

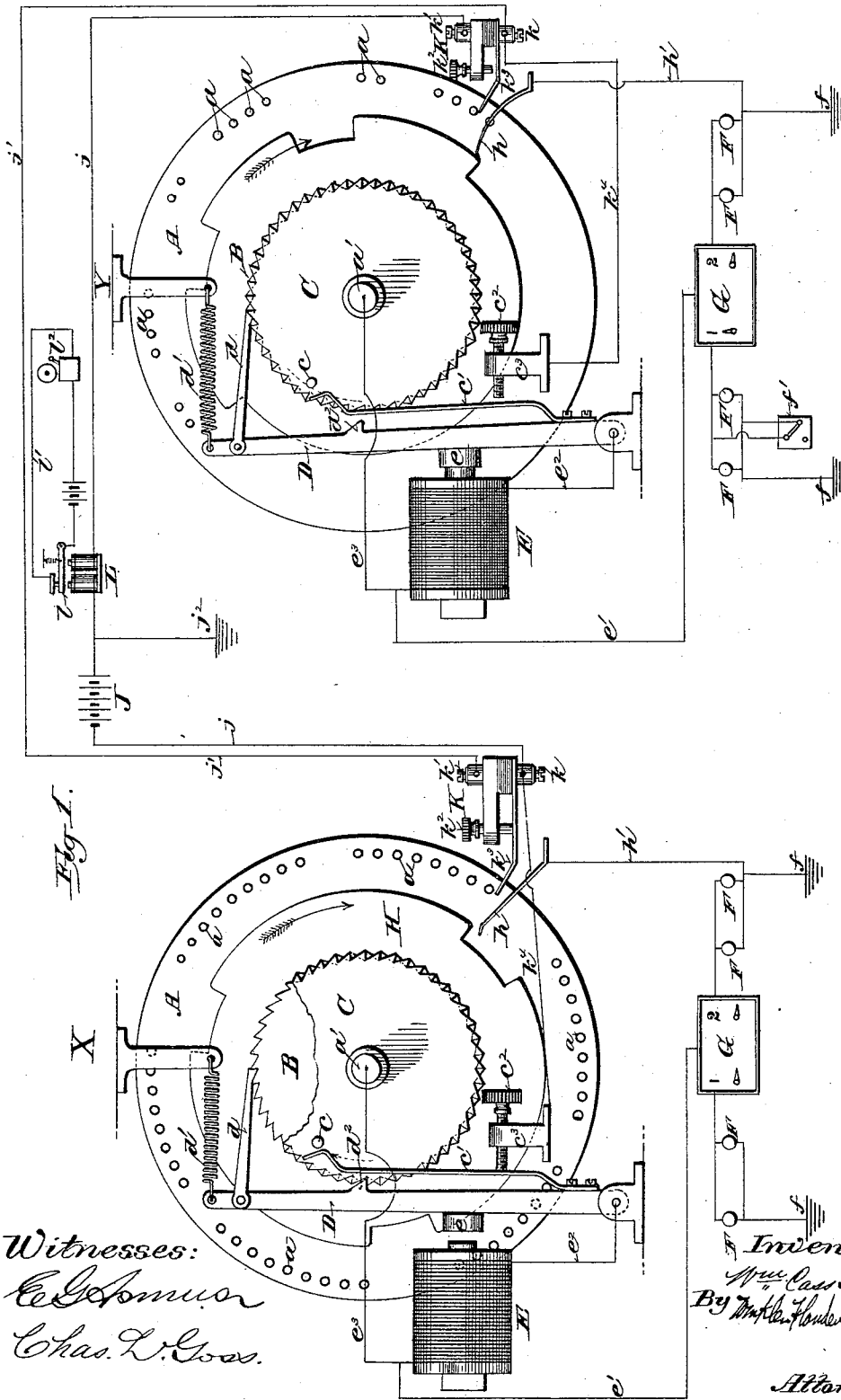
(No Model.)

2 Sheets—Sheet 1.

W. C. SHAFFER.
FIRE ALARM APPARATUS.

No. 461,371.

Patented Oct. 13, 1891.



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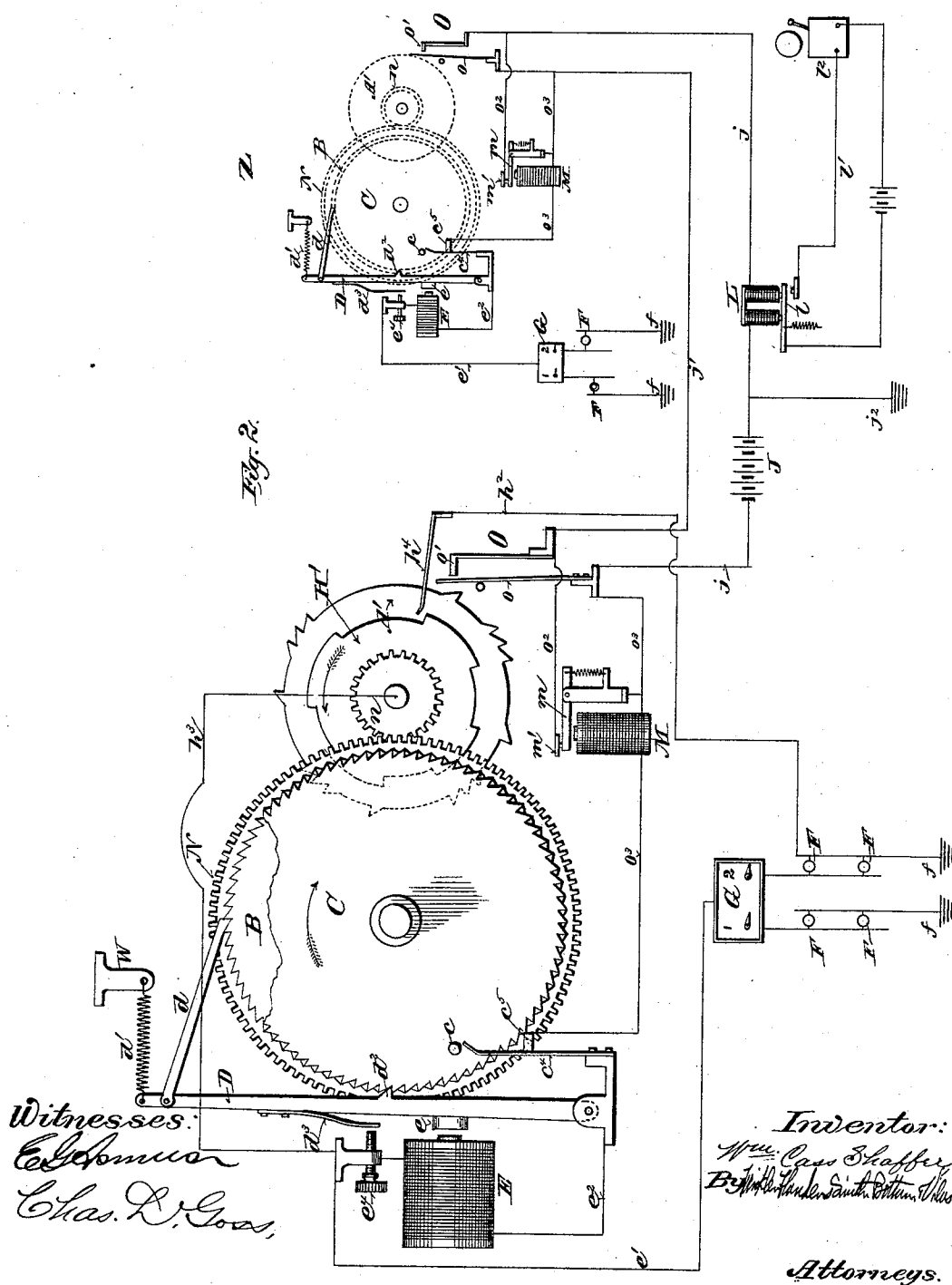
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UNITED STATES PATENT OFFICE.

WILLIAM CASS SHAFFER, OF MILWAUKEE, WISCONSIN.

FIRE-ALARM APPARATUS.

SPECIFICATION forming part of Letters Patent No. 461,371, dated October 13, 1891.

Application filed December 14, 1888. Serial No. 293,639. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CASS SHAFFER, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Automatic Fire-Alarm Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The objects of my invention are in an automatic fire-alarm apparatus to operate the break-wheels by an electric current, to operate a number of break-wheels constituting a connected system by a single battery, to actuate the break-wheel by a regular constant power, to automatically ground the wire and close the circuit, operating any one of the break-wheels while it sends in a complete signal, &c.

In the accompanying drawings like letters designate the same parts in both figures.

Figure 1 represents, partly in diagram, a view of my improved apparatus, and Fig. 2 is a like view of a modified form and arrangement of the apparatus.

Referring to Fig. 1, $j j'$ represents a normally-closed circuit; J, the main central battery connected therewith, and L a relay-magnet placed in said circuit, and l its armature arranged to close a circuit j' , operated by an independent battery, and work a gong or other suitable alarm h . Between the battery J and magnet L a ground connection j^2 is made. The main battery and alarm are located in some convenient central station, and with the main circuit $j j'$ are connected any desired number of automatic signaling devices X Y, arranged to be operated by the central battery J. Each signaling device consists of a circuit-breaker K, with which the wires $j j'$ of the main circuit are connected, a break-wheel A and actuating mechanism operated by an electro-magnet E, the windings of which are connected with the circuit-breaker and by a wire e' with a circuit-closing thermostat or through an annunciator G with a number of such thermostats F F, located at various points in the same or different buildings and

grounded on one side, as at $f f$. Each circuit-breaker K is composed of two insulated terminals or binding-posts $k k'$, to which the wires $j j'$, leading to the battery J on the one hand and to the magnet L on the other hand, are attached, a contact-point or screw k^2 in connection with the binding-post k' , and a metallic spring k^3 in connection with the binding-post k and resting normally against the screw k^2 . Each break-wheel A is provided with a circular series of pins grouped in numbers to designate the station to which it belongs and arranged to engage the spring k^3 of the circuit-breaker and intermittingly move the same out of contact with the screw k^2 . Two ratchet-wheels B and C, with teeth inclined in opposite directions, are mounted on each break-wheel shaft a' . A vibrating lever D, provided with a pawl d , working with the ratchet-wheel B, and a tooth or projection d^2 , working with the ratchet-wheel C to prevent the passage of more than one tooth to each vibration of said lever, is fulcrumed at one end to a suitable insulated support and is connected at the other end with a fixed support by a spring d' of sufficient strength to actuate the break-wheel A. To this lever is attached the armature e of the magnet E and a spring c' , which bears normally when said lever is at rest constantly against a contact-screw c^2 , connected through its insulated support c^3 by a wire k^4 with the binding-post k of the circuit-breaker. A wire e^2 connects the magnet E with the lever. The ratchet-wheel C is provided with a pin c , which engages the free end of spring c' and forces the same out of contact with the screw c^2 at the end of each complete revolution of the break-wheel, thereby breaking the circuit by which the actuating-magnet E is energized and arresting the further movement of the break-wheel.

To reset the device in readiness to send in another alarm, the pin c is moved out of engagement with said spring c' by turning the break-wheel and the associated ratchet-wheels B C into the position in which they are shown at the left of Fig. 1 in the device designated X.

I may provide the apparatus with switches, as f' , by which the circuit may be manually closed through the magnet E of either signal-

ing device and an alarm sent in independently of the thermostats F F. To insure the completion of a single signal by a break-wheel A, whenever the same is started by a momentary closing of the circuit through the magnet E, I provide a device by which a ground connection through said magnet will be made when the break-wheel is turned slightly and will be maintained when once made till a complete signal has been sent in. This device consists of a disk H, secured on the break-wheel shaft a' and having notches or breaks in its periphery adjacent to and corresponding with the spaces between the groups of pins $a a$. It has an insulated connection e^3 with the windings of the magnet E, and a spring h , having a ground connection h' , bears on the periphery of said disk H between the breaks therein and maintains a closed circuit through said magnet, while one group of pins $a a$ passes the spring h^3 , whether a closed circuit is maintained through a thermostat or not. When this device is employed, I may dispense with the stop-pin c , in which case the break-wheel will continue to rotate as long as connection is maintained through the thermostat, the circuit through the spring h being broken while it passes the breaks in the periphery of the disk H.

The foregoing apparatus operates as follows: Suppose, for example, a ground connection to be made through one of the thermostats F in connection with the device at station Y. The current will then pass from the main battery J to the left through the wire j , through the circuit-breaker K of station X, through wires $j' k^4$, screw c^2 , lever D, wire e^2 , through the windings of magnet E, thence through wire e' and the closed thermostat to the ground. The magnet E thus energized attracts its armature, swings lever D to the left, temporarily breaks the circuit between the spring c' and screw c^2 , and strains the spring d' , which recoil when the current is broken, swings lever D to the right, and by means of pawl d turns the ratchet-wheel B one tooth and the break-wheel A correspondingly. In this manner, so long as the circuit is closed through the thermostat, the lever D is rapidly vibrated, thereby turning the break-wheel A in the direction indicated by the arrow. As the pins $a a$ engage and pass the spring h^3 , the circuit through magnet L is intermittently broken between said spring and the screw h^2 , the circuit l' correspondingly closed, and a signal given by the alarm l^2 , corresponding to the number of pins $a a$ in each group, being in this case 42. As the break-wheel A completes a revolution, the pin c engages the spring c' and breaks the circuit through magnet E and arrests the further movement of the signaling mechanism, which requires to be reset by hand before it will be again set in motion by the closing of the thermostat. As the several groups of pins $a a$ pass the spring h^3 of the circuit-breaker K, the disk H engages the

spring h and establishes an independent ground connection through the windings of the actuating-magnet E and insures the sending in of a complete signal. The relay-magnet I is made long, so as not to be affected by the temporary interruptions of its exciting current, due to the rapid vibrations of the lever D.

Referring to Fig. 2, illustrating a modification of the apparatus in which the break-wheels are geared up so as to make a number of revolutions to each revolution of the ratchet-wheels and in which the operation of any signaling device automatically cuts out those of the stations beyond it, W and Z represent signaling devices at different stations connected with the main normally-closed circuit $j j'$, and arranged to be operated by a single central battery J. The wires $j j'$ of the main circuit are connected with the parts $o o'$ of circuit-breakers O O of the several signaling devices. A' A' are break-wheels provided on their peripheries with teeth arranged in groups corresponding with the numbers of the stations to which they severally belong. Upon the break-wheel shafts are mounted pinions $n n$, which mesh with and are driven by the larger gears N N on the ratchet-wheel shafts. Two ratchet-wheels, like those hereinbefore described, are fixed side by side upon the same shaft and are arranged to be intermittently rotated by the vibration of the lever D. The levers D, like those previously described, are swung in one direction by the action of electro-magnets E and in the reverse direction by springs d' . The windings of the magnets E are connected through wires e' with thermostats having ground connections, in the manner previously described, and by wires e^2 with springs c^4 , which normally bear against contact-pieces c^5 , connected by wires o^3 with the main circuit. To the levers D are attached springs d^3 , which, when said levers are drawn toward the magnets E, bear against screws e^4 , connected with the wires e' , and temporarily shunt the current passing through the wires e' through the levers D around the magnets E. The said magnets, being thus demagnetized, permit the levers D to be swung away from them by the recoil of the springs d' . The wires o^3 are connected with the coils of electro-magnets M M, the spring-actuated armatures of which rest normally against the contact-pieces m' , connected by wires o^2 with the main circuit.

The modified form of my apparatus shown in Fig. 2 operates as follows: Suppose, for example, a ground connection to be made through one of the thermostats at station W. The current will pass through wire e' , magnet E, thence through wire e^2 , spring c^4 , wire o^3 , magnet M, thence through the wire j of the main circuit to the battery J, thence to the ground. The magnet E, energized by the passage of the current through its windings, attracts its armature e , swings the lever D to the left, and carries the spring d^3 into contact

with the screw e^4 , and thereby diverts the current from and demagnetizes said magnet. The spring d' then moves lever D to the right, turns the ratchet-wheel B one tooth, and directs the current again through magnet E. In this way the lever D is rapidly vibrated and the gear N intermittingly turned. The current, passing through the magnet M, energizes the same and attracts the armature m , moving it away from the contact-piece m' . The circuit through magnet L is thereby opened as soon as the signaling mechanism is started. The gear N, meshing with the pinion n , turns the break-wheel A', the teeth of which, passing the spring o , move the same against the contact-piece o' of the circuit-breaker and temporarily close the circuit through the magnet L, by which the alarm is given. In this arrangement of the apparatus the alarm is given by first opening a normally-closed circuit and then temporarily closing the same by means of the break-wheel. While the signaling mechanism at station W is in operation the other stations beyond or farther from the battery will be cut out of the main circuit by the magnet M, thereby avoiding the confusion which would arise from the simultaneous operation of the signaling mechanism of two or more stations. It will be observed that the circuit by which the break-wheel is operated passes alternately through the magnet E and lever D as the latter vibrates, but is continuous through the wire o^3 and magnet M. I employ with this modified arrangement of my apparatus a device like that previously described for maintaining a ground connection with magnets E independently of the thermostats by which the initial movement of the signaling mechanism is produced. This device consists of a disk H', fixed on the break-wheel shaft and having raised portions of its periphery corresponding with and adjacent to the groups of teeth on the break-wheel and notches or breaks between said raised portions corresponding with the spaces between said groups of teeth; a spring h^4 , connected by a wire h^2 with the ground and arranged to bear against the raised portions of disk H' when the latter is rotated, and a wire connecting said disk with the ground-terminal of the windings of magnet E. The signaling mechanism may be arranged, if preferred, to be operated in open circuit.

55 I claim—

1. In automatic electric signaling apparatus, the combination of a main circuit supplied with current from a single source or battery which has a ground connection on one side, a branch circuit having a ground connection and a connection with the main circuit which supplies it with current, said branch being provided with suitable circuit-controlling devices, and signal-transmitting mechanism comprising a break-wheel, a contact-piece by which the circuit is alternately broken and closed when the break-wheel is

turned, an electro-magnet having its windings in said branch, and mechanism connecting the armature of said magnet with the break-wheel and arranged to actuate the same, substantially as and for the purposes set forth.

2. In automatic electric signaling apparatus, the combination of a main circuit supplied with current from a single source or battery and grounded on one side of said battery, a number of signaling devices located at different points in said circuit and each comprising a break-wheel, an electro-magnet the armature of which is connected with and arranged to operate said break-wheel by suitable mechanism, and a branch circuit connected with the main circuit and having a ground connection and a suitable circuit-controlling device or devices, independent ground connections for each of said magnets, and switches operated by the signal-transmitting mechanism to close the circuit through said independent ground connections and the windings of the magnets associated therewith, substantially as and for the purposes set forth.

3. In automatic electric signaling apparatus, the combination of a main circuit supplied with current from a single source or battery and having a ground connection on one side of the battery, one or more branch circuits connected at one end with said main circuit, from which it is supplied with current, and having a ground connection, signal-transmitting mechanism in connection with each branch circuit, comprising a break-wheel, a contact-piece for opening and closing the main circuit when the break-wheel is turned, and an electro-magnet having its windings in the branch circuit and its armature connected with and arranged to operate said break-wheel, and a circuit-breaker arranged to be operated by the signal-transmitting mechanism and arrest the break-wheel at a certain point in its movement, substantially as and for the purposes set forth.

4. In automatic electric signaling apparatus, the combination of a break-wheel, a contact-piece working therewith to alternately open and close the circuit, a ratchet-wheel connected with the break-wheel, a spring-actuated pawl engaging with said ratchet-wheel, and an electro-magnet, the armature of which is connected with said pawl, so as to strain the spring when the magnet is energized, said spring acting in the opposite direction through the pawl to turn the break-wheel, substantially as and for the purposes set forth.

5. In automatic electric signaling apparatus, the combination of a main circuit supplied with current from a single source or battery and having a ground connection on one side of the battery, signal-transmitting mechanism comprising a break-wheel, a contact-piece working therewith to open and close the circuit for the transmission of predetermined signals, an electro-magnet, the

armature of which is connected with and arranged to turn said break-wheel through suitable mechanism, the windings of said magnet being in a branch connected with the main circuit and with the ground, circuit-controlling devices, such as thermostats, in said branch, a wheel movable with the break-wheel and having electrical contact-surfaces corresponding with the groups of teeth on the break-wheel, and a fixed contact-piece working with said wheel and having a ground connection, whereby the circuit is maintained through the actuating-magnet while a group of teeth on the break-wheel passes the contact-piece, with which they work to break and close the circuit, substantially as and for the purposes set forth.

6. In automatic electric signaling apparatus, the combination of a break-wheel, a contact-piece working therewith to open and close the circuit, an electro-magnet, the armature of which is connected with and arranged to turn said break-wheel through suitable mechanism, a spring acting on said armature in opposition to the magnet, a shunt around the windings of said magnet, and a contact-piece movable synchronously with the vibrating armature and operating to switch the current alternately through the windings of the mag-

net and said shunt, substantially as and for the purposes set forth.

7. In automatic electric signaling apparatus, the combination of a main circuit supplied with current from a single source or battery, a number of branch circuits connected therewith and provided with circuit-controlling devices, and signal-transmitting mechanism, the signal-transmitting mechanism comprising a break-wheel, a contact-piece working therewith to open and close the main circuit for the transmission of a predetermined signal, and an electro-magnet in the associated branch circuit, having a vibrating armature connected with and arranged to turn said break-wheel through suitable mechanism, a switch in the main circuit, and an associated magnet in each branch circuit arranged to operate said switch to cut out from the main line the signal-transmitting mechanism of stations beyond, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM CASS SHAFFER.

Witnesses:

E. H. BOTTUM,
F. C. WINKLER.