(No Model.) 2 Sheets—Sheet 1.

# H. E. JACOBS.

## ELECTRIC FIRE ALARM SYSTEM.

No. 466,306. Patented Dec. 29, 1891.

Fig. 2.

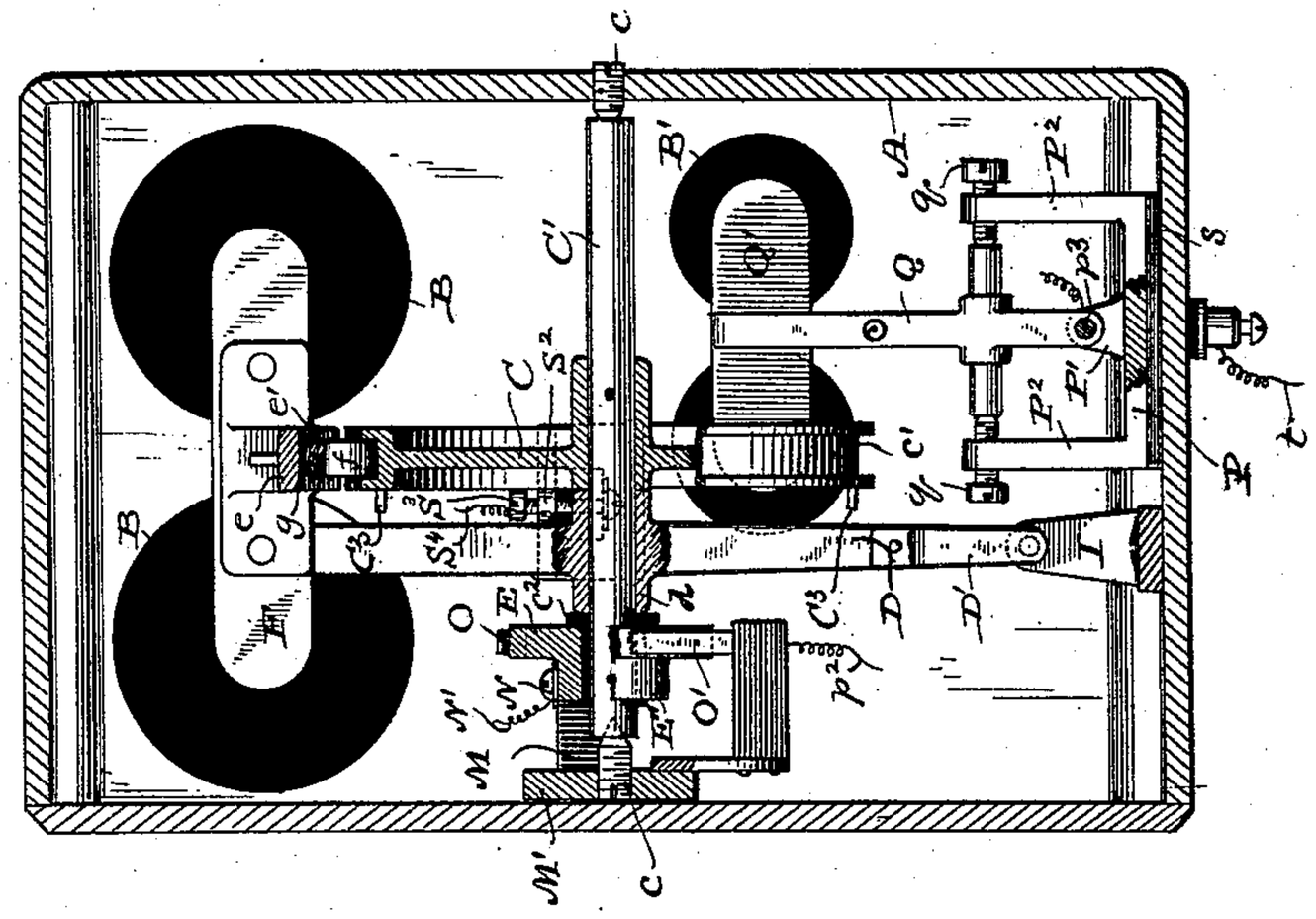
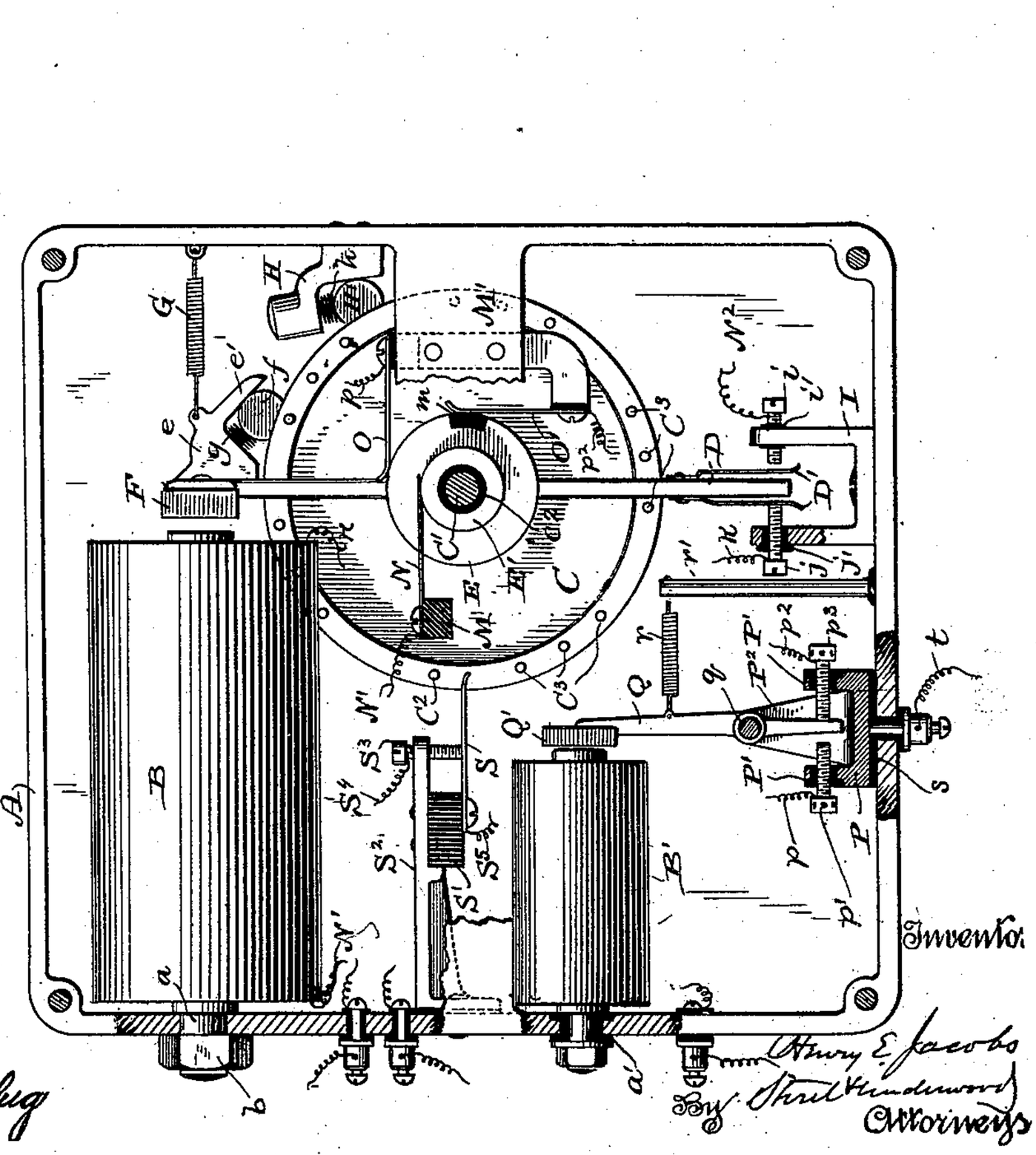


Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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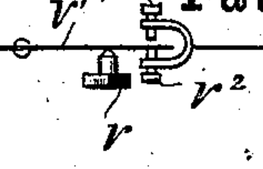


Fig. 3.

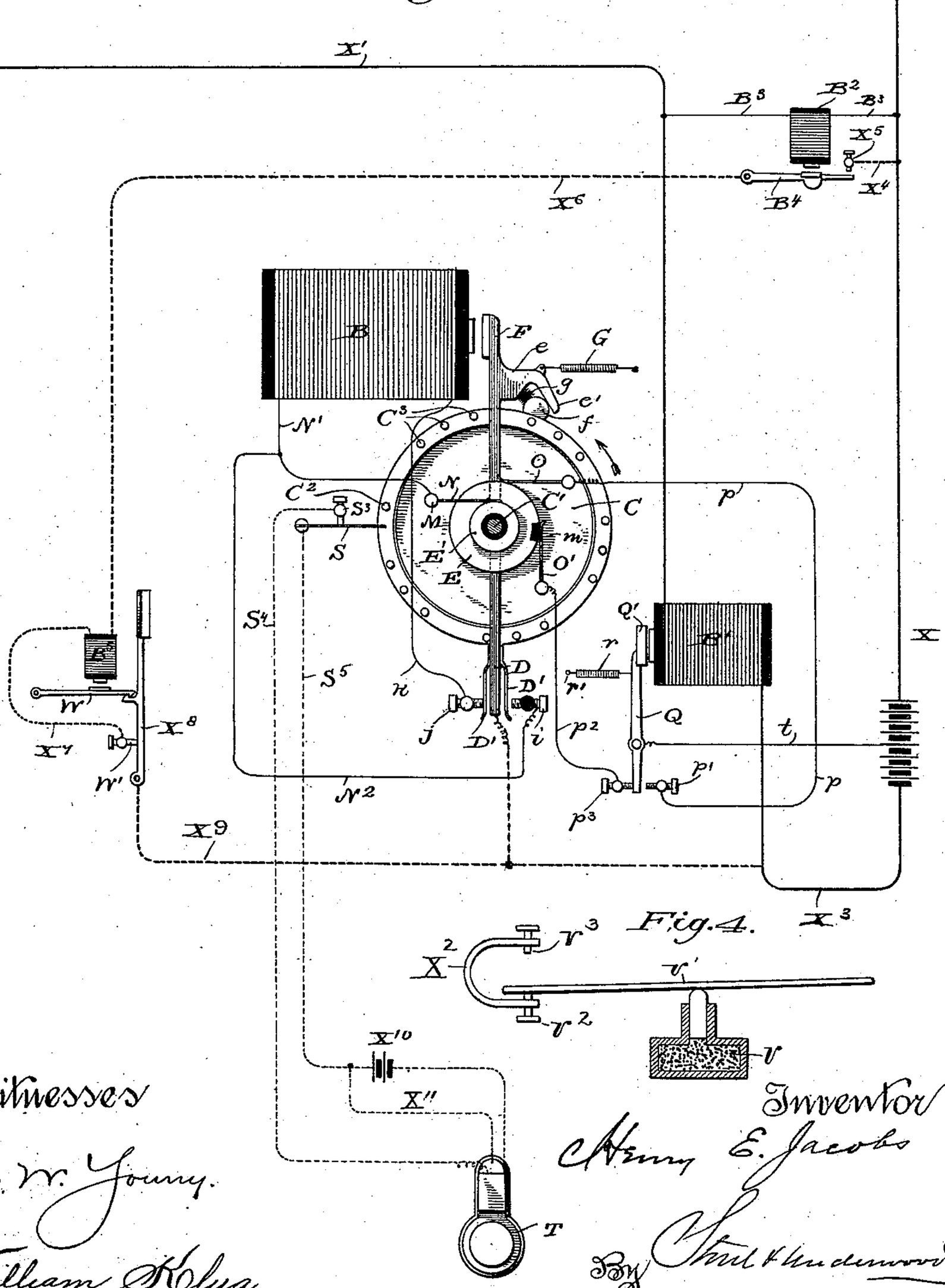


Fig. 4.




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# UNITED STATES PATENT OFFICE.

HENRY E. JACOBS, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO FRANK G. BIGELOW, MOSES H. BRAND, AND GEORGE KNOWLES, JR.

## ELECTRIC FIRE-ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 466,306, dated December 29, 1891.

Application filed March 23, 1889. Serial No. 304,512. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY E. JACOBS, of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Electric Fire-Alarm Systems; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to electric fire-alarm systems, and will be fully described hereinafter.

In the drawings, Figure 1 is a vertical section through the center of the box containing the mechanism of my alarm system. Fig. 2 is a transverse section thereof, and Fig. 3 is a diagram of my system. Fig. 4 is an enlarged detail view of the thermostat.

A is a metal box.

B is an electro-magnet consisting of two spools, each of which is connected to the box by its stem *a* and a nut *b*.

C is a wheel, the axle C′ of which is supported at each end by a cone-bearing *c*, and to this axle the wheel C is keyed or feathered. This axle also carries a lever D, the boss *d* of which fits loosely on it between the wheel C and an insulated collar E, which the axle also carries. The periphery of wheel C is grooved, as at *c*′, and the lever D, which carries an armature F on its upper end, also carries a kind of cap *e* on its face opposite the armature, which cap overhangs the wheel C and has a finger *e*′, that, like the periphery of the wheel C, is grooved, and the two confine a friction-disk *f* between them, while a spring *g* is confined between the inner portion of the cap and inner face of the disk *f*, which spring gives the disk *f* a constant tendency to wedge between the cap *e* and wheel C when the armature F is being drawn to the magnet B, and permits the cap to yield when being drawn away from the magnet by a spring G, one end of which is hooked to the cap and the other to the box. Another cap H is secured to the box, and this cap confines another disk H′ in the groove *c*′ of wheel C at such an angle that a forward revolution of the wheel C will not be impeded by the disk H′; but a backward movement of said wheel will wedge this disk between the cap H and wheel C and prevent it from revolving in that direction; and to further insure this action of the disk H′ a spring *h* is interposed between the overhanging portion of the cap H and the disk, which spring when at rest will normally wedge the disk between the nearly vertical portion of cap H and the periphery of wheel C, and thus securely lock the wheel against backward movement. The lever D has a pair of contact-springs D′ secured to its lower end, and these springs depend between the arms of a bracket I. One of these arms carries a contact-screw *i*, while the other carries a contact-screw *j*, which latter is insulated at *j*′ from the bracket-arm, through which it passes, and a wire *k* leads from it to the electro-magnet B. The collar E, which is of metal and is insulated from the axle C, as shown at $c^2$, has a hub E′ on one of its faces, and on its periphery the collar proper has an insulating-plug *m* embedded in it.

M is an arm of insulating material that projects from a bracket M′, that is suitably secured to one side of the box or casing, as shown in Fig. 2, and from this arm a brush N projects onto the hub E′, and this brush is connected with magnet B by a wire N′.

O and O′ are other brushes that are supported by bracket M′, from which they are insulated in such positions that at one period in the revolution of wheel C and collar E the brush O′ will rest on insulation *m*′ and brush O will rest upon the metal surface, and when brush O is upon an insulation the brush O′ will be upon metal. The brush O is connected by a wire *p* with a contact-post *p*′, and the brush O′ is likewise connected by a wire $p^2$ with a post $p^3$. These posts are insulated in opposite arms P′ P′ of a bracket P, and this bracket has other arms $P^2$, through which pass pivot-screws *q q* of a lever Q, the upper end of which carries an armature Q′ of a magnet B′, which is secured to the box-like magnet B, but is insulated from the box, as shown at *a*′, Fig. 1. The lower portion of the lever Q depends between the contact-posts *p*′ and $p^3$, and a spring *r*, one end of which is connected to the upper end of lever Q and the other to a post *r*′, serves to draw the armature Q′ away from the magnet when it is de-energized. The bracket P is insulated from the box, as shown at *s*, and is connected by a fine wire *t* with the battery

X, which wire may lead from any part of bracket P. The wheel C has a series of pins $C^2$ $C^3$ $C^3$ $C^3$ projecting from its face and parallel to its axis, which pins are grouped differently on the wheel of each box, and these pins are for engagement with a brush S, one end of which is connected by an insulating-block S′ with a bracket $S^2$, the free end of which bracket carries a contact-screw $S^3$, that is in normal contact with brush S and connects it by a wire $S^4$ with a signal-box T, which latter is also connected with brush S by a wire $S^5$, through battery $X^{10}$, and this connection is broken by the contact of the pins $C^2$ $C^3$ during the revolution of the wheel C to operate an alarm in box T.

V in the diagram represents a thermostat of any desired construction, that shown in the drawings, more particularly in Fig. 4, comprising a chamber filled with expansible material, and a plunger or piston fitted within an opening in said chamber and resting upon said expansible material in such a manner as to be moved outwardly by the expansion of said material. V′ is a contact-spring, which is operated by the thermostat, $V^2$ the normal contact-post, and $V^3$ the post that the spring V′ is thrown into contact with by the thermostat when a fire occurs. These are in circuit with magnet B′ and battery X, through wires X′ $X^2$ $X^3$. They are also circuited to a small electro-magnet $B^2$ by a fine wire $B^3$, and when this magnet is energized its armature $B^4$ is thrown into circuit with the battery X, through wires $X^2$ $X^4$, contact-point $X^5$, wire $X^6$, magnet $B^5$, wire $X^7$, drop $X^8$, and wires $X^9$ $X^3$.

The operation of my device is as follows: Upon an excessive rise in the temperature within the room in which the thermostat is located, such as would cause the thermostat to lift the spring V′, so as to break the circuit traversing the wires X′ and $X^2$, or upon a break occurring at any other point in said circuit between the junctions of the wire $B^3$ therewith, the loop within which the thermostat is located will be cut out and the current will then pass through electro-magnet B′, as before, along wire X′ to the junction of wire $B^3$ therewith, thence along wire $B^3$ through magnet $B^2$, which is of comparatively high resistance, to wire X, and thence along wire X to the battery. This places the high-resistance magnet $B^2$ in series with magnet B′, thereby lessening the flow of current through said magnet B′, and consequently lessening the power of said magnet sufficiently to permit the spring $W^2$ to draw the armature Q′ away from the core of said magnet B′ and thus vibrating the lever Q, so as to break the contact between the lower end of said lever and the post $p^3$ and establishing a contact between the lower end of said lever and the post $p'$. Before this movement takes place current is free to pass along wire $t$ from the battery to lever Q, thence through post $p$ and wire $p^2$ to brush O′, which at this time rests upon the insulating section or plug $m$ on the collar E, where it stops. When the above-described movement of the lever Q takes place, current passes from the battery along wire $t$, as before, to lever Q, thence through post $p'$ and wire $p$ to the brush O, which rests upon the metallic portion of the collar E, thence through said collar E, brush N, post M, and wire N′ to magnet B, through said magnet B and wire $k$ to the post $i$, and from said post $i$ through contact-spring D′, lever D, and wire $X^9$ back to the battery. The magnet B is thus energized, so as to cause its core to attract the armature F at the upper end of the lever D, thus causing said lever to vibrate, so as to break contact between the spring D′ and post $i$, and to establish a contact between the other spring D′ and post $i$. By this movement of lever D the circuit passing through magnet B is obviously broken and said magnet de-energized, the current now passing from wire N′ along wire $N^2$ to post $i$, and thence through spring D′, lever D, and wire $X^9$ back to the battery, as before described. As soon as the magnet B becomes de-energized the spring G draws the upper end of the lever D away from said magnet, breaking the contact between the post $i$ and the spring D′, and re-establishing the contact between the other spring D′ and the post $i$, thereby again causing current to pass through the magnet B, energizing said magnet and causing the armature F to be again attracted thereby. This operation is very rapidly repeated, the magnet B operating alternately with the spring G to vibrate said lever D. The vibration of said lever D, by means of the engagement of the disk $f$ with said lever and with the periphery of the wheel C, will operate to rotate said wheel so as to bring the pin $C^2$ into engagement with the contact-spring S, thereby breaking contact between said spring and the post $S^3$, and so breaking the circuit which normally traverses the wires $S^4$ and $S^5$ and causing the current to pass from the battery $X^{10}$ through wire $X^{11}$ and the signaling device T, and thence back to the battery $X^{10}$, thus ringing the signal T once. By the continued movement of the wheel C the pins $C^3$ $C^3$ $C^3$ are successively brought into engagement with the spring S, so as to cause three more successive breaks in the circuit operating the signal T and ringing said signal T three times in quick succession. By this time the wheel C will have revolved so as to bring the insulating-section $m$ beneath the brush O, and current will then be cut out from magnet B and the lever D will cease to operate. When the break first occurs in the loop within which the thermostat is located, the high-resistance magnet $B^2$, being energized, will attract the armature $B^4$ so as to form a contact between post $X^5$ and the extremity of said armature, thus permitting current to flow from wire X along wire $X^4$, post $X^5$, armature $B^4$, wire $X^6$, through magnet $B^5$, wire $X^7$, post W′, the pivoted arm $X^8$, and

wire $X^9$ back to the battery. This energizes the magnet $B^5$ and causes it to attract the armature W, so as to lift the extremity of said armature out of engagement with the arm $X^8$, thus permitting said arm to fall so as to operate the indicator. The fall of said arm $X^8$ obviously breaks the circuit traversing said parts at W', but does not affect the main circuits passing through the magnet B and magnets B' and $B^2$. The operation of the signal, as before described, indicates trouble of some kind, but not necessarily fire; but in case the trouble happens to be fire the thermostat will be operated by the further rise of the temperature, so as to raise the spring V' into contact with the contact-point $V^3$. This re-establishes the circuit through wires X' $X^2$, and the magnet $B^2$, being arranged in shunt with said circuit, will receive comparatively little current. All of the current passing over the main circuit will, however, pass through magnet B, thus increasing the energy of said magnet sufficiently to overcome the resistance of the spring *r*, so as to cause the armature Q' to move toward the core of said magnet. This movement of the armature Q' causes the arm Q to vibrate, so as to bring its lower end into contact with post $p^3$, when current will pass from the battery over wire *t* through lever Q, post *p*, wire $p^2$, and brush O, which now rests upon a metallic portion of the collar E, and thence passing through brush N, post M, wire N', magnet B, wire *k*, post *i*, spring D', and wire $X^9$ back to the battery, as before described. This again sets the lever D in operation and causes the wheel C to rotate, so as to bring the remaining pins located in groups about the periphery of the said wheel into engagement with the spring S, thus causing a number of successive breaks in the signal-operating circuit and thus causing a succession of operations of said signal. By the arrangement of parts shown in the drawings the signal would be operated so as to ring "three" four successive times during this last operation of the wheel C. The lever D continues to operate as described, so as to rotate the wheel C until said wheel has been revolved sufficiently to bring the insulating-section *m* beneath the brush O', when current will be again cut out from magnet B and the lever D and wheel C will again cease to operate, the parts being now in the relative positions shown in Fig. 3 of the drawings.

It will be observed by reference to the drawings, more particularly Fig. 3, that the electro-magnet B' is always in circuit with the battery, the magnets $B^2$ and $B^5$ being arranged in shunt with said magnet B', the high-resistance magnet $B^2$ being thrown into series with magnet B' only upon a break in the main circuit, as before described, and its function being to lessen the power of said magnet B' by the introduction of its resistance into circuit with said magnet B' and the consequent lessening of the quantity of current traversing said circuit, so as to permit the spring *r* to vibrate the lever Q into position to establish a circuit through the magnet B to cause the lever D and wheel C to operate as before described, so as to break the signal-operating circuit. Of course any desired arrangement of the pins about the periphery of the wheel C may be employed instead of the arrangement shown in the drawings, so as to produce any desired number of operations of the signal.

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

1. The combination, with an electric motor and contact-collar revolved thereby, the latter having a continuous and an intermittent contact-surface, of a brush bearing on the continuous contact-surface and wired to the motor-magnet, an electric circuit including a thermostat, a magnet and its armature, contact-posts between which one end of the armature depends, two brushes resting on the intermittent contact-surface of the motor-collar and wired each to one of the contact-posts last named, a wheel revolved by the motor, having horizontal pins projecting from it in series, and a brush normally in circuit with a signal-box, but projecting in the path of the pins aforesaid, substantially as described.

2. The combination, with a circuit including a motor for operating a signaling device, of a second circuit including a thermostat and a low-resistance magnet having movable armature adapted to shift the circuit which operates said motor, and a high-resistance magnet arranged in shunt with said thermostat and low-resistance magnet, substantially as and for the purposes described.

3. The combination, with a loop including a thermostat, of a shunt-wire and magnet connecting the branches of the loop between the thermostat and battery, a low-resistance magnet adjacent to the battery, an armature for the last-named magnet having a lever-extension that is adapted to vibrate between contact-posts, brushes wired to these posts, a motor operated by the current through the brushes, and a switch and signal operated by the motor, substantially as described.

4. The combination, with a thermostat and contact-spring controlled thereby, of contact-points spanning said spring and in circuit with a battery, an electric motor, a wheel operated by said motor and a make-and-break collar carried thereby, an electro-magnet in circuit with the battery and contact-spring, an armature-lever for said electro-magnet, contact-points between which the lower end of the armature vibrates, two brushes resting on the make-and-break collar, each of which is wired to one of the last-named contact-posts, and a wire connecting said armature-lever with the battery, substantially as described.

5. In a fire-alarm, the combination, with an electro-magnet, of a lever having an arma-

ture for said magnet on its upper end, a spring for retracting said armature when the magnet is de-energized, a shaft forming a fulcrum for said armature-lever, a wheel keyed to said shaft, a cap forming part of the armature-lever and a loose disk connecting said cap with the periphery of the wheel, a metal collar insulated from but carried by the shaft aforesaid and having insulations on its periphery as well as a solid metallic hub, a brush wired from the hub to the electro-magnet of the motor, springs arranged on the lower end of the armature, contact-posts, one on each side of the spring, one leading to the wire that connects the hub with motor-magnet and the other wired directly to the said magnet, two brushes resting on the collar and wired to separate contact-posts, a lever one end of which carries an armature while its other end depends between the last-named contact-posts, and an electro-magnet in circuit with a battery and thermostat, substantially as described.

6. The combination, with an electric signaling device, of a make-and-break contact device in circuit with said signaling device, a wheel provided with means for operating said make-and-break device to break the circuit through the signaling device, an electro-magnet in circuit with a battery and having a vibrating armature engaged with said wheel and adapted to rotate said wheel, one end of said vibrating armature being arranged to vibrate between contact-posts, one of which is in circuit with said magnet to make and break said circuit and a circuit including a thermostat, a low-resistance magnet provided with a vibrating armature adapted to shift the circuit passing through the first-mentioned magnet, and a high-resistance magnet and a visual signal or indicator arranged in shunt with low-resistance magnet and the thermostat, substantially as and for the purposes described.

7. The herein-described fire-alarm-signal apparatus, comprising an electric signaling device, a make-and-break contact device in circuit therewith, a motor for operating said make-and-break device and in circuit with a battery, a thermostat, and a low-resistance magnet also in circuit with a battery, a high-resistance magnet, and a visual signal in shunt with said thermostat and low-resistance magnet, substantially as and for the purposes described.

8. The combination, with an electric signaling device and a contact device in circuit therewith, of a motor arranged to engage with said contact device to cause the signaling device to operate, an independent circuit embracing a thermostat, a low-resistance magnet and a battery, and a high-resistance magnet and an indicator connected in shunt with said circuit, substantially as and for the purposes described.

9. In an electric fire-alarm system, an electric signal, a visual signal or indicator, a thermostat and low-resistance magnet in circuit with a battery, a high-resistance magnet in shunt with said circuit, and a motor for operating said signals, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

HENRY E. JACOBS.

Witnesses:
S. S. STOUT,
WILLIAM KLUG.