) is set in motion, and the slide C is advanced until the slot y is over the tooth n^1. By such impulses the wheel w has been set in revolution, and if a time sufficient to allow of its revolution across, before the further advance of the slide C, then the arm j' will be elevated by the spring w', and the station represented by the apparatus at Fig. 2 will be summoned. The wheel W′ continues its revolution. The slide C of this instrument is, however, locked out by j'. The other instruments are, however, advanced by means of the ratchet. Their slides C engage with the levers t. When the pawls are released the weights W draw back the slides to the dead-point, at which point the hook h depresses the lever t, and the pawls are once more in engagement, as shown in Fig. 1.

The operation of the apparatus shown in Figs. 3 and 4 has been sufficiently explained.

The teeth of the ratchet should be rather more vertical than those shown in the drawings. They are shown correctly in Fig. 6.

Instead of using the magnet M to advance the slide C, said magnet might be used to trip another clock-work, which clock-work would itself supply the power to advance the slide.

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

1. In an apparatus for signaling one of several offices on an electric circuit independent of the other offices, an alarm mechanism controlled by a ratchet-slide operated by electric impulses, and the trip-motion shown for causing such alarm, which motion is operated by a certain number of impulses if a pause is made after them, but is prevented from operating in case such pause is not made, substantially as described.

2. In combination with a slide operated by impulses of the electric current, the means shown of returning such slide to its normal position in case of accidental impulses, substantially as described.

3. In combination with a slide operated by electric impulses, the means shown of automatically returning such slide to its normal position after the sending of a determined number of impulses, substantially as described.

4. In an apparatus which is constructed to give a signal after a definite number of electric impulses, the means of setting in operation a signaling-instrument, which consists of a lever controlled by a wheel operated by clock-work, and arranged to be thrown into operation after a definite interval of time, but to be prevented from operating in case such time does not elapse, substantially as and for the purposes described.

5. In combination with an apparatus for giving a signal after a definite number of electric impulses, a key controlling the electric current, which key is itself mechanically prevented from operating excepting at the normal position or dead-point of the apparatus, substantially as and for the purposes described.

6. In combination with an apparatus for giving a signal after a definite number of electric impulses, a sliding plate provided with a ratchet and controlled by two pawls, one of which advances the plate, the other of which prevents its return, substantially as described.

7. The combination of a slide operated by electric impulses and a clock-work mechanism which is tripped by said slide at a certain portion of its advance for the purpose of giving a signal, substantially as described.

8. In combination with a slide operated by an electro magnet, a ratchet-movement and clock-work mechanism, which is arranged to return the slide to its normal position in case of the accidental transmission of improper impulses, substantially as and in the manner described.

9. In combination with a slide operated by an electro-magnet, two pawls, one of which actuates the slide, the other of which prevents its return to the normal position, and the means, substantially as shown, of tripping the pawls after a definite number of impulses, and allowing them once more to engage when the slide has returned to its normal position, substantially as and for the purposes described.

THEO. N. VAIL.

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