(No Model.) 3 Sheets—Sheet 1.

A. D. & G. W. BLODGETT & J. P. TIRRELL.

ELECTRIC SIGNALING APPARATUS.

No. 263,281. Patented Aug. 22, 1882.

Fig. 3.

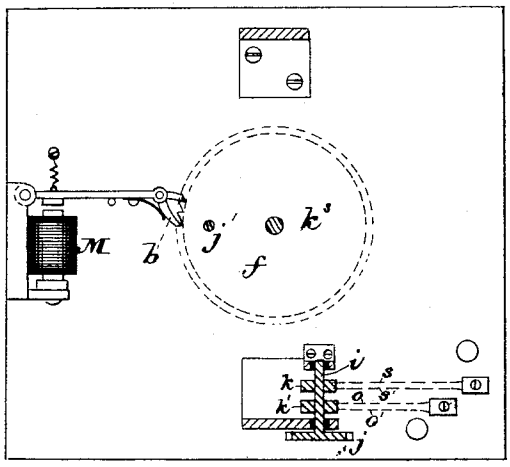


Fig. 6.

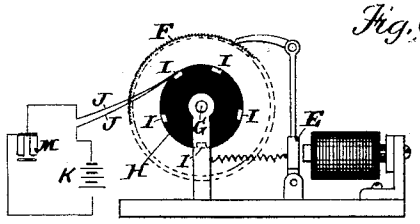


Fig. 4.

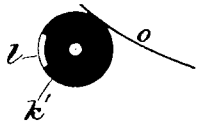


Fig. 5.

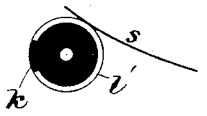


Fig. 1.

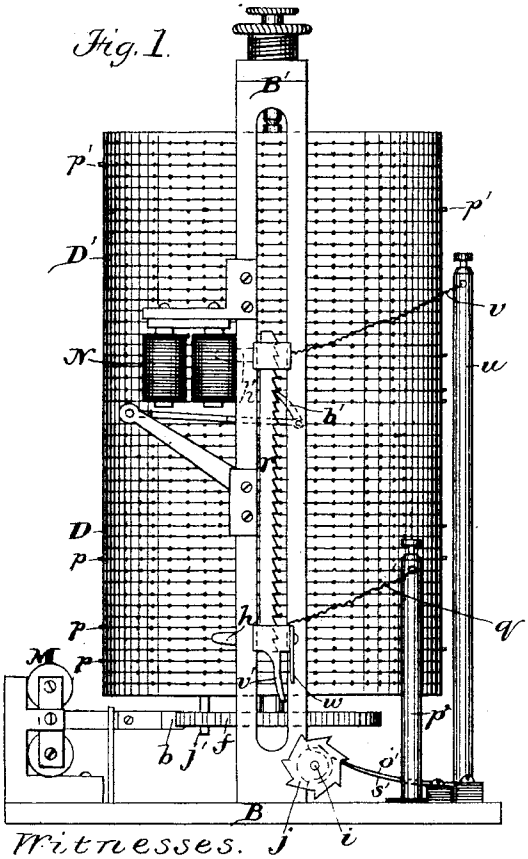
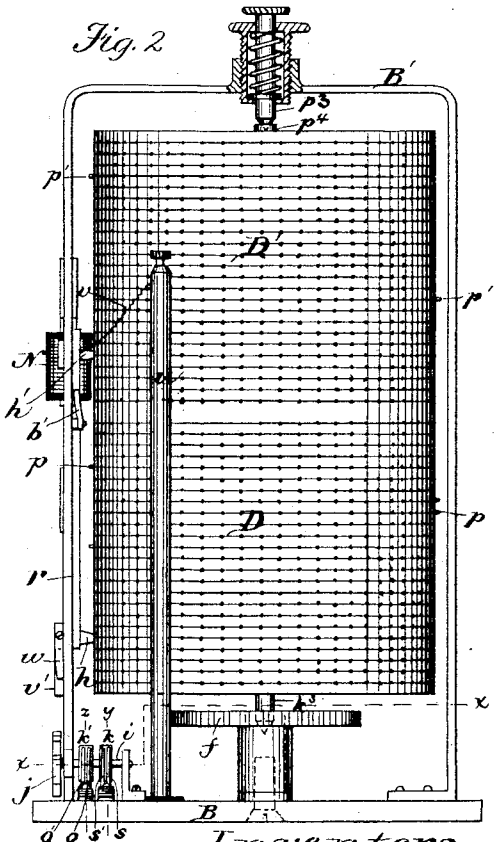


Fig. 2



Post p^3 is omitted from Fig. 2 to avoid confusion.

Witnesses.
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A. D. & G. W. BLODGETT & J. P. TIRRELL.

ELECTRIC SIGNALING APPARATUS.

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Fig. 8

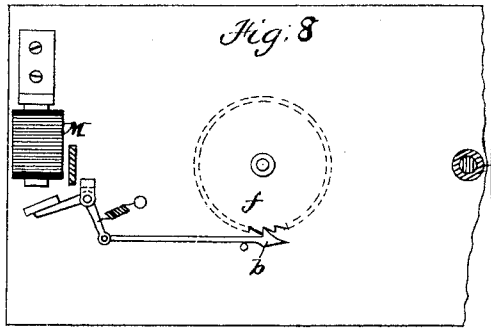


Fig. 9.

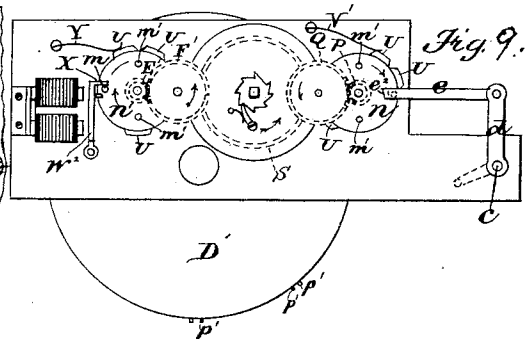


Fig. 7

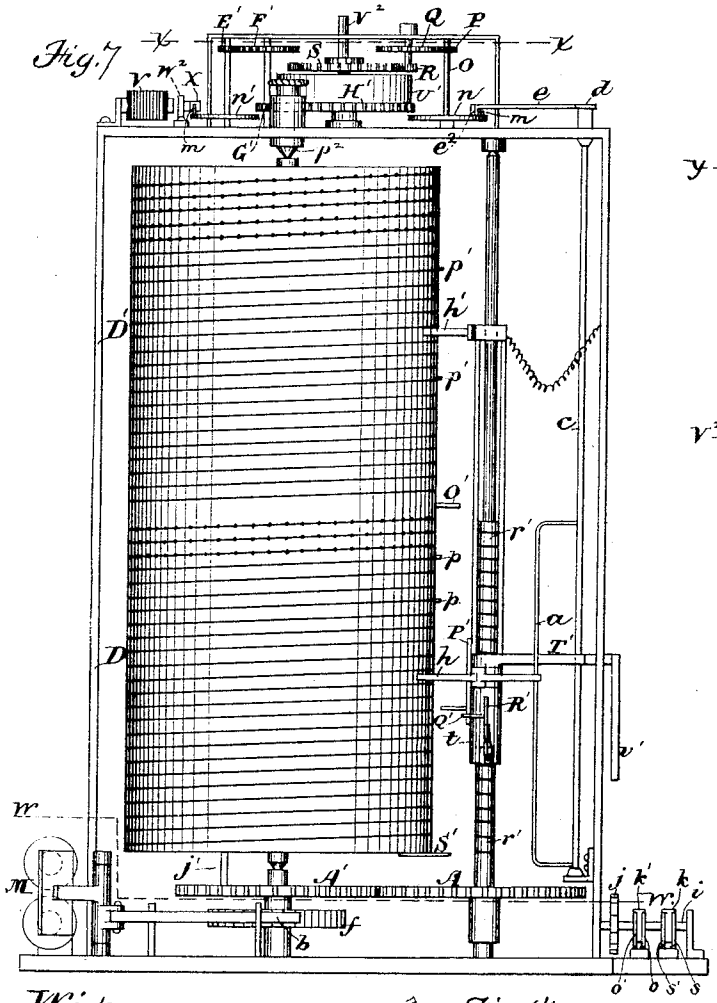


Fig. 10.

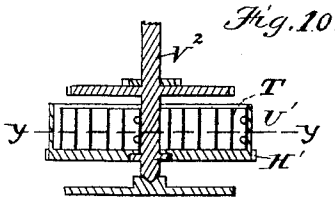


Fig. 11

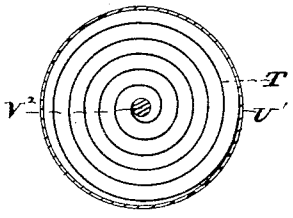


Fig. 12.

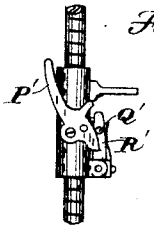


Fig. 13.

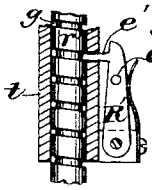
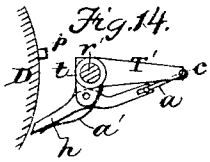


Fig. 14.



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ELECTRIC SIGNALING APPARATUS.

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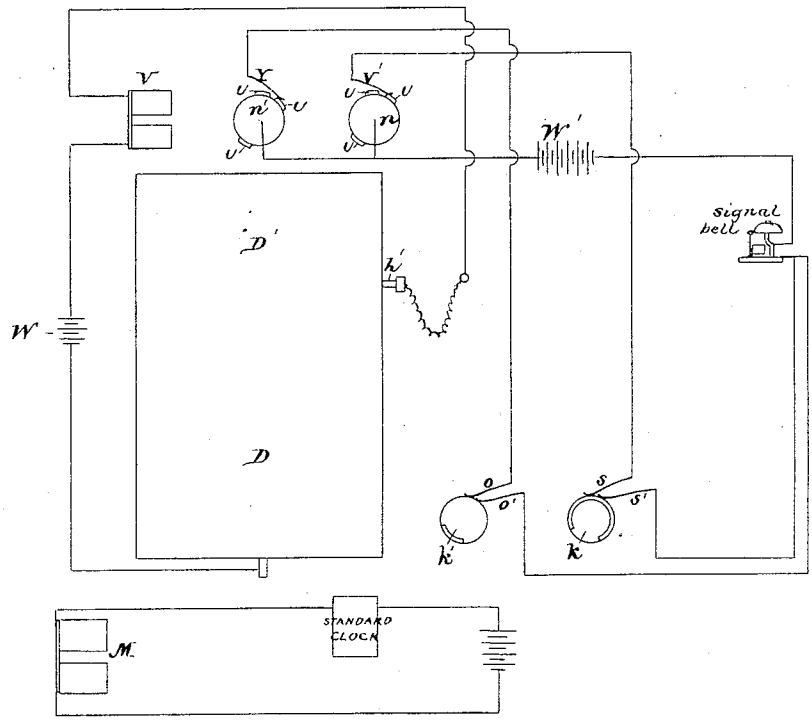
Fig. 15.



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UNITED STATES PATENT OFFICE.

AARON D. BLODGETT, GEORGE W. BLODGETT, AND JACOB P. TIRRELL, OF BOSTON, MASSACHUSETTS, ASSIGNORS TO SAID A. D. BLODGETT, G. W. BLODGETT, AND GEORGE O. CARPENTER, OF SAME PLACE, AND JAMES F. EMERSON, OF WAKEFIELD, MASSACHUSETTS.

ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 263,281, dated August 22, 1882.

Application filed May 15, 1882. (No model.)

To all whom it may concern:

Be it known that we, AARON D. BLODGETT, GEORGE W. BLODGETT, and JACOB P. TIRRELL, all of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Electric Signaling Apparatus, of which the following is a specification.

This invention is in part an improvement on the electric signal for which we filed an application for Letters Patent of the United States December 17, 1881, No. 48,169, the improvement consisting in the provision of means whereby, after the electrodes or circuit-closing devices described in said application have been in operation for six days, giving each day signals for the departure of railroad-trains, according to a week-day schedule or time-table, the said electrodes will be made inoperative, and a differently-arranged set of electrodes or circuit-closing devices will be brought automatically into action on the seventh day, the signals given on that day conforming to the Sunday time-table.

The invention also has for its object to provide improved means for automatically keeping the intermittently-rotating time-cylinder of our signal mechanism or any chronometrical device in unison with a standard clock at any desired point; and this part of our invention consists in the provision of means whereby the vibrations of the armature of an ordinary "sounder" connected electrically with a signal-clock and operated thereby at regular intervals are caused to regulate the operation of a chronometrical device.

The invention also consists in certain details of construction, all of which we will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a front elevation of a signaling apparatus embodying our improvements. Fig. 2 represents a side elevation of the same. Fig. 3 represents a section on line *x x*, Fig. 2, looking downwardly. Figs. 4 and 5 represent respectively sections on lines *y y* and *z z*, Fig. 2. Fig. 6 represents a diagram showing an arrangement of devices for regulating the time-cylinder by a standard clock. Fig. 7 represents a side elevation of a different arrangement of our apparatus. Fig. 8 represents a section on line *w w*, Fig. 7. Figs. 9 represents a section on line *x' x'*, Fig. 7. Figs. 10, 11, 12, 13, and 14 represent details employed in the construction shown in Fig. 7. Fig. 15 represents a diagram of the connections employed with the construction shown in Fig. 7.

The same letters of reference indicate the same parts in all the figures.

In the drawings, D represents a metallic cylinder adapted to rotate on a vertical axis, and provided with holes adapted to receive pins or minute-electrodes *p*. In Figs. 1 and 2 the holes are arranged in parallel peripheral rows, each row having sixty holes, while in Fig. 7 a different arrangement of holes is shown, which will be described hereinafter, the construction shown in Figs. 1, 2, 3, 4, 5, and 6 being first described as follows: The cylinder is provided with a ratchet, *f*, having sixty teeth, and with the ratchet is engaged a pawl, *b*, which is operated by the armature of an electro-magnet, M, and rotates the cylinder a distance equal to the length of one ratchet-tooth each minute, thus giving the cylinder a complete rotation once each hour.

h represents a single electrode or spring, which is mounted on a vertically-movable notched bar, *r*, which is raised by a dog, *b'*, operated by the armature of an electro-magnet, N, once each hour, the dog *b'* raising the bar *r* and its electrode a distance equal to the space between each row of minute-electrodes and the next. These movements cause each pin or minute-electrode inserted in the cylinder to make contact with the single electrode at the minute or unit of time represented by such pin, a circuit being closed through a signal-bell whenever such contact is made. A series of signals is therefore automatically given, announcing the departure of trains according to a given schedule or time-table. After the single electrode has been raised to the row of holes corresponding to the last hour of the day on the cylinder, and the latter has been

once rotated while the single electrode is in the last-named position, the notched rod carrying the single electrode is released automatically and allowed to drop, the single electrode being thus brought to the row of holes corresponding to the first hour of the day.

Apparatus operating in the manner thus generally described is shown in our above-named application, to which reference is made for a fuller description. In said application the cylinder is shown as provided with twenty-four rows of holes, one for each hour of the day, and the same minute-electrodes are brought into use every day, so that there will be no variation in the order of the signals from day to day while the minute-electrodes are arranged in any given order.

In carrying out our present invention we provide the cylinder D with an upward extension, D′, and provide it with another series of rows of holes, preferably corresponding in number and arrangement to the holes already described in the lower portion of the cylinder. In the holes of the extension D′ pins p' may be placed to correspond with a Sunday time-table. The notched rod r, supporting the single electrode h, above described, is provided at its upper end with a similar electrode, h', adapted to make contact with the pins p' successively, the electrode h' moving in unison with the electrode h. In the normal condition of the apparatus—that is to say, during the six week-days—the electrode h' is kept out of the electric circuit in which the signal-bell is located, so that although the electrode h' and the pins p' come in contact with each other daily the circuit is not closed by their contact until the seventh day, when the electrode h' is automatically put into the circuit with the signal-bell, and electrode h is automatically cut out from said circuit and made inoperative. This change is effected in the present instance by the devices next described.

i represents a shaft journaled in insulated bearings on the base B, and provided with a ratchet, j, having seven teeth, and with two disks, k k', of insulating material, one of which, k', has a short metallic section, l, in its periphery equal to about one-seventh of its circumference, while the other, k, has a metallic section, l', equal to about six-sevenths of its circumference. On the periphery of the disk k' bear two metallic springs, o o', one of which is in metallic connection through a post, p^2, and flexible wire q with the single electrode h, and the other is connected with the metallic base B of the apparatus. The spring o is connected to the post p^2, and with said post is insulated from the metallic base B, while the spring o' is in metallic connection with said base, which is connected with one pole of the battery in the signaling-circuit, as in our former application. When the springs o o' rest on the metallic portion of the disk k' they are electrically connected, so that when the electrode h is in contact with one of the pins p the circuit will be closed and the signal operated; but when the springs rest on the insulating portion of the disk they are insulated from each other and the electrode h is cut out of the circuit and inoperative.

On the disk k rest two springs, s s', one of which, s, is connected with the electrode h' through a post, u, and flexible wire v, said post and spring being insulated from the base B, while the other, s', is in metallic connection with the base. The springs s s', when resting on the metallic portion of the disk k, put the electrode h' in circuit, and when resting on the insulating portion cut out said electrode and render it inoperative. The disks k k' are so arranged on their arbor that when the springs of the disk k rest on a metallic portion the springs of the disk k' rest on an insulating portion, and vice versa. The ratchet j is rotated one-seventh of a complete rotation by each descent of the bar r, said bar carrying a tooth, v', which engages with a tooth of the ratchet when the bar drops, and with a stop, w, which abuts against a succeeding tooth and prevents the tooth v' from rotating the ratchet more than one-seventh of a complete rotation.

The operation is as follows: At the commencement of the week, or on Monday, the springs s s' rest on the forward portion of the metallic surface of the disk k and the springs o o' rest on the forward portion of the insulating-surface of the disk k'. At the end of each day the disks k k' are partly rotated, as described, and at the end of the sixth day the conditions of the two disks are reversed, the springs o o' resting on the insulated surface of the disk k' and the springs s s' on the metallic surface of the disk k. On the seventh day, therefore, the circuit is closed by the pins p' and electrode h'. The metallic portion of the disk k' and the insulating portion of the disk k are of such length that the next rotation of the disks restores them to the condition first described. It will be seen therefore that the action whereby the week-day time is suspended on Sunday and restored on Monday is entirely automatic, so that no readjustment of the minute-electrodes is necessary to adapt the apparatus for Sunday use.

It is obvious that the means whereby the electrodes h h' are alternately placed in and cut out from the circuit may be variously modified without departing from the spirit of our invention, and we do not therefore limit ourselves to the special devices described for this purpose.

The ratchet f is formed in a separate piece from the cylinder, and is journaled in a sleeve on the base B. The lower journal, k^3, of the cylinder rests in a socket in the upper surface of the ratchet, and is removable from the latter. A pin, j', projecting from the cylinder into an orifice in the ratchet, connects the cylinder and ratchet, so that they will rotate together. The upper journal, p^4, of the cylinder receives a stud, p^3, which slides vertically in a

holder in the yoke or frame B′, and is pressed downwardly by a spring, as shown in Fig. 2. When the stud p^3 is raised the cylinder D is released and can be removed from the ratchet and base, so that readjustment of the pins can be readily effected.

The electro-magnet M, which attracts the armature carrrying the cylinder-rotating dog *b*, is excited once each minute by suitable connections with an electrical clock. In Fig. 6 we have shown an arrangement whereby said magnet is excited by the operation of the armature E of a telegraphic sounder of the kind ordinarily used in a time-service system and operated by a standard clock at an observatory, so as to give a blow or sound which is synchronous with every alternate vibration of the standard clock pendulum, excepting at intervals when the operation of the sounder is interrupted to mark divisions of time. In the time-service connected with the clock at the observatory at Cambridge, Massachusetts, the sounders are caused to operate every alternate second until twenty-nine sounds have been given, and then a pause occurs which marks the close of the minute. Four minutes are indicated in this way in succession, and during the fifth minute the operation of the sounder ceases, after giving eighteen sounds, until the close of the minute, so that a longer pause occurs, marking the closing of a period of five minutes.

F represents a ratchet on an arbor, G, and H represents a disk of insulating material affixed to the same arbor, and provided with five insulated metallic sections, I I I I I, on its periphery. The ratchet F has one hundred and thirty-four teeth—a number equal to the number of sounds given by the sounder in five minutes, as above set forth.

J J represent a pair of metallic springs bearing on the disk H. One of these springs is connected with the magnet M and the other with one pole of a local battery, K, with the other pole of which the magnet M is connected. When the springs J J both rest on a metallic section I the circuit is closed through the magnet M, and the latter is caused to attract its armature and rotate the cylinder D one step. The number of teeth with which the ratchet F is provided insures one complete rotation of the ratchet and the disk H every five minutes, and the arrangement of the metallic sections I is such that the circuit will be closed in the manner described at the expiration of each minute, four of said sections being at uniform distances apart, and the fifth being separated from the fourth by a space shorter than any that exists between the others, so that the fifth section will be brought to a contact with the springs J J by the eighteen beats of the fifth minute. It will be seen therefore that the cylinder is governed in its rotation by the standard clock, and is therefore rotated with entire accuracy.

It is obvious that the device for periodically closing the circuit by the operation of the sounder may be employed for other chronometrical purposes besides regulating the rotation of the cylinder D. Hence we do not limit ourselves to the employment for said purpose; nor do we limit ourselves to the employment of a circuit-closing device in connection with the armature of a telegraph-sounder as a means for regulating the chronometrical device. Said armature may be arranged to fall when released from its magnet upon an arm projecting laterally from the pendulum of a clock, and thereby give an impulse to said pendulum and keep it in a uniform rate of vibration. The armature in this case should be kept vibrating at a uniform rate, instead of being allowed to stop at intervals, as above described.

In Fig. 7, 8, 9, 10, 11, 12, 13, and 14 we have shown a different arrangement of pins or minute-electrodes on the cylinder D and its extension, different means for closing the circuits through the signal, and certain other details of construction. The holes for the pins or minute-electrodes *p*, instead of being arranged in parallel peripheral rows, are arranged in a single spiral row, the number of holes being the same as previously described. The holes in the extension D′ are also arranged in a single spiral row. The single electrodes *h h′* are therefore raised continuously at such a rate that they will meet the pins or minute-electrodes successively, and their upward motion is effected by means of a spirally-grooved vertical arbor, *r′*, a sleeve, *t*, adapted to slide vertically on said arbor and supporting the electrodes *h h′*, and a pin, *e′*, passing through the sleeve *t* and entering the spiral groove *g* in the arbor *r′*.

A represents a gear-wheel on the arbor *r′*, meshing with a gear-wheel, A′, on the arbor of the ratchet *f*, the arbor *r′* being thus rotated by and with the cylinder D, the spiral groove causing the pin *e′* and sleeve *t*, with the electrodes *h h′*, to move continuously upward on the arbor *r′*.

We have arranged the pins *p* and the electrode *h* so that they do not act directly as electrodes in closing the circuit, but have a mechanical action, whereby a clock-train is released and caused to rotate a circuit breaking and closing disk. To this end the electrode *h*, which in this connection we will call a "lever," is pivoted to the sleeve *t*, and is extended backwardly from its pivot and engaged at its rear end with an elongated crank, *a*, on a vertical rock-shaft, *c*, which is journaled in suitable fixed bearings. On the upper end of the rock-shaft *c* is an arm, *d*, to which is pivoted a second arm, *e*, having a stop, e^2, at its outer end. When a pin, *p*, comes in contact with the electrode or lever *h* it turns said lever on its pivot, and thus causes it, through the crank *a*, to turn the rod *c* in its bearings and move the arm *e* in one direction, a spring, *a′*, pressing the lever *h* toward the cylinder and moving the arm *e* in the opposite direction.

When the pin *p*, that displaced the lever *h*, passes by said lever, the arm *e* is thus reciprocated, so that the stop e^2 will come alternately in front of pins *m m'* on a disk, *n*, which is rotated by a train of gearing, P Q R S, impelled by a spring, T. Each movement of the arm *e* in one direction releases the pin *m*, bearing against the stop e^2, and causes said stop to arrest the next pin, *m'*, while the opposite movement of the arm *e* causes its stop to release the pin *m'* and stop the next pin, *m*.

The periphery of the disk *n* is provided with projections U, which, when the disk is rotated, make contact successively with a metallic spring, V', which is electrically connected with the spring *s*, that bears on the disk *k'*. (See Fig. 15.) The contact of each projection U with the spring V' closes the circuit through the signal-bell, the disk *n* being connected through a battery, W', and the signal-bell with the spring *s'*, bearing on the disk *k*, as shown in Fig. 15. The projections U are preferably so arranged that during one movement of the disk *n* a given number of signals will be given—say two—and at the next a different number—say one. Hence by placing one pin *p* in a hole representing the starting-minute and another in a hole representing one or more minutes prior to the starting-minute the first pin will cause a warning-signal to be given differing from the starting-signal given by the next pin.

The electrode *k'* is electrically connected with an electro-magnet, V, which is connected through a battery, W, with the metallic frame of the machine and the cylinder D, so that whenever a pin, *p'*, in the extension of the cylinder touches the electrode *k'* the circuit is closed through the electro-magnet V and the armature W^2 thereof is attracted. Said armature has a stop, X, which projects over a disk, *n'*, having pins *m m'* and projections U, arranged like those of the disk *n*.

The disk *n'* is rotated by a train of gearing, E' F' G' H', impelled by the spring T. When the armature W^2 is attracted to the magnet the stop X thereon releases one of the pins *m'*, and when the armature is released arrests one of the pins *m'* of the disk *n'*.

A spring, Y, electrically connected with the spring *o* of the drum k^2, is arranged to make contact with the projections U of the disk *n'*, said disk being connected through the battery W' and the signal-bell with the spring *o'*, bearing on the disk *k'*, so that the rotation of the disk *n'*, caused by the closing of the circuit through the magnet V, causes the signal to be operated, as by the rotation of the disk *n*. The disk *n* is automatically kept in circuit for six days in succession, and is then cut out, while the disk *n'* is automatically put in circuit on the seventh day and allowed to remain one day, and is then cut out by means of the arbor *i*, ratchet *j*, disks *k k'*, and springs *o o' s s'*, as already described, the ratchet *j* being rotated one-seventh of a revolution at each descent of the sleeve *t*, said sleeve carrying the tooth *v'*, which operates the ratchet *j*. The sleeve *t* is released and allowed to fall after reaching its extreme of elevation by the withdrawal of the pin *e'* from the spiral groove in the arbor *r'*, thereby depriving the sleeve *t* of its only support. The pin *e'* is withdrawn by the contact of an arm, O', on the cylinder D with a lever, P', which is pivoted to the sleeve *t* and bears against a pin, Q', on the pivoted arm R', on which the pin *e'* is formed. When the sleeve *t* reaches a sufficient height the rotation of the cylinder causes the arm Q' to tilt the lever P' and the latter to tilt the arm R', so as to withdraw the pin *e'*. The sleeve *t* then falls until arrested by a stop, S'. The sleeve *t* is guided and prevented from rotating on the arbor *r'* by an arm, T', projecting from the sleeve, and having a slot in its outer end, which rides on the rock-shaft *c*.

It will be observed that the single spring T rotates both the disks *n n'* through the intermediate trains of gearing. Said spring is attached at one end to a flange, U', on the gear-wheel H' of the train that rotates the disk *n'*, and at the other end to the arbor V^2, to which the gear-wheel S of the train that rotates the disk *n* is attached. The arbor V^2 is adapted to rotate independently of the gear-wheel H', so that the two are rotated in opposite directions by the uncoiling force of the spring exerted at its ends. This arrangement, whereby one spring is enabled to operate two trains, may be applied to various mechanisms besides the one described.

If desired, the cylinder D may be provided with a continuous spiral groove, into which the pins or minute-electrodes may be inserted, instead of two independent holes.

We claim—

1. In a signaling apparatus, the combination of a rotating vertical cylinder having two parts or divisions, each adapted to receive and permit any desired arrangement of pins, as described, two single devices, *h h'*, moved upwardly along the cylinder by suitable mechanism, so as to make contact with said pins successively, and allowed to fall once each day, a signal-bell, and intermediate devices whereby the signal is automatically operated for six successive days by the pins of one division of the cylinder and on the seventh day by the pins of the other division of the cylinder, as set forth.

2. In a signaling apparatus, the combination of a rotating cylinder having two parts or divisions, each adapted to receive and permit any desired arrangement of pins, as described, two single devices, *h h'*, supported by a bar or slide, which is raised and released at intervals, as described, a signal-bell located in an electric circuit, intermediate devices whereby the circuit is closed through said bell by the action of the pins in one division or the other of the cylinder, and an arbor having a ratchet which is rotated one step by each descent of said bar

or slide, and circuit-changing devices, substantially as described, operated by the rotation of said arbor, whereby the pins in the different divisions of the cylinder are caused to alternate in their action on the circuit-closing devices, the pins of one division being made operative for six successive days and the pins of the other division on the seventh day, as set forth.

3. The combination of the base B, having the ratchet *f*, the cylinder D, having its lower bearing supported on said ratchet and engaged with said ratchet, so as to be removable therefrom, and the vertically-movable stud p^2, supporting the upper journal of the cylinder, as set forth.

4. The combination, with a telegraph-sounder and chronometrical device, of a ratchet, F, operated by a pawl on the armature of the sounder, and having as many teeth as there are operations of the sounder in a period of five minutes, an insulating-disk having metallic sections arranged as described, and springs bearing on said disk and connected, as described, with a circuit which includes the electro-magnet directly operating the chronometrical device.

5. As a means for raising and releasing the single devices *h h'*, the combination of the rotated spirally-grooved arbor *r'*, the sleeve *t*, supporting said devices, and having the movable pin *e*, entering the spiral groove of the arbor, and automatic devices whereby said pin is withdrawn from the spiral groove, as set forth.

6. The combination of the mechanically-rotated disk *n*, having the pins *m m'* and projections U, and connected, as described, in an electric circuit, the stop e^2, adapted to arrest the pins *m m'* successively, the rock-shaft *c*, operating said stop, the pivoted lever *h*, engaged, as described, with the rock-shaft, and the rotating cylinder D, having pins adapted to operate the lever *h*, as set forth.

7. The combination, with the cylinder D, having two sections or divisions, each provided with pins, of the mechanically-impelled disks *n n'*, connected, as described, in the same electric circuit, and alternately arrested and released by the action of the pins, and automatic means for putting one of said disks into and the other out of the circuit at predetermined intervals, as set forth.

8. In a signaling apparatus, a rotary cylinder having two parts or divisions, each adapted to receive and permit any desired adjustment of pins, as described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 13th day of May, 1882.

AARON D. BLODGETT.
GEO. W. BLODGETT.
JACOB P. TIRRELL.

Witnesses:
C. F. BROWN,
A. L. WHITE.