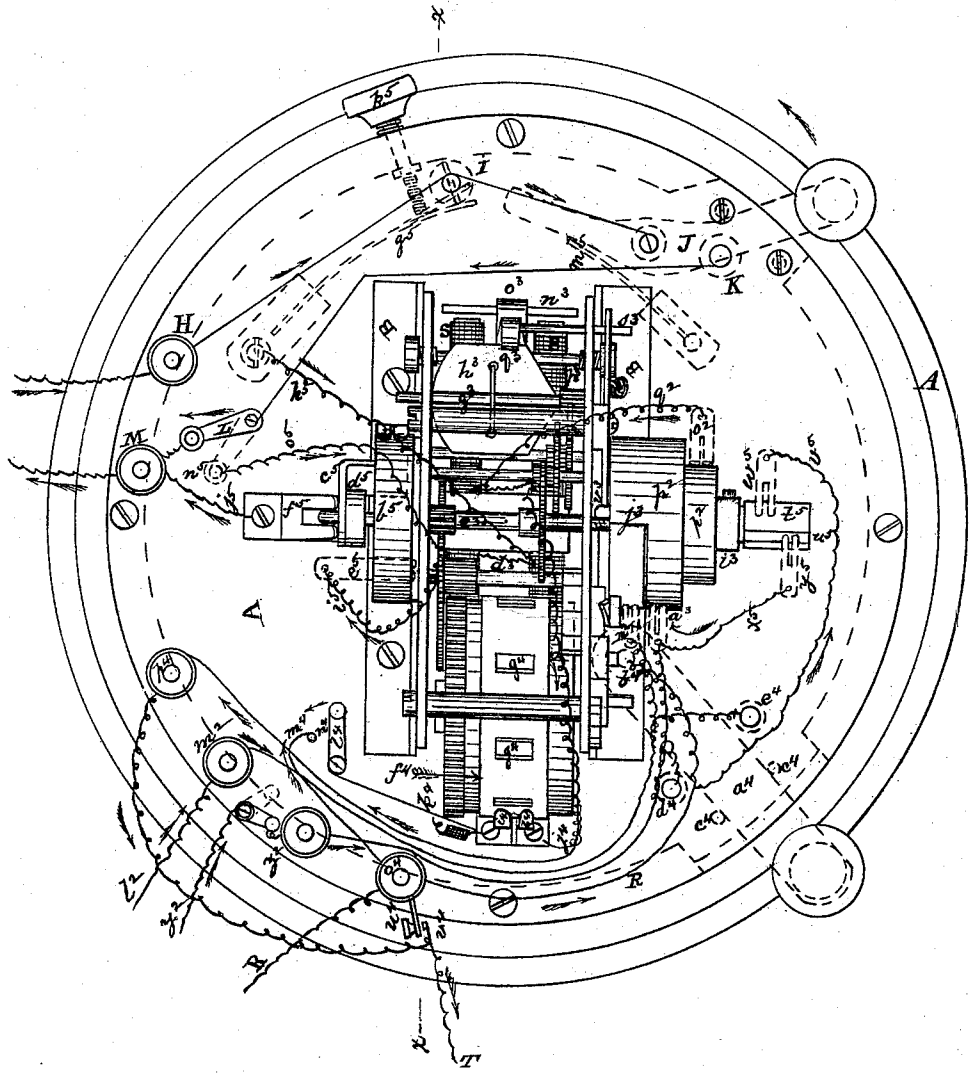
6 Sheets—Sheet 1.

W. B. WATKINS.

DOUBLE-ACTING FIRE AND BURGLAR ALARM-TELEGRAPH.

No. 172,221. Patented Jan. 11, 1876.

Fig. 1.



Witnesses.

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6 Sheets—Sheet 2.

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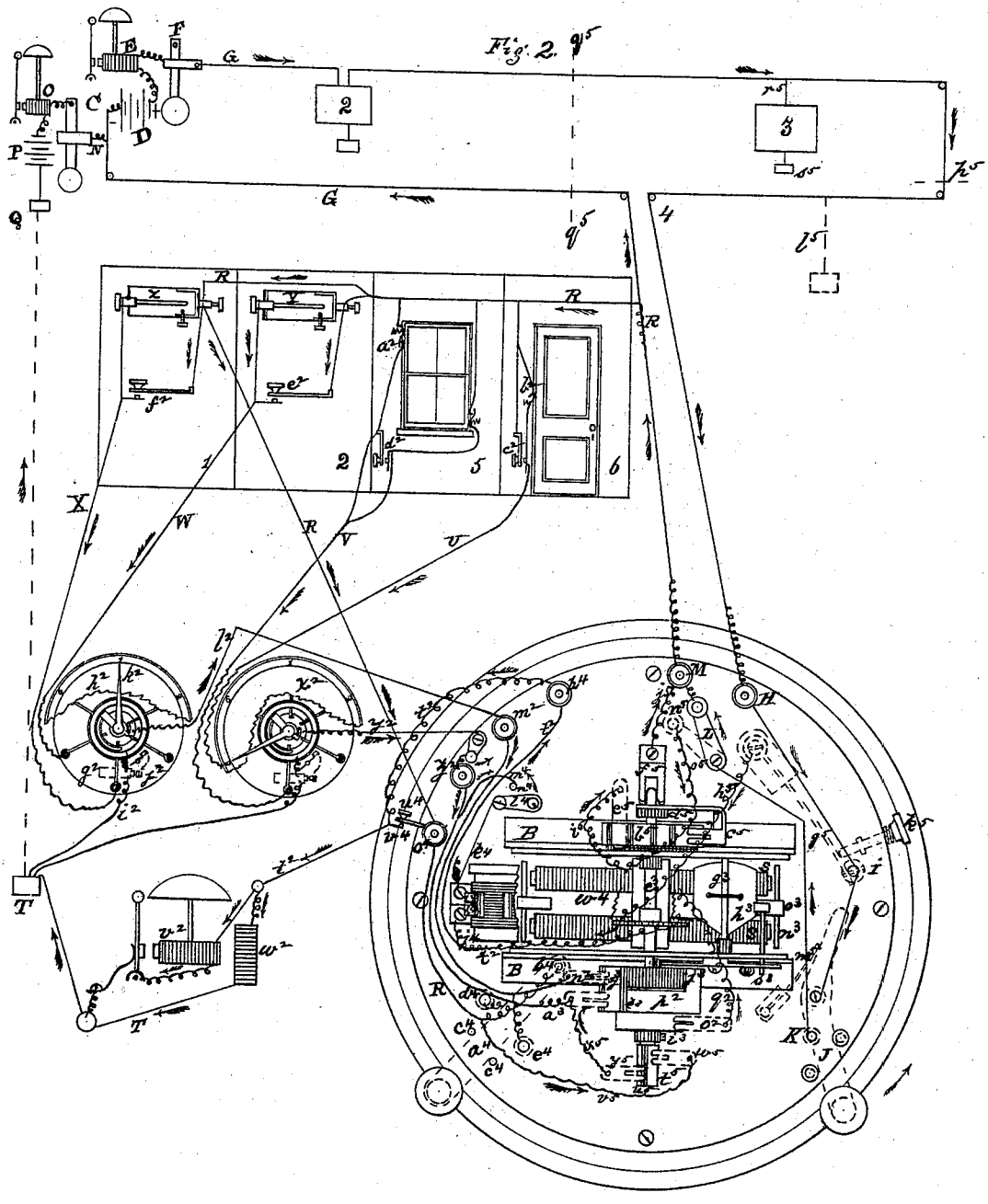
DOUBLE-ACTING FIRE AND BURGLAR ALARM-TELEGRAPH.

No. 172,221. Patented Jan. 11, 1876.

Fig. 2.



Witnesses.

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6 Sheets—Sheet 3.

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DOUBLE-ACTING FIRE AND BURGLAR ALARM-TELEGRAPH.

No. 172,221. Patented Jan. 11, 1876.

Fig. 4.

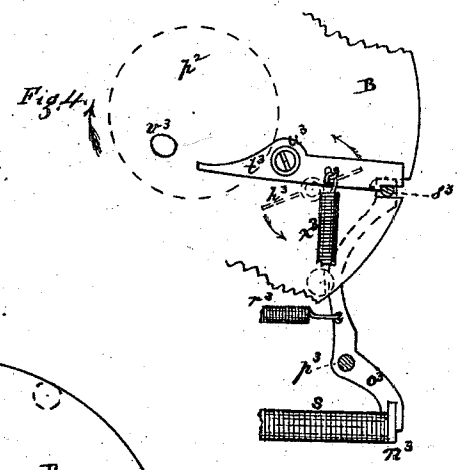

Fig. 3.

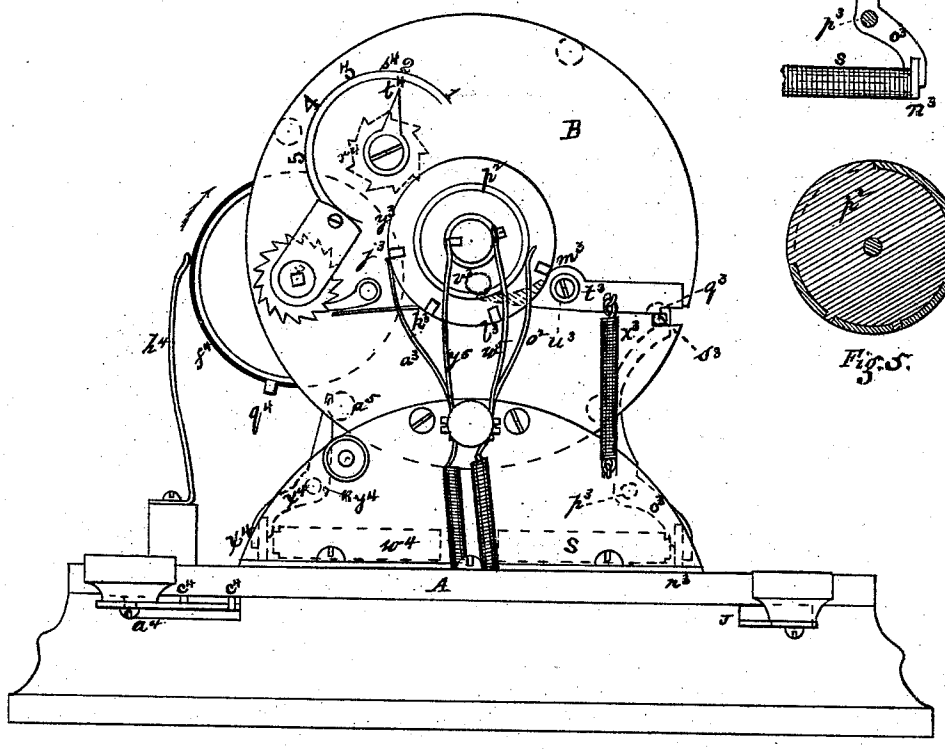

Fig. 5.

Witnesses.

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6 Sheets—Sheet 4.

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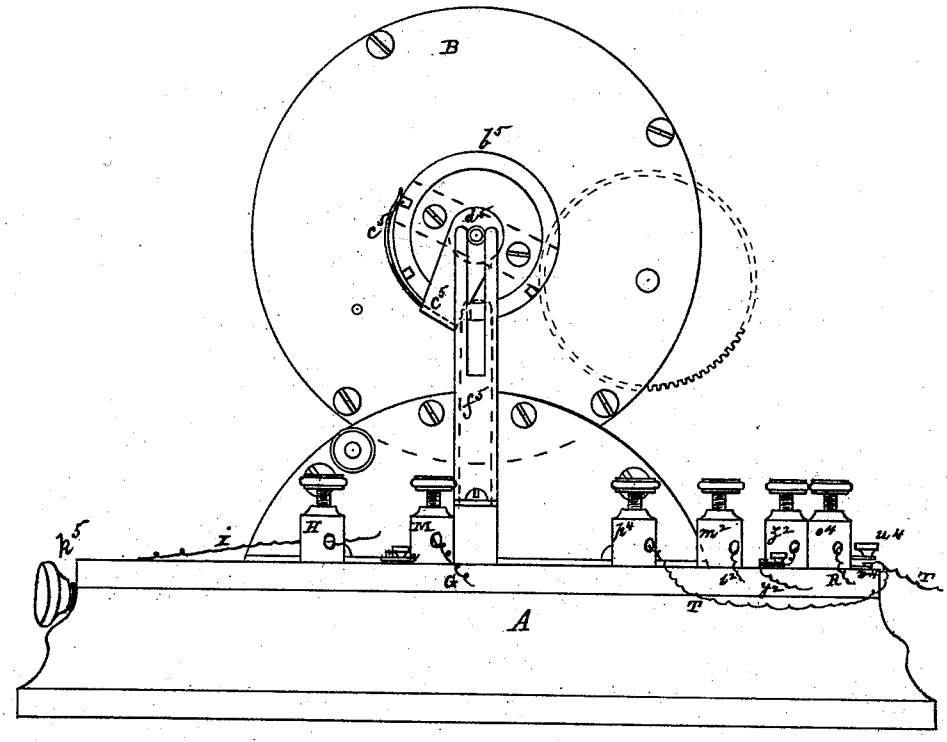
DOUBLE-ACTING FIRE AND BURGLAR ALARM-TELEGRAPH.

No. 172,221. Patented Jan. 11, 1876.

Fig. 6.



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6 Sheets—Sheet 5.

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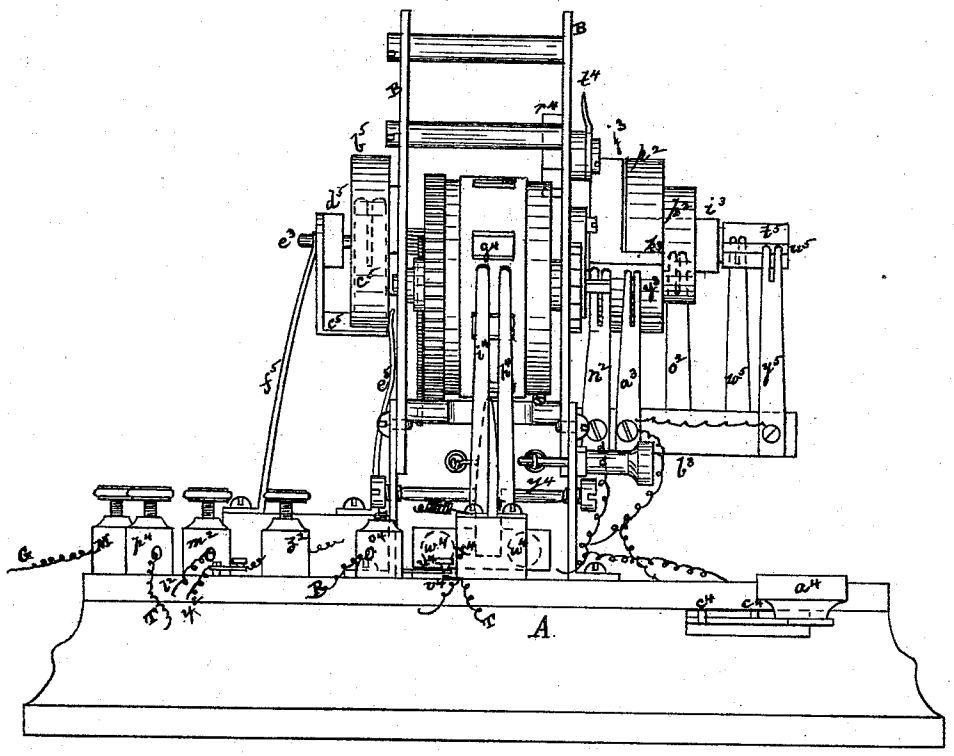
Fig. 7.



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6 Sheets—Sheet 6.

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DOUBLE-ACTING FIRE AND BURGLAR ALARM-TELEGRAPH.

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Fig. 9.

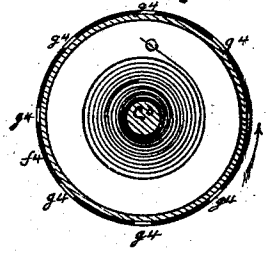
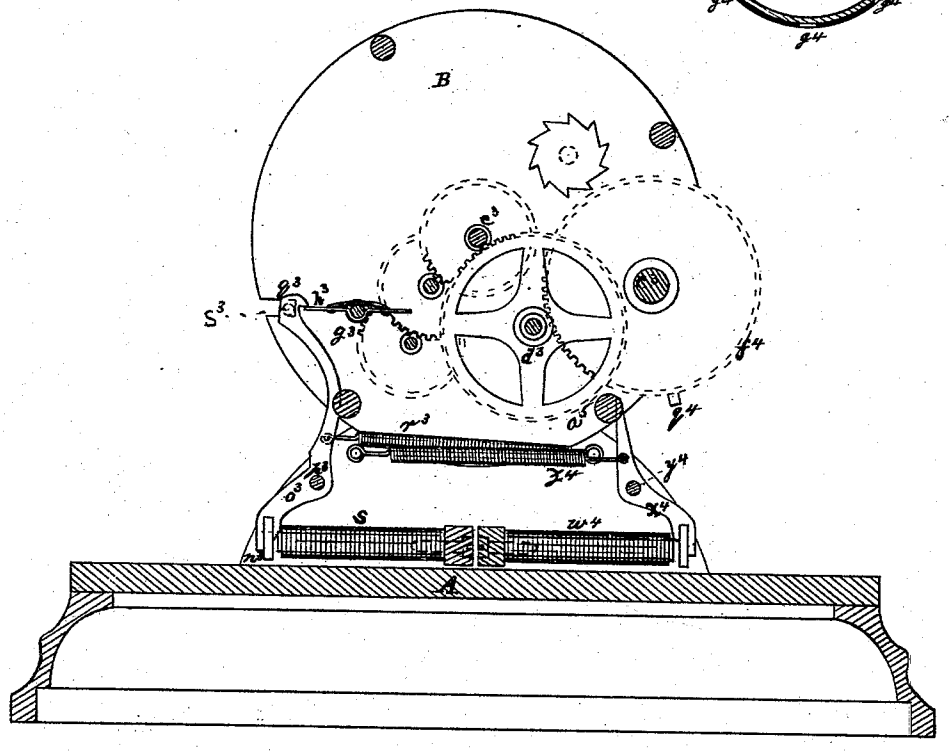


Fig. 8.



Witnesses.

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Charles L. Barrick

William B. Watkins

Inventor.

UNITED STATES PATENT OFFICE.

WILLIAM B. WATKINS, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN DOUBLE-ACTING FIRE AND BURGLAR ALARM TELEGRAPHS.

Specification forming part of Letters Patent No. **172,221**, dated January 11, 1876; application filed January 29, 1873.

To all whom it may concern:

Be it known that I, WILLIAM B. WATKINS, of Jersey City, State of New Jersey, have invented an Improved Double-Acting Heat and Burglar Signal Alarm Telegraph; and I do hereby declare the following to be a full description of the same:

The nature of my invention consists, first, in constructing a main and auxiliary circuits of galvanic electricity, whereby two simultaneous and independent signals may be transmitted to the receiving signal-station, for different purposes, by means of any suitable telegraphic signaling apparatus; second, in constructing a clock-work apparatus, having an actuating-magnet, in combination with a system of switches, circuit-closers, and an auxiliary circuit of galvanic electricity, having heat or burglar detecters arranged therein, whereby signals of fire or burglar alarms at any point of the main circuit of wires may be transmitted through the apparatus and auxiliary circuit to the receiving signal-station, notwithstanding that the main line of wires may be broken or short-circuited at any intermediate place between the receiving signal-station and magnet of the transmitting apparatus; third, in the method of combining, with a train of wheels, actuated by a magnet, a revolving circuit-breaker, whereby signals may be transmitted either over a closed or open circuit, or both at the same time; fourth, in the method of automatically stopping the train of wheels by means of a self-adjusting stop-lever, in combination with the armature and lever of an electro-magnet and a releasing-pin, operated by one of the train of wheels, whereby the train will be stopped when the current ceases through the actuating-magnet, with the revolving circuit-breaker wheel always in the same position with reference to its metallic surfaces and spring circuit-breakers; fifth, in the method of operating a revolving circuit-breaker arm, secured to the axis of a stationary circuit-breaker wheel by means of a stopping-lever, in combination with a fly-wheel, detent-lever, and adjusting switch-lever, whereby a signal is transmitted through the closed circuit of the main line to the receiving signal-station; sixth, in the method of constructing a revolving circuit-breaker upon the periphery of the clock-work mainspring-barrel, in combination with two circuit-breaker springs, having an electric connection with an auxiliary branch of the main circuit, whereby a definite series of signals may be transmitted to any receiving signal-station; seventh, in the method of indicating the time when the train of clock-wheels are run down by means of a toothed wheel, having a pointer attached to its axis, and rotated by a stud or pin on the periphery of the mainspring-barrel, whereby it may be seen by simple inspection of the front of the apparatus when the mainspring requires winding up again, to insure its being in working order at all times; eighth, in the method of transmitting the same signal-number by different means, by making the insulating-spaces across the face of a revolving circuit-breaker wheel of different lengths circumferentially of the said wheel, whereby a fire or burglar alarm may be indicated by the longest insulating-space, while a signal-call, or other alarm, may be indicated by the shorter insulating-space; ninth, in the method of completing the circuit of the auxiliary branch through the revolving circuit-closer wheel by means of an adjustable circuit-closer, in combination with two circuit-closer springs and the auxiliary branch circuit of the main line, whereby either of the different signals or calls may be transmitted to the receiving signal-station, by the vibration of an adjustable switch to either side, to transfer the circuit to make the different calls as desired; tenth, in the method of constructing a detective signal-call, by combining with the axis of the revolving circuit-breaker wheel, or other axis of the train of wheels in connection therewith, a metal hub, having a transverse insulating-strip inserted in its face, and two circuit-closer springs at opposite sides of the hub, so arranged as to have the tip of one spring rest on the insulator and the other tip on the metallic portion of it, so as to form an open circuit through the auxiliary circuit to the receiving signal-station, but a closed circuit instantly that the hub revolves, and thus would transmit an alarm, should any one tamper with the train of wheels, though the circuits were open, through the fire or burglar circuit closers.

But, to describe my improvements more particularly, I will refer to the accompanying drawings forming a part of this specification, the same letters of reference wherever they occur referring to like parts.

Figure 1, Sheet 1, is a plan view of the transmitting apparatus. Fig. 2, Sheet 2, is a plan view of the apparatus and system of main and auxiliary circuits, and connections with fire and burglar circuit closers, alarm instruments, and indicators. Fig. 3, Sheet 3, is a front view of the transmitting apparatus. Fig. 4, Sheet 3, is a detached view of the self-adjusting stop-lever and its connections. Fig. 5, Sheet 3, is a cut sectional view of the signal-circuit-closer wheel. Fig. 6, Sheet 4, is a rear view of the transmitting apparatus. Fig. 7, Sheet 5, is an end view of the apparatus. Fig. 8, Sheet 6, is a longitudinal cut sectional view of the apparatus through the line *x x*, Fig. 1. Fig. 9, Sheet 6, is a detached cut sectional view of the insulating-band as attached to the mainspring-barrel.

Letter A represents the base of the transmitting apparatus, and B the frame for the train of wheels to be secured upon. To the base are also secured an actuating-magnet, switches, and lines of wires for operating the apparatus. Letter C represents a receiving signal-station, at which is arranged a battery, D, magnet E, and key F. From the positive pole of the battery a line, G, passes through the magnet E and key F, and thence to the screw-post H on the base A, button I, actuating-switch J, button K, switch L, and screw-post M, and thence returns to the station C, and connects with the negative pole of the battery D, to complete a closed metallic circuit.

In connection with the receiving signal-station C is arranged an auxiliary branch circuit, N, magnet O, battery P, and ground Q; also, at such points as may be desired, one or more other auxiliary branch circuits, R, magnets S, and ground T, may be combined with the metallic circuit G. The object of this combination of circuits is to obviate the objection to the use of a simple metallic circuit, which, when once broken or short-circuited, cannot be used for transmitting signals until it has again been electrically repaired. But, by my combination of the auxiliary branch circuit with the main circuit, two signals may be transmitted at the same instant over the one wire to the receiving signal-station without interference with each other, while at the same time, if a break or cross occurs at any part of the main line, the signal may still be instantly transmitted to the receiving-station without repairing the line.

The importance and utility of the combination of the auxiliary branch circuit with the main line will, therefore, be obvious, as it insures perfect security against the spread of a fire before an alarm could be given at the receiving-station.

Letters U, V, W, and X are representations of additional auxiliary circuits, branching from the auxiliary line R, which may connect with heat-circuit closers, as shown at Y and Z, for fire-alarms; or with the circuit-closers a^2 and b^2 attached to doors or windows, for burglar-alarms; or with circuit-closer keys c^2, d^2, e^2, and f^2, in different rooms, for signal-calls.

In case of fire, the circuits W and X, when closed, may connect with the operating-magnet g^2 of an indicator, h^2, and with the auxiliary branch i^2, for operating a train of wheels, (as is more fully described in certain other inventions made by me, and now on file in the Patent Office,) so that an armature, j^2, will be released to let the train of wheels rotate, and by means of a dial-plate and pointer, k^2, indicate the room on fire. At the same time the circuit will be transferred to an auxiliary branch, l^2, screw-post m^2, thence to a spring, n^2, signal-circuit-closer wheel, p^2, of the train of wheels of the transmitting apparatus, spring circuit-breaker o^2, wire q^2, magnet S, and thence by the wire t^2 to the ground T, and thence through the ground Q of the auxiliary branch N, to complete the circuit with the station C, thus dispensing with the use of local batteries in the building.

In the auxiliary ground-branch t^2 may be used a local-alarm-operating magnet, v^2, and coil w^2, of equal resistance, for dividing and maintaining the circuit, so that both the local alarm and the signal at the station C may be given at the same instant. A similar indicator, x^2, may be used in a similar manner for burglar-alarms when either of the circuits *u* or V may be closed, and the transfer auxiliary branch y^2 from the indicator x^2 carried through the screw-post z^2, spring circuit-closer a^3, to the revolving circuit-closer wheel p^2, so as to convey a burglar-alarm signal differing from the fire-alarm signal, and thus indicate the cause of the signal.

It will be obvious that any suitable local alarm and indicator may be used to accomplish the objects described.

The circuit breaker and closer springs n^2 and a^3 are secured to an insulator, b^3, and separated from each other, as shown in Fig. 7, Sheet 5. Letters c^3, d^3, e^3, f^3, and g^3, Figs. 1, 2, and 8, represent the axles or spindles of the train of wheels of the transmitting apparatus. On the axle g^3, Fig. 8, is secured a fly, h^3, for regulating the speed of the train of wheels; and on the axle e^3 is secured a signal-circuit breaker and closer wheel, p^2, which is insulated therefrom by a hub, i^3, Figs. 1 and 7, and is in electric connection with the auxiliary branch circuit R.

The signal-circuit-closer wheel p^2 may be arranged on the different instruments with such a number of breaks and such spaces between them as may correspond with the signal-number desired to be transmitted. In this instance, to illustrate its operations to signal a given number—to wit, No. 4, at the station C—four insulating-breaks, j^3, k^3, l^3, and m^3, are used, Fig. 3.

It will be observed that when the circuit-

closer wheel p^2 is revolved the circuit will be open longer on j^3, Fig. 7, (when the circuit is completed through the circuit-closer spring n^2,) than it will be when the circuit is completed through the circuit-closer spring a^3. In either case the corresponding movements of the armature of the magnet O at the station C may be made to announce the cause of the signal by bringing into operation, in a well-known manner, any suitable printing, sounding, or indicating telegraph instrument; and, by connecting a local alarm circuit with the armature of the magnet O. a continuous alarm may be given at the station C, should an accidental ground occur on the line G, and it will be continuous until it is removed; thereby, by the special character of the alarm, as distinguished from the slower intermittent number-signals, becoming an automatic detective of any defect in the proper working condition of the line.

The magnet S is secured to the lower part of the frame B of the transmitting apparatus, and n^3 is its armature, secured to the lower end of the lever o^3, working or vibrating on an axis, p^3, Fig. 8. To the upper end of the lever a detent, q^3, is formed, to hold the fly h^3 from rotating when there is no current through the magnet, and is held in that position by a spiral spring, r^3. s^3 is an arm projecting from one side of the lever o^3, upon which rests one end of a stop-lever, t^3, Figs. 3 and 4. This stop-lever is secured to the frame B by a center-pin, U^3, so as to have a free up-and-down vibratory motion; and its object is to automatically stop the train of wheels and revolving circuit-closer wheel p^2 always in the same position, that the circuit breaker and closer springs n^2 and a^3 may rest upon the metallic surfaces of the wheel p^2, as shown in Figs. 3 and 7. This is effected by means of a cam, v^3, or other equivalent device attached to the side of p^2, (or its axis,) as shown in Figs. 3 and 4, which, as the wheel rotates, depresses the inner end of the stop-lever t^3, whereby the catch at its outer end is raised from the arm s^3. When the armature n^3 is attracted by the magnet S, or the lower arm of the lever o^3 is otherwise forced inward, the arm s^3 will be withdrawn from the detent-notch in the outer end of the stop-lever t^3. When thus released the spiral spring x^3, attached to the lower side of the lever, will pull it down, so that the catch at its outer end will again hold the arm s^3 and detent q^3, and the train of wheels will be released, and the cam v^3 will revolve in the direction of the arrow, as shown in Fig. 4; but when the cam reaches the position shown in Fig. 3 it will depress the inner end of the stop-lever t^3 and cause its opposite or outer end to release again the arm s^3. If at this point there is no current through the magnet S the armature will be released, and the train will be stopped by the detent-lever q^3, with the circuit-closer springs n and a^3 resting upon the metallic surface y^3 of the circuit-closer wheel p^2 in the position it first had, as shown, Figs. 3 and 7; but if, in this position of the parts, there is still a current through the magnet S the armature n^3 will not be released, and the circuit-closer wheel p^2 will continue to revolve until the circuit-closer which started the train has been opened, thus repeating at each revolution of the wheel at the station C the signal corresponding with the insulating-breaks thereon. a^4 is a switch, working on a center pin or screw, b^4, secured into the base A of the transmitting apparatus, and connects with the auxiliary branch R of the main line G. This switch is held in position by pins c^4, but when pressed down may be turned on the button d^4, connecting by a wire with the circuit-closer spring a^3, or on the button e^4, which connects with the circuit-closer spring n^2. By this means the circuit may be closed through either spring, as desired, to operate the instrument. f^4 is an insulating-band surrounding the clock-work main spring-barrel, having spaces g^4, Figs. 1 and 9, cut through it at equal distances apart from each other throughout its length, so that the circuit-closer springs h^4 and i^4 may make a metallic connection with the barrel as it revolves, but insulated therefrom when resting on the band, as shown in Figs. 1 and 7. j^4, Figs. 1 and 2, is a wire, which connects the circuit breaker and closer spring h^4 with the ground-wire T; and a wire, k^4, connects the circuit breaker and closer spring i^4 with the switch l^4, and the wire m^4 connects the button n^4 with the screw-post o^4.

When the switch l^4 is turned on the button n^4, and the circuit has been closed through either of the auxiliary branches, and the train of wheels of the transmitting apparatus released by the means above described, the mainspring-barrel, with its insulating-band f^4, will revolve until the ends of the circuit-breaker springs h^4 and i^4 press upon the metallic surface of the barrel through the opening g^4 in the band. When this has been effected the train will instantly be stopped, as the circuit will then be completed through the path of least resistance, which will be through the auxiliary branch R, wire m^4, switch l^4, wire k^4, springs i^4 and h^4, wire j^4, and then directly in the direction of the arrow to the screw-post p^4, and to the ground T, thus automatically cutting out the magnet S and releasing the armature n^3, and stopping the train at the proper point by means of the stop-lever t^3, as previously explained. The running down of the train would cause a greater number of revolutions of the circuit-breaker wheel p^2 than would be required for signaling purposes; but by the means described only a definite series of signals will be automatically transmitted at one time, and the number may be governed by the distance between the open spaces g^4 in the insulating-band f^4. After the train has been stopped, as described, and the signals answered, the attendant may cause the springs h^4 and i^4 to rest on the insulating-band, as shown in Fig. 7, by causing a single revolution of the circuit-closer wheel p^2. For the purpose of showing when the train is run down, a spur, q^4, is at-

tached to the edge of the insulating-band f^4, which at each revolution will revolve a toothed wheel, r^4, one degree, which will be registered on a dial, s^4, on the external face of the clock-work side frame or plate B by a pointer, t^4, on the axis of the toothed wheel, thereby registering the number of revolutions of the main-spring-barrel, and when its power is exhausted, or so nearly so as to require winding up again, to have the apparatus in perfect working order. The key u^4, Figs. 1 and 2, connects with the auxiliary branch R, and when pressed on the button v^4 the circuit will be closed through the ground T, and messages may be transmitted to the receiving signal-station C, which will then be received by means of the magnet O of the auxiliary branch N, and without interfering with the operation of the magnet E—that is to say, both the closed circuit and the auxiliary branch circuits and magnets connected therewith may be used at the same instant without interfering with each other. The magnet w^4, with its armature-lever x^4 of the circuit G, is secured to the frame B of the transmitting apparatus. The lever x^4 works on an axis, y^4, and the spiral spring z^4 and stop a^5 regulate its movements. The stationary circuit-breaker b^5, Figs. 6 and 2, is secured to and insulated from the frame B. It has insulating-breaks in its face corresponding with those of the revolving circuit-closer wheel p^2, so as to signal the same number by means of electric connections through a revolving spring-arm, c^5, secured to the shaft or spindle e^3 by means of an insulating-hub, d^5. The spring e^5, Fig. 7, connects with the metallic portion of the circuit-breaker b^5, and the spring f^5 connects with the revolving arm c^5. Now, when the switch J is turned in the direction of the arrow off the button K, Figs. 1 and 2, the circuit will then be completed from the button I through the spring or key g^5, wire h^5, coils of magnet w^4, wire i^5, spring e^5, stationary circuit-breaker b^5, revolving spring-arm c^5, spring f^5, wire j^5, screw-post M, and thence to the receiving signal-station C. Now, it will be obvious that if the circuit G is in use the armature x^4 will operate at intervals; but if not in use any desired message may be transmitted to the signal-receiving station C over the circuit G by means of the key k^5, which will operate the spring-key g^5 and the magnet E at the station C, and thus, by the movements of its armature, bring into operation any of the well-known telegraphic instruments.

The armature of the magnet E may also be used to close a local-alarm circuit to notify the attendant, by ringing an alarm, when a break occurs in the line G. Now, if it be desired to transmit a signal, the turning of the switch or actuator J of the transmitting instrument in the direction of the arrow far enough, will push in the lower end of the lever o^3, the arm attached thereto, s^3, will be held back by the catch in the outer end of the stop-lever t^3, when the train of wheels will be released and the spring-arm c^5 will revolve around the stationary circuit-breaker wheel b^5 and the magnet E of the closed circuit G, and instruments which may be connected therewith at the signal-station C will sound or print the signal corresponding with the breaks on the stationary circuit-breaker b^5. If at any point the line be accidentally grounded, as shown at t^5, Fig. 2, the ground-alarm will be given at the station C, that the ground may be removed. The switch J, when released, will be forced back by the spring m^5, (Figs. 1 and 2,) and the train will be stopped by the stop-lever t^3, as has been previously described. Now, if the switch L, Fig. 1, be turned on the button n^5, as shown in dotted outlines, the circuit will be completed through the wires o^5 and i^5, circuit-breaker b^5 and connections, as described. If the auxiliary circuit R be now closed, by turning the switch a^4 on the button d^4 or e^4, or if the circuit be closed through either of the branches l^2 or y^2, Fig. 2, by the circuit-closers Y, Z, a^2, b^2, c^2, d^2, e^2, or f^2, connected with these branches, the armature n^3 of the magnet s will be attracted, and the train will be released, and a double signal will be transmitted to the station C, operating the armature of each instrument located there, as has been described. Again, if the circuit G be broken, as at point p^5, it would simply be divided into two open circuits, both connected with the auxiliary branch N and ground Q at the station C, and then, if either of the branches l^2 or y^2, or the auxiliary circuit R be closed, as has been described, there will still be a signal transmitted to the station C by means of the revolving circuit-breaker wheel p^2, and the signal will be received through the magnet O of the permanent auxiliary branch N at the station C, without any attention to the line, and without repairing the break in the line; or, if a cross should occur, as shown at q^5, on the main line G, so as to cut out the circuit-breaker b^5, and the auxiliary branches are operated, as has been described, the signal will still be given by means of the magnet O the instant the circuit is closed.

It will thus be evident that even when the closed circuit G is in use by another operator, if the switch L is turned in the position as shown in the drawing, Fig. 1, so that the circuit will not be completed through the stationary circuit-breaker b^5, and either of the auxiliary branches V or U or R, be closed by either heat or burglar detecters, as shown at Y Z, or a^2 b^2, or by turning the switch a^4 on either of the buttons d^4 or e^4, as described, the signal will still be transmitted by means of the revolving circuit-closer wheel p^2, and will be received at the signal-receiving station C through the auxiliary branch N, without interfering with the working of the circuit G. In all cases the signal through the auxiliary branches will be given, and will not be interfered with by operating the main circuit G. This is apparant from the fact that whenever the circuit is completed from any point of the

auxiliary branch R through the ground T, the circuit must be completed to the ground Q and through the branch N at the station C. The battery P generates the current which operates the magnet O and its armature. This armature will not be effected by opening and closing the circuit G. It will only be operated when the auxiliary branches are closed or broken, as described. The circuit will then be completed through the ground Q, and from branch N to the branch R over the circuit G, through the portion of least resistance when the circuit G is closed.

When circuit G is broken, as at p^5, and thus divided into two open circuits, as described, the only path for the current to branch R will be to the right of N. If, with the break p^5, the auxiliary branch r^5 in building 3, Fig. 2, should be closed through the ground s^5, the only path for the current would be to the left of N, and both magnets O and E will operate their respective armatures in unison, as both batteries in this instance are in the circuit.

As a further explanation of the operations of my improved system of automatically signaling fire and burglar alarms, if the revolving circuit-breaker p^2 is stopped with the circuit-breaker spring a^3 resting upon an insulating-space, as j^3, of said wheel, Fig. 3, and in this position the auxiliary branch R is permanently connected with the spring a^3 by securing the switch a^4 to the button d^4, or otherwise, and with the revolving circuit-breaker spring c^5 resting on the metallic portion of the stationary circuit-breaker wheel b^5, then by starting the train of wheels with the actuator J, by pushing in the armature n^3, both magnets O and E will operate at the station C, if the circuit G is closed; but if it is broken or short-circuited, or both, then a signal will be given on the instrument of the auxiliary branch magnet O, for, as has been previously described, when the revolving circuit-breaker wheel p^2 revolves, and there is a circuit to spring a^3, there must be alternate circuits through the ground T. Now, with the circuit-breaker spring n^2 adjusted so as to be in metallic contact, as at y^3, Fig. 7, of the revolving circuit-breaker wheel p^2, the signal may be transmitted either automatically by means of heat-detecter instruments, or by means of the switch J, regardless of the condition of the line. t^5, Figs. 1 and 2, is a metallic hub, secured to and insulated from the axis e^3, having an insulating-space u^5 across its face. This hub connects with the auxiliary branch R by means of the wire v^5 and spring w^5, in contact with the metallic surface of the hub, and with the revolving circuit-breaker wheel p^2 by means of the wire x^5 and spring y^5, resting upon the insulating-space u^5 of the hub. Now it will be seen that the starting of the train by the actuator J, or otherwise, without operating any of the circuit-closers, (as has been previously described,) will instantly transmit the signal, for immediately the train is started the hub t^5 will be revolved, both springs w^5 and y^5 will then be upon the metallic surface of the hub, and the circuit from the auxiliary branch R will be completed alternately through the signal-circuit-breaker wheel p^2 and its connections through the ground T to the signal-station C. The signal will be transmitted during the revolution of the hub t^5, upon whichever axis or spindle of the train of wheels it may be secured, and until the circuit is broken, when the insulating-space u^5 is again brought under the point of the spring y^5. The object of this arrangement is to give a detective-signal when the train of clock-wheels is tampered with, also to be used to transmit a regular signal through the auxiliary branches by starting the train of wheels.

It will be evident that the form of construction of the transmitter and its circuit-breaker and connections, and the manner of operating the same, may be varied in numerous ways so as to carry out equally well my invention of transmitting signals by means of signaling instruments, in connection with open earth branches and a metallic circuit, having a permanent auxiliary earth-battery and receiving instruments connected therewith.

Having now described my improvements, I will proceed to set forth what I claim and desire to secure by Letters Patent of the United States.

1. In combination with a main line, a branch, R, or series of branches, heat or burglar detecters z and a^2, train of wheels, circuit-breaker p^2, magnet s, armature n^3, grounds T and Q, battery P, magnet O, forming a single circuit, by means whereof the number on the circuit-breaker p^2 will be signaled at the station C, substantially in the manner as hereinbefore described.

2. In combination with a main line, a branch, R, or series of branches, heat or burglar detecters z and a^2, train of wheels, circuit-breaker p^2, magnet s, armature n^3, grounds T and Q^1, battery P, magnet O, and indicator instrument h^2, either with or without an alarm instrument, v^2, and resistance-coil w^2, substantially as described, and for the purposes set forth.

3. In a fire-alarm telegraph, in combination with a main metallic circuit, G, having a receiving-magnet, E, a permanent auxiliary earth-branch, N, with its receiving-magnet O, battery P, and ground Q, one or more normally open auxiliary earth-branches, R, and suitable circuit-breakers p^2 and b^5, in connection with the earth and metallic circuits, so that, when operated, a signal will be transmitted either over the earth or metallic circuit to the receiving-magnet O or E, or to both at the same time.

4. In combination with the main metallic circuit G, the permanent earth-branch N, with its receiving-magnet O, battery P, and ground Q, and one or more open auxiliary earth-branches, R, heat or burglar detecters z or a^2, circuit-breaker p^2, magnet S, and ground T,

forming by this means an open and closed circuit through the main and auxiliary branches, whereby a signal will be transmitted to the receiving-station C, whether the circuit G be broken or closed, all arranged to operate substantially as hereinbefore described.

5. For transmitting a signal through the closed circuit of the main line G to the station C, substantially as described, the combination of the actuating-magnet S, armature n^3, detent-lever q^3, fly h^3, circuit-breaker b^5, and auxiliary branch R, with the circuit-closers in connection therewith, to operate substantially as set forth.

6. The combination, with the main metallic circuit G, and auxiliary branch R, the circuit-breaker p^2, actuating-magnet s, armature n^3, detent-lever q^3, fly h^3, circuit-breaker b^5, and circuit-closers in connection therewith, whereby a double signal, each independent from the other, will be transmitted to the station C, and will be received by the magnets O and E, when the line G is clear, but will insure the receiving of the signal on the magnet O when the line G is either broken or short-circuited, as described.

7. For completing the circuit of the auxiliary branch R through the circuit-breaker p^2, the adjustable switch a^4 with either of the two circuit-breaker springs n^2 or a^3, buttons d^4 or e^4, and an auxiliary branch, R, of the main line G, substantially as described, whereby either of the different signals or calls, as represented by the long or short breaks j^3 and k^3 of the circuit-breaker p^2, may be transmitted to the station C, as set forth.

8. The combination of a motor or train of wheels, stop-lever t^3, catch or detent lever arm s^3, and a releasing lever or cam, v^3, operated by a shaft e^3 of the train, as described, for always stopping a shaft or circuit-breaker in the same position, at any designated point.

9. The combination of a motor or train of wheels, an actuating-magnet, s, armature, n^3, detent-lever arm s^3, stop-lever t^3, and releasing lever or cam v^3, for automatically starting a train and stopping a shaft or circuit-breaker at a designated point, by closing and opening the circuit.

10. The combination of a stop-lever, t^3, detent-lever s^3, releasing lever or cam, v^3, with a motor or train of wheels, actuating-magnet s, armature n^3, with either of the circuit-breakers p^2 or b^5, or both, with either of the electrical connections for operating the same, as and for the purposes described.

11. The combination of the lever o^3, detent-lever arm s^3, stop-lever t^3, releasing-lever cam v^3, with the motor or train of wheels, circuit-breaker b^5 of closed circuit G, and its connections, for transmitting a signal to the station C by their operating the magnet E, as and for the purposes described.

12. The combination of the revolving metallic hub t^5, circuit-breaker p^2, motor or train of wheels, armature n^3, actuating-magnet s, or their equivalent, with an electric circuit and line connections, for automatically transmitting a detective-signal whenever the train is set in motion, whether the line G be broken or short-circuited, as described.

13. For transmitting to a receiving-station a definite series of signals, the combination of a revolving circuit breaker and closer band, f^4, springs h^4 and i^4, wires j^4 and k^4, and an auxiliary branch, R, of the main circuit G, or their equivalents, constructed to operate as set forth.

14. For indicating the working condition of the train of wheels, the combination of the spur q^4, toothed wheel r^4, dial s^4, and pointer t^4, arranged and operating as described.

15. For transmitting to the receiving-station the same signal-number by two different notations or degrees of sound, the combination of a circuit-breaker, p^2, having an L-shaped or long and short breaks or insulating-spaces j^3 and k^3, across its face, with the spring circuit-breakers n^2 and a^3, and open auxiliary branches R, electrically connected with the main line and with n^2 and a^3, and with the receiving apparatus at the station c, whereby a fire or burglar alarm will be distinguished by the long break j^3 and circuit through n^2, while a detective-signal or other telegraphic call will be distinguished by the short break k^3, and circuit through a^3, or vice versa, all constructed to operate substantially as hereinbefore set forth.

16. For transmitting two simultaneous and independent signals to a receiving signal-station, for fire or burglar alarm, or other telegraphic purposes, a system of electric circuits composed of a main metallic circuit, G, auxiliary branch or branches R, arranged and operating as hereinbefore set forth, in combination with a transmitting apparatus composed of an actuating-magnet, s, train of wheels, and system of keys, switches, circuit-breakers, and wires, arranged as described, whereby a new and improved system of signaling fire and burglar alarms is effected.

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Witnesses:
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