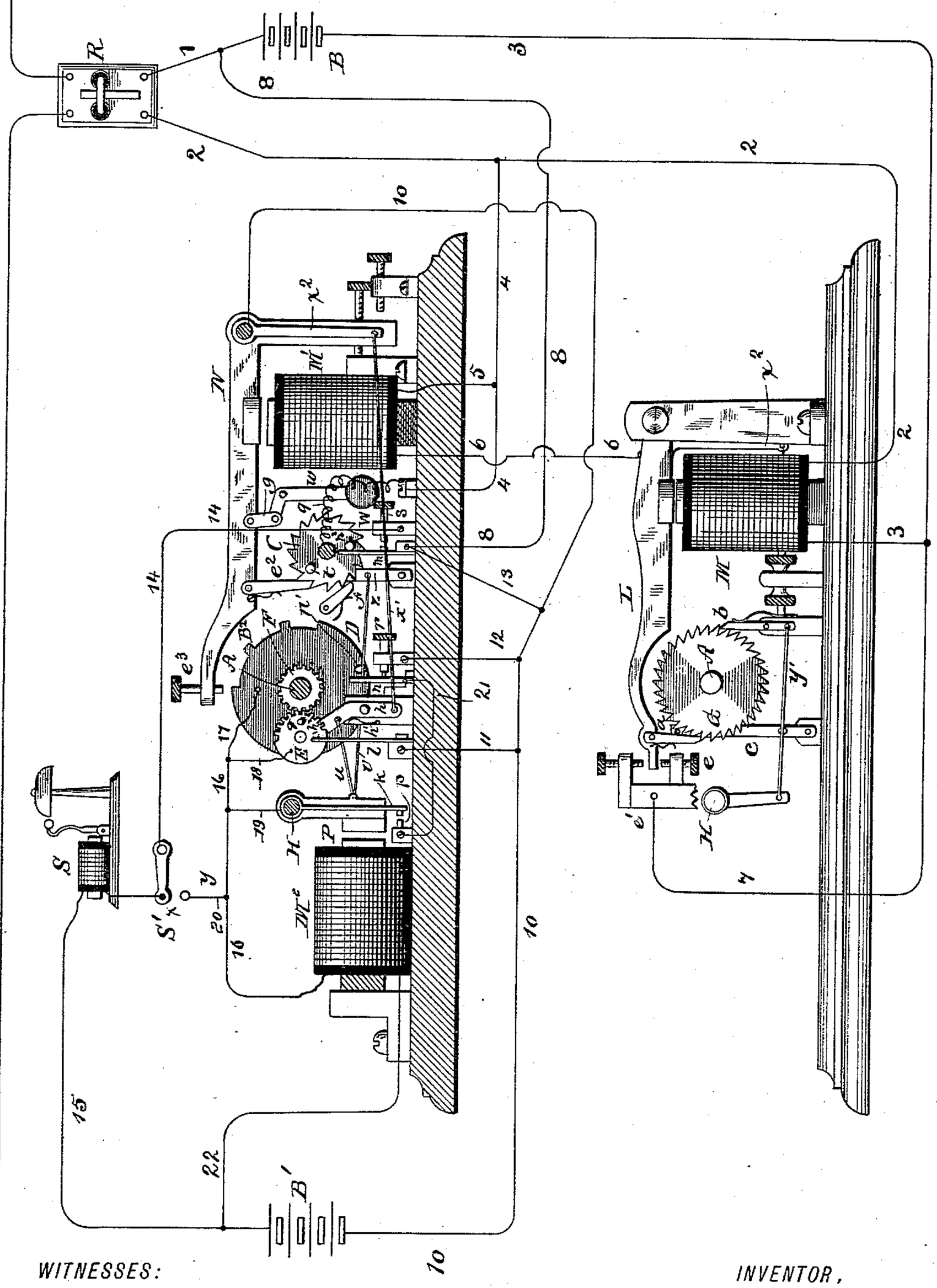
(No Model.)

J. D. TAYLOR.

ELECTRIC SIGNAL.

No. 420,255. Patented Jan. 28, 1890.



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ELECTRIC SIGNAL.

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To all whom it may concern:

Be it known that I, JOHN D. TAYLOR, of Piketon, in the county of Pike and State of Ohio, have invented a new and Improved Electric Signal, of which the following is a specification, reference being had to the accompanying drawing, which is a side elevation of one of the signal-instruments, the instrument being represented as divided longitudinally, one part being dropped down below the other to show the construction.

The object of my invention is to provide signaling apparatus for use in connection with telegraph-lines, in which a signal may be sent to any station upon the line without disturbing the other stations.

My invention consists in the combination of a relay, a signal-receiver, and a signal, all constructed and arranged as hereinafter more fully described, and pointed out in the claims.

My improved signal will find its chief use in connection with railroad-telegraph lines.

By means of my apparatus all the signals on the line may be placed under the control of the train-dispatcher, enabling him to operate a signal at any station without affecting any other upon the line. He can signal a train at any station whether the operator at that station is asleep or awake, present at his instrument, or absent. It is also possible by its use to stop a train at any station.

On railroad-lines the telegraph-operator is generally freight-agent, ticket-agent, yard-master, and freight-handler, and on account of the multiplicity of his duties is obliged to be out of his telegraph-office frequently for a considerable length of time, and when he is required to receive a message it frequently takes half an hour to find him. If the message is one of importance—as, for example, a train-order—it takes precedence of all others, and other business must stop until he answers his call and receives the message. By the use of my instrument, after repeating the call three times, an alarm-bell is set in operation at the office, which continues to ring until the operator arrives to stop it, and this signal continues to ring without regard to what transpires upon the telegraph-line. My invention thus will save a great amount of time which is now occupied in calling the operator, and which might be used for other business, besides giving a better signal, as a bell can be heard at a greater distance than a sounder.

My improved instrument is useful wherever a number of electrical instruments are connected in series and where it may be desired to throw one of the instruments into the circuit without affecting the others.

I will proceed to describe the construction and operation of my improved apparatus, assuming that it is in use at a station whose call is "G."

The letter "G" in the Morse alphabet, as is well known, consists of two dashes and a dot, (— — ·.) When the letter "G" is transmitted, the first impulse sent through the line closes the circuit of the battery B through the wires 1 2, the magnet M, and wire 3 back to the battery B. The magnet M, being energized, draws down the armature-lever L of the said magnet, which, acting through the spring-pressed pawl *a*, pivoted to the lever L, turns the ratchet-wheel G one tooth. It also turns the wheels D and F, which are attached rigidly to the shaft A, which carries the ratchet-wheel G. This movement of the lever L also brings it into contact with the platinum-tipped screw *e*, supported by the standard *e'*, thus closing the circuit of the battery B through the wires 1 2 4 5, magnet M', wire 6, lever L, screw *e*, wire 7, and wire 3 to the battery, which provides two circuits for the current of the battery—one through the magnet M and one through the magnet M'. As the resistance is reduced nearly one-half by placing the magnets M M' in parallel circuit, the strength of the current through each magnet is about the same as it is when it flows through only one magnet. The current passing through the magnet M' causes the armature-lever N to be drawn down, carrying with it the pawl e^2, which moves the ratchet-wheel C one tooth. As the wheel D, which is provided in its periphery with notches corresponding to the signal, has moved the space of one tooth from the wheel G, the screw e^3, carried by the lever N, falls over a notch in the periphery of the wheel D, and as its downward motion is limited the screw e^3 cannot make a contact with the wheel D. The

second dash (—) of the character operates in exactly the same manner, moving the ratchet-wheel G, the wheel D, and the spur-wheel F forward a distance equivalent to one tooth of the wheel D, at the same time moving the ratchet-wheel C another notch. The third impulse, which is a dot, energizes the magnet M in the same manner, and by the engagement of the pawl *a* causes the wheel G to move forward one tooth farther, thus bringing the projection B^2 on the periphery of the wheel D between two adjacent notches under the screw e^3, carried by the lever N. The said lever N is connected by a link *g* to an angled lever *w*, the lower end of which carries a weight W, which lever is arranged to hang vertically when the lever N is raised, and is capable of being swung out of its vertical position whenever the said lever N is drawn down. As the circuit through the magnet M′ is not closed until after the lever L has made a full downward stroke, and as the lever L immediately returns when the impulse corresponding to the dot is sent, the time is too short for the magnet M′ to overcome the inertia of the weight W of the lever *w;* consequently the lever N is not drawn down when a dot is made. When this character (the dot) is transmitted the second and third times, the operation, so far as the armature-lever, the shaft A, and parts connected therewith are concerned, is the same as that just described; but when the last dash is being sent and the armature-lever N has made about one-half of its downstroke, the rotation of the ratchet-wheel C by the action of the said lever carries the pin *t*, projecting from the side of the ratchet-wheel C, into contact with the spring *m*, thereby closing the circuit, so that the current flows from the battery B through the wires 1 8, the spring *m*, the pin *t*, the wheel C, wires 9 4 2 3 to the battery B, also from the battery B through the wires 1 8, spring *m*, pin *t*, ratchet-wheel C, wires 9 4 5 6, lever L, screw *e*, and wires 7 3 back to the battery, thus holding the levers L and N down independently of the relay R, which is in the main line. When the lever N completes its full stroke, the spring *m* is brought into contact with the contact-screw *s*, closing the circuit of the battery B′, so that the current runs from the battery B′ through the wires 10 13, the spring *m*, contact-screw *s*, wire 14, switch S′, bell S, and wire 15 back to the battery B′, thus placing the signal-bell S in the circuit of the battery B′, where it will remain until the switch S′ is changed from the point *x* to *y*, when the circuit will be from the battery B′ through the wires 10 13, the spring *m*, contact-screw *s*, wire 14, switch S′, wires 20 16, the magnet M^2, and the wire 22 back to the battery B′. This draws the armature P toward the said magnet M^2. The armature P is connected with the retaining-pawl *b* and with the pawl-releasing lever *c* by the wire *y*′. The said armature is also connected by the wire *v* with the lever *z*, which is adapted to disengage the pawl e^2 and the retaining-pawl *f* from the ratchet-wheel C, so that when the armature P is drawn forward by the magnet M^2 the pawls *a b* e^2 *f* will be released, and their respective ratchet-wheels will return to the point of starting, the shaft A and the shaft of the ratchet-wheel C being provided with a spiral spring (not shown) for causing them to return after being released.

To cause the armature P to be retained a sufficient length of time to allow the wheels to return to the point of starting, the spring *k*, carried by the shaft H of the armature P, is made to touch the contact-point *p* upon a very slight movement of the armature, thereby closing the circuit of the magnet M^2, so that the current of the battery B′ flows through the wires 10 12, the contact-screw *r*, the lever *n*, normally held in contact with the screw *r*, the wire 21, contact-point *p*, spring *k*, wires 19 16, the magnet M^2, and the wire 22 back to the battery B′. When the wheel D arrives at the point of starting, a pin *n*′, projecting from its face, strikes the lever *n*, removing it from the contact-screw *r*, thus breaking the circuit through the magnet M^2 and releasing the armature P. The pin *n*′ stops the wheel D at the proper place, as the motion of the lever *n* is limited by the block to which it is pivoted. A similar pin n^2, projecting from the face of the ratchet-wheel C, stops the said wheel at the point of starting by engaging the spring *m*, which is attached to a support fixed to the base of the instrument.

I have just described the manner in which a signal is sent by means of the proper call. I will now describe how a signal is prevented when another than the proper call is sent. Suppose that the instrument is set for "G," as before, but that the call "W" (-— —) is sent over the line. The first character, a dot, (-,) will move the wheel D one space, but will not affect the ratchet-wheel C in the manner before described. The next character, which is a dash, (—,) moves the wheel D another space and at the same time moves the ratchet-wheel C one space. The third character, which is also a dash, moves the wheel D another space, but brings the projection B^2 under the screw e^3. The last dash also causes the armature-lever N to be drawn down, bringing the screw e^3 into contact with the projection B^2, closing the circuit of the battery B′, so that the current flows from the said battery through the wire 10, the lever N, the screw e^3, projection B^2, the wheel D, the wires 17 16, the magnet M^2, and wire 22, back to the battery, thus drawing the armature P toward the magnet M^2, pulling the pawls *a b* from the ratchet-wheel G and removing the pawls e^2 *f* from the ratchet-wheel C, allowing the wheels to return to the point of starting. The armature P is held to the magnet M^2 by bringing the spring *k* against the contact-point *p* until the circuit is broken by the separation of the lever *n* from the contact-point *r* in the manner before described. The second and third set of

impulses, representing the letter "W," would act in the same manner.

Suppose the letter "D" (— - -) is to be sent over the line. The first character, (a dash,) being the same as the first character in "G," would move the wheels D and C each one space. The second character (a dot) would move the wheel D, but would not move the wheel C. The third character (a dot) would move the wheel D again, bringing the projection B^2 under the contact-screw e^3; but as the lever N does not move for a dot, B^2 and e^3 do not form a contact. The second and third "D" act in the same manner, each moving the wheel D three spaces and the wheel C one space. The last dot of the last "D" brings the last contact-surface of the said wheel D under the contact-screw e^3; but the wheel C has moved only three spaces instead of six, the number required to throw the signal into the circuit, and the next dash which passes over the line brings the lever N into contact with the periphery of the wheel D, which throws the electro-magnet M^2 into the circuit and releases the wheels D and C, as before explained. In the same way it may be shown that any letter or combination of letters other than that for which the instrument is arranged would bring the armature-lever N and the wheel D into contact before the ratchet-wheel C had moved far enough to throw the signal into the circuit. This operation would also return the ratchet-wheel C and the wheel D to the point of starting.

Unison between the transmitter and the receiving instrument is effected by a segmental spur-wheel E meshing into the spur-wheel F upon the shaft A. The spur-wheel F has the same number of teeth as the ratchet-wheel G, in order that the segmental wheel E may drop into place as soon as it is returned to its starting-point. The segmental wheel E is required to make only part of a revolution, and the side opposite that occupied by the teeth is loaded at its periphery to return it to the point of starting when it is released from the spur-wheel F. If desirable, it may be returned by a spring in lieu of the weight. The segmental wheel E turns on a stud projecting from the lever *h*, which is pivoted near its center to a support projecting from the base of the instrument. A spring *h'* is arranged to press against the lever *h* and hold the segmental wheel E in contact with the spur-wheel F. A pin h^2 projects from the rear of the segmental wheel E in position to engage the lever *h* and stop the segmental wheel E at the point of starting. The lower end of the lever *h* is connected by a wire *x'* to a lever x^2, attached to the shaft of the armature-lever N. Another wire *u* connects the lever *h* with the armature P of the magnet M^2, so that whenever a dash is made or the magnet M^2 is in the circuit the segmental wheel E will be pulled away from the spur-wheel F and consequently allowed to return to the point of starting. A pin *q*, carried by the segmental wheel E, comes into contact with the spring *l*, supported by the base-piece whenever the segmental wheel E is moved far enough. The pin *q* is placed at such a distance from the spring *l* that it requires a greater number of dots than occur in succession in the call for that instrument; or to make the same device of general application, a greater number of dots than occur in succession in any call on the line to bring the pin *q* and the spring *l* into contact. For example, suppose this number to be six and that the pin *q* is placed six spaces from the spring *l*. When the segmental wheel E is at the starting-point, then six dots (- - - - - -) sent over the line will bring the pin *q* into contact with the spring *l*, closing the circuit of the battery B' through the wires 10 11, spring *l*, pin *q*, segmental wheel E, wires 18 16, the magnet M^2, and the wire 22 back to the battery. The armature P is held to the magnet M^2 by the contact of the spring *k* with the point *p*, and is released by the removal of the lever *n* from the contact-screw *r*, as before explained. This movement of the armature P releases the wheel D and the ratchet-wheel C. It also releases the segmental wheel E when they all return to the starting-point.

Before sending a signal a dash (—) is sent over the line to insure the return of the segmental wheel E to the point of starting in case it may have failed to return in the regular operation of the instrument. The manner of proceeding when it is desired to throw any signal into the circuit is to first make a dash, (—.) This will certainly throw the segmental wheel E and possibly the wheel D and the ratchet-wheel C to the point of starting. The transmitter of the signal should hold his key open for a second after making the dash, so that if the screw e^3, carried by the armature-lever N, has made a contact with the wheel D, the wheel D and the ratchet-wheel C may have time to return to the starting-point. Six dots (- - - - -) are then made. This brings the pin *q* against the spring *l*, thus closing the circuit through the magnet M^2 and releasing the segmental wheel E, the wheel D, and the ratchet-wheel C, all of which return to the point of starting. As the pin *q* is placed at the same distance from the spring *l* in all the instruments on the line, they will all be set at zero by making a signal corresponding to one dash and six dots (— - - - - - -.) Then by repeating the call for any office on the line three times the signal at that office will be thrown into the circuit.

I do not limit or confine myself to the exact construction herein shown and described, as I may in practice modify the construction to adapt the instrument to use under different conditions. I may also use the equivalents of the mechanism herein described in lieu of that shown in the drawing.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In electric signaling apparatus, the combination of the electro-magnets M M′, the armature-levers L N, adapted to be operated by the said magnets, the shaft A, the ratchet-wheel G and wheel D, mounted upon the said shaft, the pawl *a*, carried by the armature-lever L, the contact-screw e^3, inserted in the armature-lever N, and the line and local connections, substantially as specified.

2. In electric signaling apparatus, the combination of the electro-magnets M M′, the armature-lever L, pawl *a*, carried thereby, the armature-lever N, provided with the contact-screw e^3, the shaft A, ratchet-wheel G, spur-wheel F, and wheel D, carried by the said shaft, the segmental wheel E, provided with the stop-pin h^2 and contact-pin *q*, the spring *l*, and the line and local connections, substantially as specified.

3. In electric signaling apparatus, the combination of the electro-magnets M M′, the armature-levers L N, adapted to be operated by the said magnets, the shaft A, the ratchet-wheel G, and wheel D, mounted upon the said shaft, the pawl *a*, carried by the armature-lever L, the contact-screw e^3, inserted in the armature-lever N, the pawl e^2, carried by the armature-lever N, the ratchet-wheel C, provided with the studs n^2 *t*, the spring *m*, contact-screw *s*, the electric signal S, and the line and local connections, substantially as specified.

4. In an electric signaling apparatus, the combination, with the armature-lever N, of a pivoted and weighted angle-lever and a link connecting the lever to the armature, substantially as described.

5. In electric signaling apparatus, the combination of the magnets M M′, the armature-levers L N, the pawl e^2, carried by the lever N, the pawl *a*, carried by the lever L, the ratchet-wheel G, spur-wheel F, wheel D, shaft A, supporting the said wheels G F D, the retaining-pawl *f*, engaging the ratchet-wheel C, the retaining-pawl *b*, engaging the ratchet-wheel G, the magnet M^2, armature P, the shaft H, supporting the said armature, the lever *h*, the segmental wheel E, supported thereby and provided with the pins h^2 *q*, the spring *l*, lever *n*, levers *c z*, the wires *y′ u v*, and the electrical connections, substantially as specified.

6. In an electric signaling apparatus, the combination, with the gear-wheel F and the armature-lever N, of the spring-pressed lever *h*, the segmental gear-wheel E, carried by the lever, the lever x^2, secured to the shaft of the armature-lever, and the wire *x′*, connecting the levers *h* x^2, substantially as described.

7. In electric signaling apparatus, the combination of the electro-magnets M M′, the armature-levers L N, adapted to be operated by the said magnets, the shaft A, the ratchet-wheel G, and wheel D, mounted upon the said shaft, the pawl *a*, carried by the armature-lever L, the contact-screw e^3, inserted in the armature-lever N, the pawl e^2, carried by the armature-lever M, the ratchet-wheel C, provided with the studs n^2 *t*, the spring *m*, contact-screw *s*, the screw *e*, the electric signal S, and the line and local connections, substantially as specified.

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