(No Model.) 4 Sheets—Sheet 1.

J. B. YEAKLE.

AUTOMATIC CIRCUIT BREAKER FOR BURGLAR ALARMS.

No. 332,130. Patented Dec. 8, 1885.

Fig. 1.

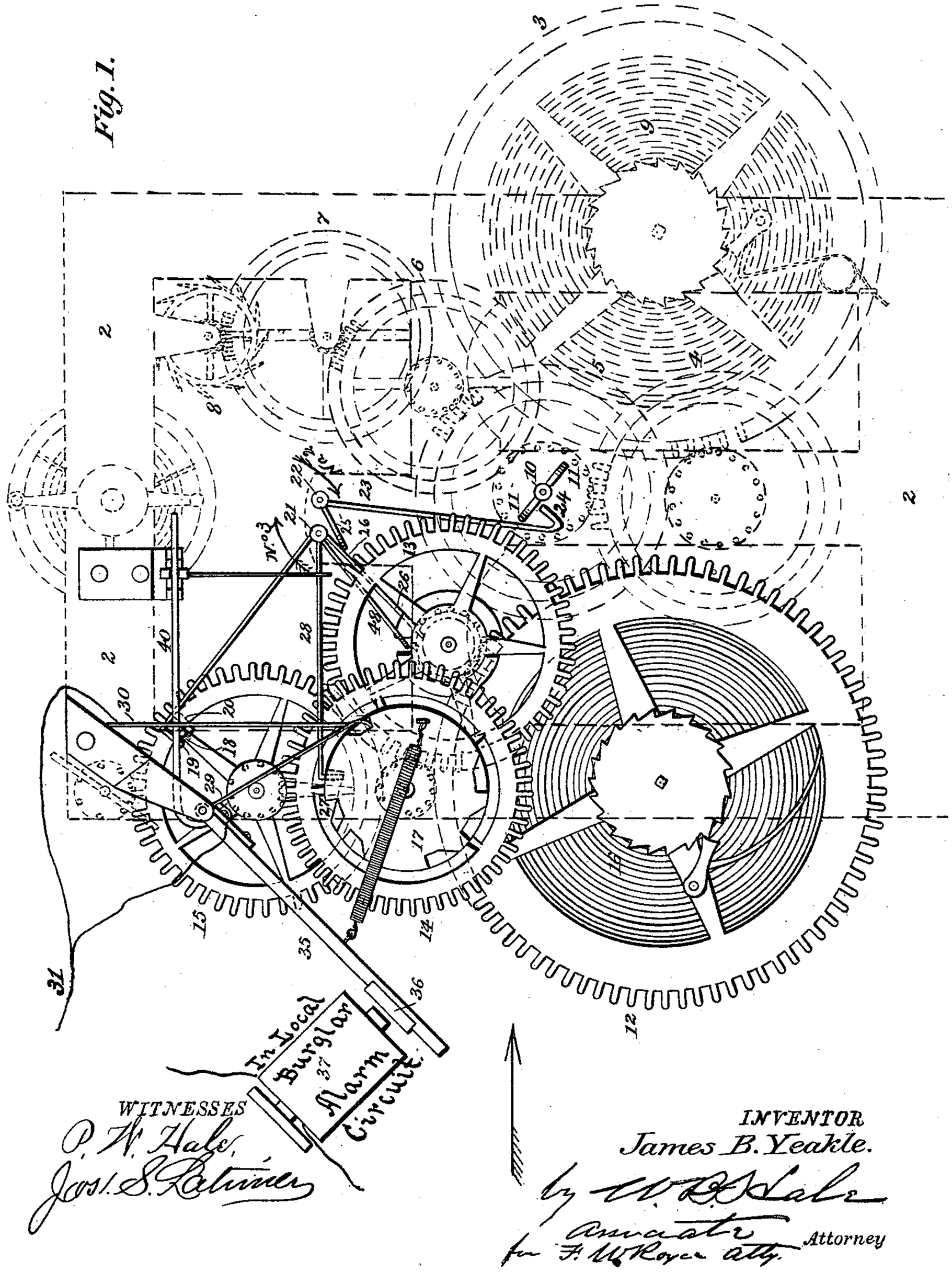

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Fig. 2.

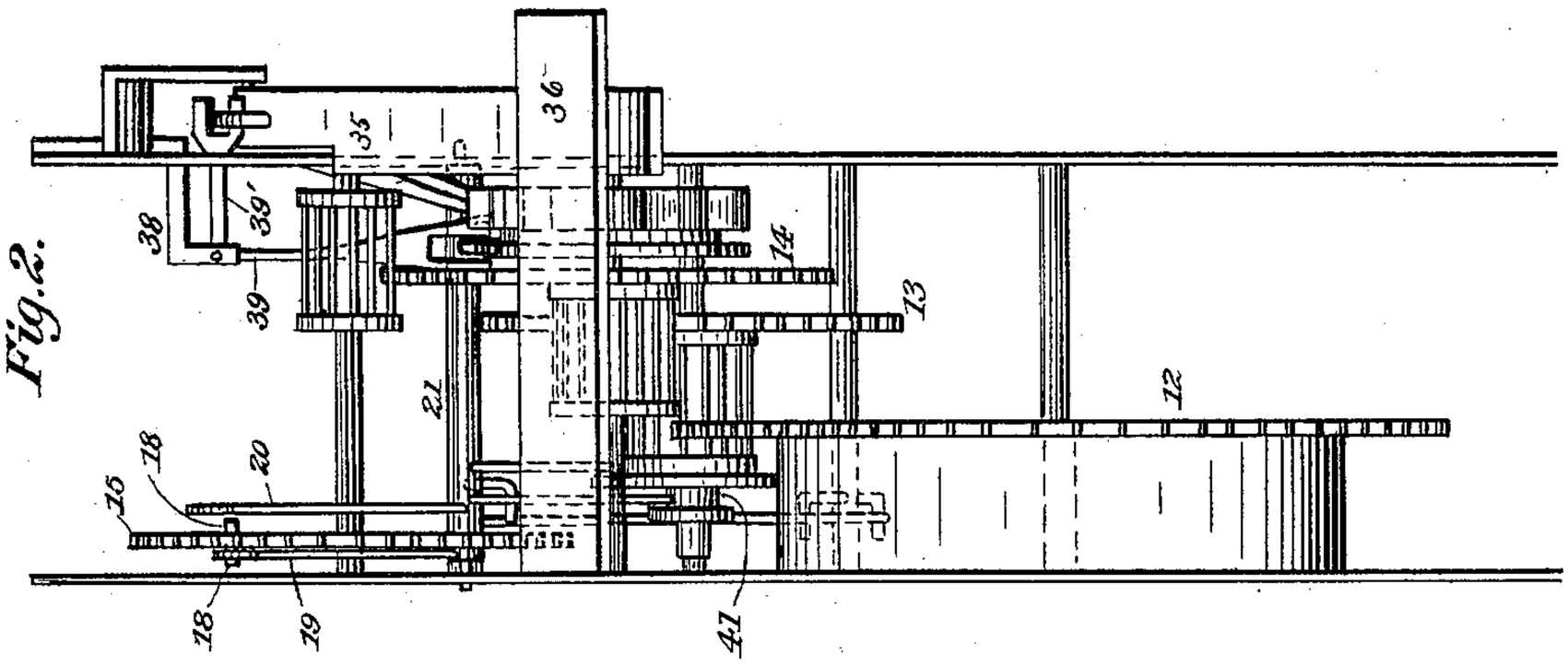
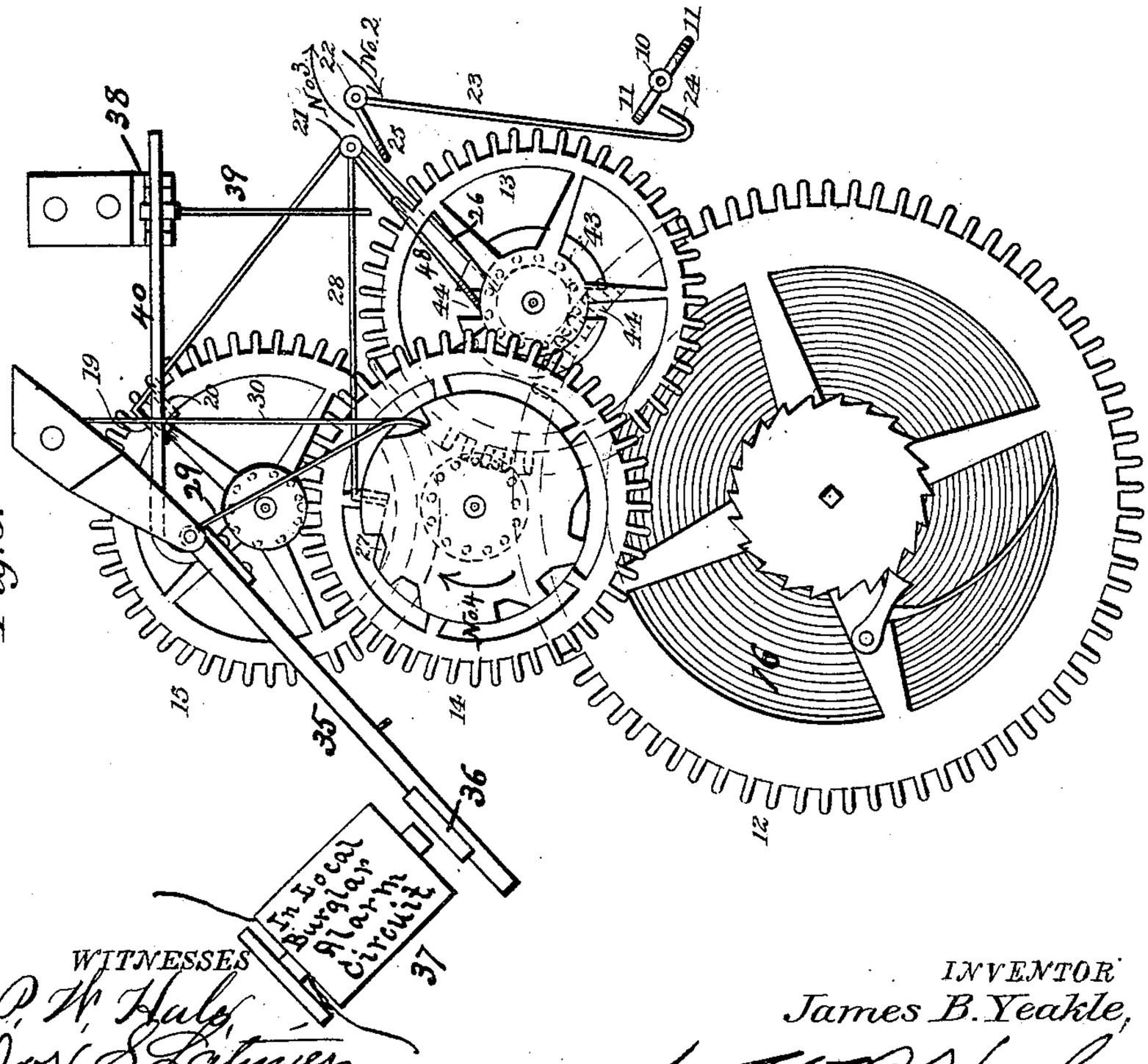


Fig. 3.



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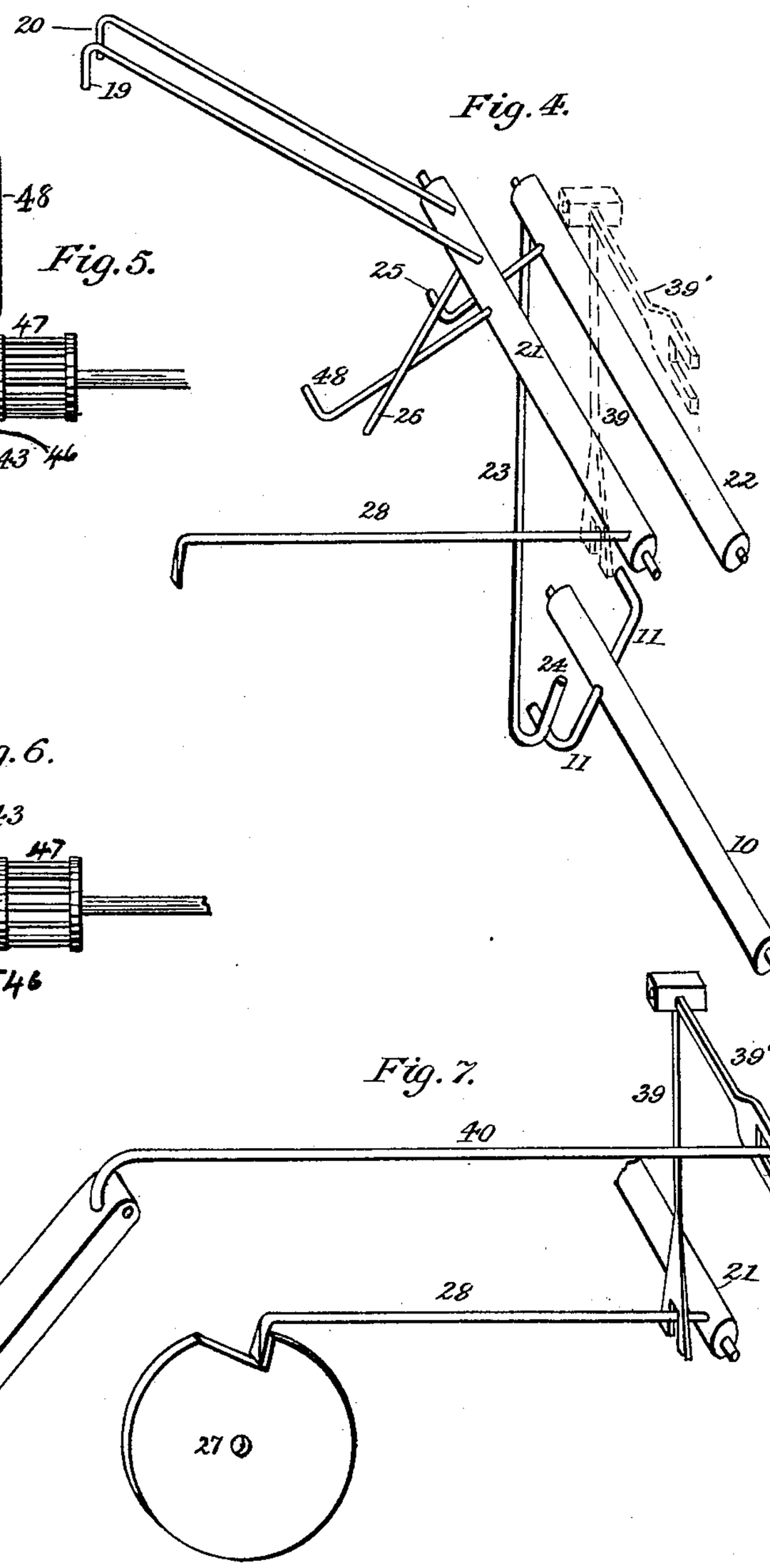

Fig. 4.

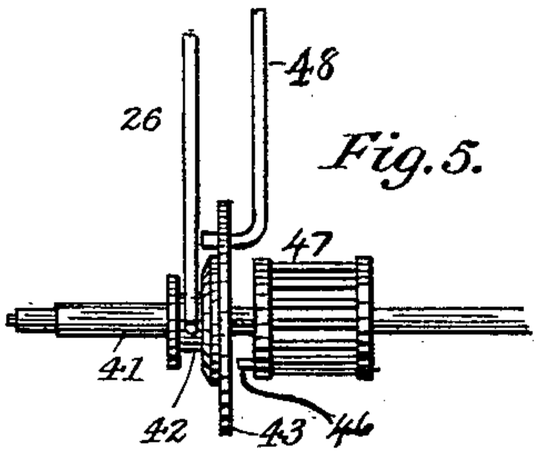

Fig. 5.

Fig. 6.

Fig. 7.

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(No Model.) 4 Sheets—Sheet 4.

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AUTOMATIC CIRCUIT BREAKER FOR BURGLAR ALARMS.

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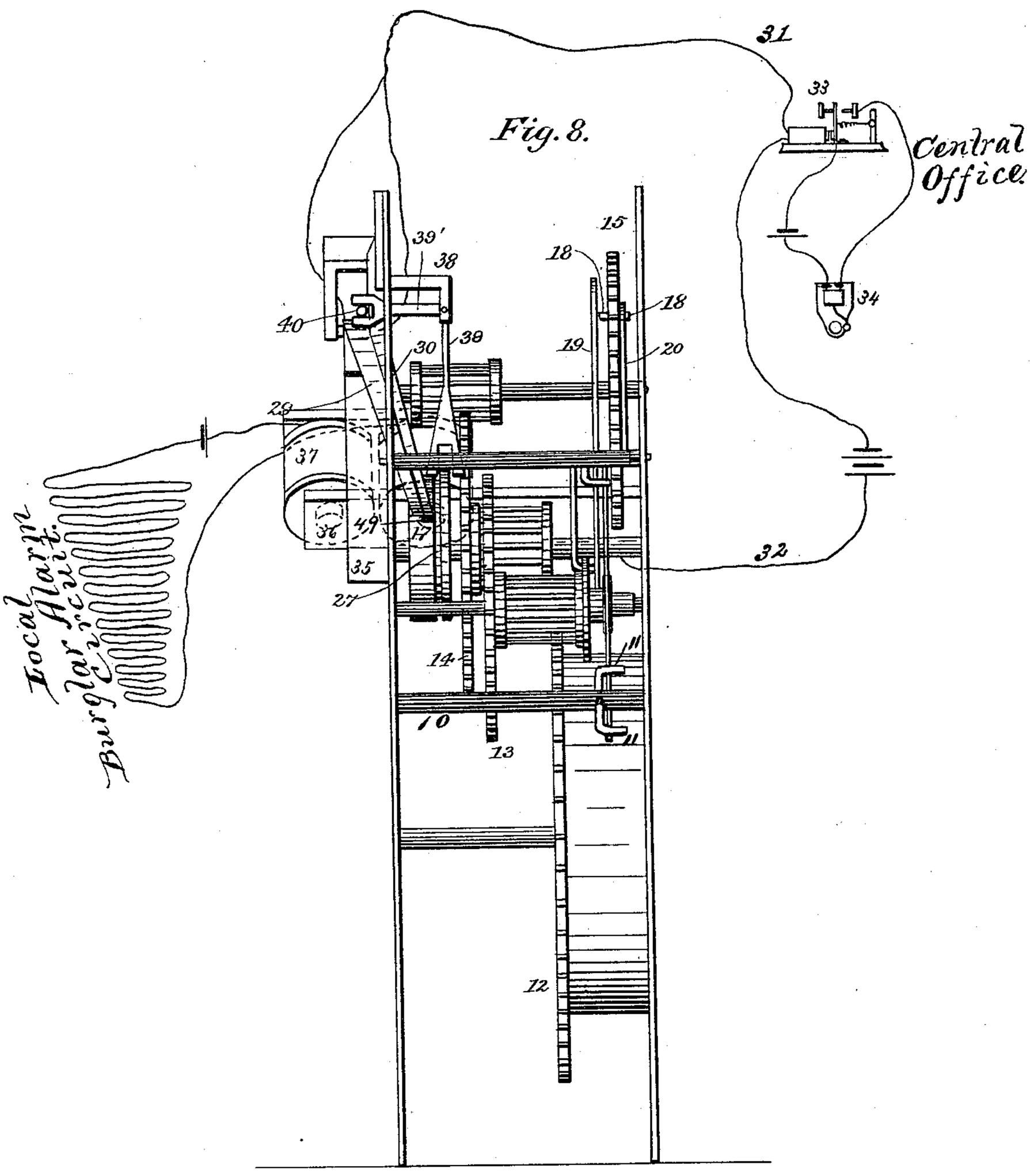
Fig. 8.



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UNITED STATES PATENT OFFICE.

JAMES B. YEAKLE, OF BALTIMORE, MARYLAND.

AUTOMATIC CIRCUIT-BREAKER FOR BURGLAR-ALARMS.

SPECIFICATION forming part of Letters Patent No. 332,130, dated December 8, 1885.

Application filed May 14, 1885. Serial No. 165,464. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. YEAKLE, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Automatic Circuit-Breakers for Burglar-Alarms, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electric burglar-alarms of the class in which one or more circuit-breaking devices at premises to be protected are in circuit with electric-alarm apparatus located at a distance.

The object of my improvement is to cause an alarm at a central office or other distant place whenever the premises guarded are burglariously invaded, and also to cause a signal to be given at stated intervals at the central office or other distant place, for the purpose of indicating that the alarm-circuit is intact.

The invention consists in certain novel constructions and combinations of devices, which will be readily understood from the following particular description, in connection with the accompanying drawings, and which will be definitely pointed out in the appended claims.

In the drawings, Figure 1 is a front elevation of an automatic circuit-breaking mechanism combined with an automatic tripping mechanism according to my invention, a portion of the devices being shown in dotted lines. Fig. 2 is an end view of the same from the direction indicated by the arrow No. 1 in Fig. 1. Fig. 3 is a diagram in detail of the circuit-breaking mechanism. Fig. 4 is a perspective detail view of the shifting-shaft and its arms and hooks. Fig. 5 is a view of the shifting lift-disk and a portion of its co-operative devices. Fig. 6 illustrates a modification of the same. Fig. 7 is a detail perspective view of the devices for operating the shifting-shaft. Fig. 8 is a diagram illustrating the circuits connected with the apparatus.

Referring to Fig. 1, the numeral 2 indicates a frame in which are mounted two systems of spring-driven gear-wheels similar to the time-train and striking-train of an ordinary striking-clock.

The devices corresponding to the time-train are mainly shown in dotted lines. Their use is simply to actuate a trip at predetermined intervals for starting into operation the train corresponding to the striking-train, and I prefer to use an actual regulated time mechanism, essentially such as shown in the drawings. The wheels of this time-train are indicated by the numerals 3 4 5 6 7 8, and as their construction and operation are well-known they need not be more particularly described. The motive spring 9 is connected up in the usual manner. The dial-wheels are omitted, as they are not essential. The wheel 5 I will call the "hour-wheel." It is fixed upon the shaft 10, and from this shaft two tripping-hooks, 11 11, project diametrically opposite each other. There might be three or four, or even more, of these hooks at equal distances apart around the shaft.

The wheels 12 13 14 15 (shown in full lines) are geared in train in the usual manner and driven by spring 16, the same as the striking-train of a clock; but, instead of operating a striking mechanism, they operate a circuit-breaking wheel, 17, which is fixed upon the shaft of wheel 14. I will refer to this train hereafter in this specification as the "circuit-breaker train." The wheel 15 has a pin, 18, passed through it near its periphery, so as to project on both sides, and to hold the circuit-breaker train from running. This pin will be engaged by one or the other of two detent-hooks, 19 or 20, as will presently be explained. These hooks 19 and 20 project from a shaft, 21, mounted transversely in the frame 2, and having elongated journals to permit the shaft to be shifted back and forth longitudinally. The hooks 19 and 20 are at such a distance apart that when one is in the plane of the path of the pin 18 on one side of the wheel 15 the other hook will be out of the plane of the path of said pin on the other side of said wheel. In other words, when one hook is engaged with the pin the other stands clear of it laterally.

Alongside of the shaft 21 is another shaft, 22, having an arm, 23, projecting downward and provided at its lower end with a hook, 24, which stands in the path of the tripping-hooks 11 11 on shaft 10. This shaft 22 has also a tripping-hook, 25, projecting forward at an angle to the arm 23, and lying directly under an arm, 26, which projects obliquely downward from the shifting-shaft 21. This

arm 26 has a further function, but for the present will be treated simply as receiving the action of the tripping-hook 25.

Upon the shaft of the wheel 14, behind the break-wheel 17, is permanently fixed a lift-disk, 27, having a single notch, in which engages a hook, 28, projecting from the shifting-shaft 21. It will now be seen that when the shaft 10 turns, as in the ordinary operation of a time mechanism, the tripping-hooks 11 11 will at intervals strike the hook 24 of the arm 23, and through said arm the shaft 22 will be partially turned in the direction of the arrow No. 2, so that the tripping-hook 25 will lift the arm 26, partially turning shaft 21 in direction of arrow No. 3, and raising the hooks 19 and 20, so that whichever hook is at the time engaged with the pin 18 will be disengaged therefrom, and the circuit-breaker train thus released and allowed to commence running. At the same time the hooks 19 and 20 are raised the hook 28 is also raised out of the notch in the lift-disk 27, and the notch is immediately carried away from under the hook. The tripping-hook 11 which has struck the hook 24 very soon escapes therefrom, and the arm 23, shaft 22, and trip-hook 25 return to their original position. The shaft 21, however, cannot return to its original position and allow the hooks 19 and 20 to fall so that one of them will catch the pin 18 immediately, because now the hook 28 rests on the periphery of the lift-disk 27, and this disk must make a complete revolution before its notch again comes under said hook 28 and permits it to fall so as to allow the shaft 21 to turn partially backward and carry down the hooks 19 and 20, so that one of them may engage with the pin 18, and thus arrest the circuit-breaker train. Therefore, every time one of the trip-hooks 11 trips the arm 23 the circuit-breaker train will be released and the break-wheel 17 will make one complete revolution. Upon the periphery of this break-wheel normally bear two spring-contact fingers, 29 and 30, which are connected with a wire, 31, forming part of the main alarm-circuit which goes to the distant station or central office. The other wire, 32, forming the other part of the circuit, is connected with the metallic shaft of the break-wheel, and leads also to the distant station or central office, and the two wires may be there connected to any suitable electrical alarm apparatus, so as to include the same in a metallic circuit in the usual manner.

In the diagram, Fig. 8, the central office is indicated by name, and at this point a relay, 33, is included in the main circuit. This relay is arranged to close on its backstroke a local circuit including an electric-bell, 34. It will now be obvious that every time the break-wheel 17 makes a complete revolution the bell at the central station will be rung a number of times and at intervals corresponding to the breaks of said break-wheel. One revolution of the break-wheel sends a complete signal from the place to be protected to the central office, and these complete signals are sent at intervals corresponding to the number of trip-hooks 11 on the hour-wheel shaft 10. There being two such hooks, as shown in the drawings, and the shaft making one revolution every hour, a signal will be sent every thirty minutes. If there were four such hooks at equal distances apart, a signal would be sent every fifteen minutes. These signals indicate that the main circuit is intact.

I have stated that there are two contact-fingers, 29 and 30, bearing upon the periphery of the break-wheel 17. One of these fingers, 30, is fixed to but insulated from the frame 2. The other finger, 29, is attached to but insulated from an armature-lever, 35, carrying an armature, 36, arranged to be attracted by an electro-magnet, 37. This electro-magnet is supported in proper position, as shown, by being secured to a suitable casing which may inclose the apparatus, and is not shown in the drawings, or it may be secured to a bracket suitably attached to a wall or other support to which the apparatus is secured. It is only when the magnet attracts its armature that the contact-finger 29 is pressed against the periphery of the break-wheel. This magnet is intended to be included in a local circuit at the place to be guarded. I have shown the local circuit by name in the diagram, Fig. 8. This local circuit may include circuit-breaking devices to be operated by the opening of doors, windows, &c., or it may include a metallic cage, of wire or other conductor, enveloping the place to be guarded, or so arranged that the local circuit will be broken by an attempt to invade the premises, as shown, for instance, in the Patent No. 106,324, granted to Charles T. Chester, August 16, 1870. The local circuit of course includes a battery, and as long as this circuit is closed the magnet 37 will be energized and attract its armature, thus pressing the contact-finger 29 against the break-wheel.

I will now describe particularly those devices which determine which of the hooks 19 or 20 shall be in position to engage the pin 18, and explain why the change is made from one to the other. Projecting inwardly from the front wall of the frame is a bracket, 38, to which is pivoted a bell-crank lever having one arm, 39, extending downward and forked at its lower end to embrace the arm of hook 28. The other arm, 39′, of this lever projects outward horizontally, and is forked at its end to embrace an arm, 40, which extends from the armature-lever 35. It will now be seen that when the armature is attracted the arm 40 and the arm 39′ of the bell-crank lever will be depressed, and the arm 39 of said lever will be thrown inwardly, and this arm, on account of its engagement with the hook-arm 28, will move the shifting-shaft 21 rearwardly, thus bringing the hook 19 in position to engage the pin 18, and moving hook 20 so far to the rear that it could not engage said

pin, even when down to its lowest position. On the shaft of the wheel 13 is a sliding sleeve, 41, in an enlarged portion of which is a circumferential groove, as shown at 42, into which projects the arm 26, for the performance of its further function, which has heretofore been alluded to, this function being to shift the sleeve whenever the shaft 21 is shifted. This sleeve 41 carries a lift-disk, 43, which has two diametrically-opposite notches, 44 44, and two perforations, 45 45. These perforations are to receive a pin, 46, projecting from the pinion 47 of the wheel 13, when the sleeve and disk are shifted toward said pinion. The shaft 21 has a hook-arm, 48, the bent end of which either rests upon or drops into one of the notches of the lift-disk 43. The gearing of the circuit-breaker train is so arranged that the wheel 13 makes one complete revolution while the break-wheel makes eight revolutions. Now, if the local circuit be closed, (the premises guarded not being molested,) it will be remembered that the bell-crank lever shifts the shaft 21 rearwardly, and the hook 19 engages the pin 18. At this time, also, the arm 26, being engaged with the sleeve 41, moves said sleeve rearwardly and carries the disk 43 out of engagement with the pin 46, which projects from the pinion 47. As long as affairs continue in this condition the time mechanism will go on tripping the circuit-breaker train at regular intervals, and causing single complete signals to be sent, as explained, indicating that the main circuit is complete and the local circuit unbroken by any attempt to invade the premises guarded. As soon, however, as the local circuit is broken, the armature of the magnet 37 drops, the arm 40 operates the bell-crank lever to move the shifting-shaft 21 forward, disengaging the hook 19 from the pin 18, and releasing the circuit-breaker train. At the same time the arm 26 moves the sleeve 41 up, so that the disk 43 engages with the pin 46, and will therefore be turned with the shaft of the wheel 13. The tip of the hook 28 is so wide that it does not pass out of the plane of the lift-disk 27 with the shifting of shaft 21, and as one of the walls of the notch of this lift-disk is gradually curved from its foot to the periphery of the disk, when this disk turns in the direction of the arrow No. 4 it lifts the hook 28, and therefore turns the shaft 21 so that the hooks 19 and 20 will be raised, and the arm 48 will also be raised out of the notch of disk 43 which it may happen to be in. Being out of the notch, the disk in turning carries the notch from under the said hook 48, and now the hook must rest on the periphery of the disk and cannot fall until the disk has make a half-revolution. While this half-revolution is being performed of course the hooks 19 and 20 are also held raised, and the circuit-breaker train runs until the break-wheel has completed four revolutions, when another notch comes under the hook 48, allowing it to drop, and also the hooks 19 and 20. The latter hook then engages the pin 18, as it will be remembered that the shifting-shaft has been moved forward. Thus it will be seen that four complete signals will be sent in as the result of breaking the local circuit and independently of the time mechanism. It will be noticed that the hook 19 projects a little beyond the hook 20, so that when the hook 19 is disengaged by being shifted forward the pin will escape freely, and the hook 20 will have plenty of time to rise before the pin can come around to it. The arm 26 rests on the bottom of the groove in the sleeve 41 when the sleeve and lift-disk are not locked to the shaft, and at such time the pressure of said arm will prevent the sleeve from turning. It will be understood that when the tripping occurs by the action of the time mechanism the disk 43 must remain stationary, in order that the hook 48 may drop back into the notch from which it was raised, and thus allow the hook 28 to drop back into the notch of the lift-wheel 27 when that wheel has completed one revolution, so that the hook 19 may also drop and arrest the circuit-breaker train. It will be remembered that when the armature-lever drops the contact-finger 29 is raised from the break-wheel, but the finger 30 remains in contact therewith. Normally this finger 30 bears on a small insulating-plate, 49, let into the periphery of the wheel, and though this finger acts as a contact to make and break circuit and send the signals while the wheel is turning, when the wheel completes its fourth revolution and is arrested after sending in a burglar-alarm, the said finger 30 rests on the insulating-plate, and the main circuit is thus left open. The purpose of this arrangement is to provide against any failure of the circuit-break in mechanism to operate and send in a burglar alarm when the local circuit is broken, for if an inspection, which should occasionally be made, of the relay or other instrument at the central office shows that the main circuit is open it will be the duty of the attendant or attendants to go to the premises guarded and find out the cause of the breakage of the circuit, even though a burglar-alarm has not been sent in.

It will be obvious that instead of using a single break-wheel with an insulating-plate or break to receive the finger 30, there might be two break-wheels on the same shaft or on separate shafts, one wheel receiving the pressure of the finger 29 when the armature is raised, and the finger 30 standing at a break of the other wheel.

It might sometimes happen that the pressure of the arm 26 would not be sufficient to hold the sleeve 41 and lift-disk 43 from turning when the shaft of wheel 13 turns within said sleeve. I have, therefore, provided a modification of the devices, such as shown in Fig. 6. The devices here are the same as shown in Fig. 5, with the addition that the sleeve 41 has at its rear end a disk, 50, with notches coinciding with but narrower than those of

the disk 43. A pin, 51, projects from a stationary frame, and will engage in one of these notches when the sleeve is shifted rearward to unlock it and the disk 43 from the pin 46. It will be readily seen that this pin 51 will hold the sleeve and disk from turning when they are unlocked, and therefore the hook 48 will be free to fall back into a notch from which it has been raised at such time. It will now be seen that when the local circuit is closed, and also the main circuit, owing to the finger 29 being pressed on the break-wheel, the tripping operation of the time mechanism will cause the circuit-breaking mechanism to send in safety-signals at regular intervals, the length of these intervals being regulated by the distance apart at which the tripping-hooks are placed on the shaft 10 or hour-wheel shaft of the time mechanism, and if at any time the local circuit is broken a burglar-alarm, consisting of four repetitions of the signal will be immediately sent in and the main circuit will be then left open. Of course it is a mere question of gearing how many repetitions of the signals shall be made, and I do not confine myself to any particular number. In fact, the sending of a single signal at other than the regular period would be sufficient to indicate it to be a burglar-alarm requiring immediate attention at the premises guarded.

I do not confine myself to the precise details of mechanism, but reserve to myself the right to vary the same in any manner that may be found desirable or expedient without departing from the true spirit and scope of my invention.

What I claim is—

1. In a burglar-alarm, the combination, with a main electric circuit connecting a place to be guarded with a distant station, of an automatic circuit-breaker in the main circuit, a time mechanism arranged to trip said circuit-breaker into action at predetermined intervals, an electro-magnet disconnected from the main circuit and arranged to be included in a local-battery circuit, and tripping devices controlled by said electro-magnet for tripping the circuit-breaker into action independently of the time mechanism, essentially as set forth.

2. The combination, with the automatic circuit-breaker train having a break-wheel upon one of its shafts, and upon another the wheel with a detent-pin projecting upon both sides thereof, of the longitudinally-shifting shaft carrying the hooks 19 and 20, the time mechanism and intermediate devices arranged to partially turn said shaft, and the electro-magnet and intermediate devices for shifting said shaft endwise, substantially as described.

3. The combination of the circuit-breaker train having the break-wheel and lift-wheel 27 upon one of its shafts, upon another the wheel 15 having a detent-pin projecting on both sides thereof, and upon another the shifting grooved sleeve and its attached lift-disk 43, provided with one portion of a clutch, the other portion of which is fixed upon the shaft, with the longitudinally-shifting shaft carrying detent-hooks 19 and 20, and arm 26, projecting into the groove of said sleeve, and arm 48, having its end hooked to engage the lift-wheel 43, and hook 28, arranged to engage the lift-wheel 27 on the break-wheel shaft, the time mechanism having a shaft provided with one or more tripping-hooks, 11, the intermediate tripping devices between said hooks, and the arm 23, the bell-crank lever having one of its arms loosely engaged with a projection of the shifting-shaft, and the electro-magnet and its armature having a projecting portion loosely engaged with other arm of said bell-crank lever, the whole constructed and arranged to operate essentially as set forth.

4. The combination, with a main-line terminal, of the two break-wheel contact-springs connected thereto, and the break-wheel connected with the opposite line-terminal, and provided with a break or insulating-space to receive one of said springs when the wheel is at rest, and an electro-magnet in a local circuit arranged to hold the other spring in position to make electric contact with the break-wheel only when said magnet is charged, substantially as described.

5. The combination, with the automatic circuit-breaking mechanism and time mechanism for tripping it into action at predetermined intervals, of the regulating mechanism for determining the specific character or number of repetitions of the signal when caused to be sent by said time mechanism, the electro-magnetic devices for tripping said circuit-breaking mechanism independently of the time mechanism, and the regulating mechanism which determines the specific character or number of repetitions of the signal when sent by said electro-magnetic tripping mechanism, and independently of the further action of the same, essentially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES B. YEAKLE.

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