

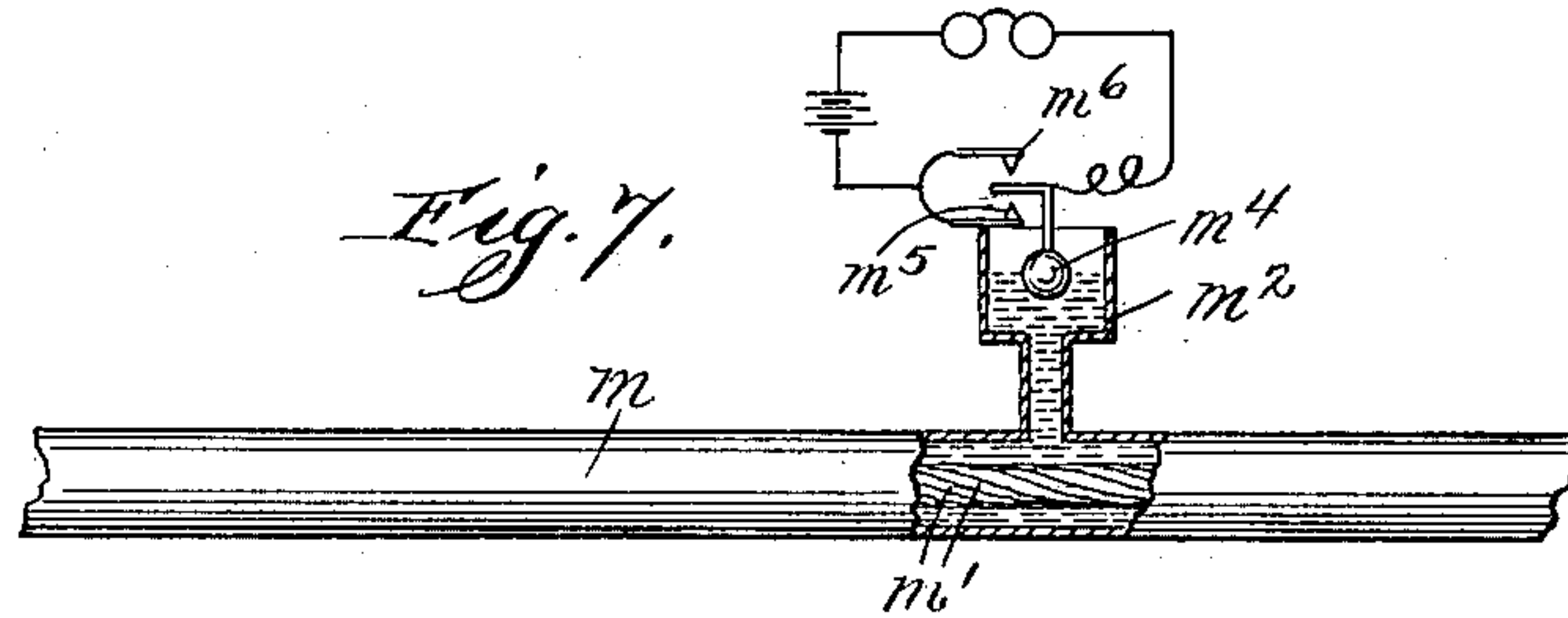
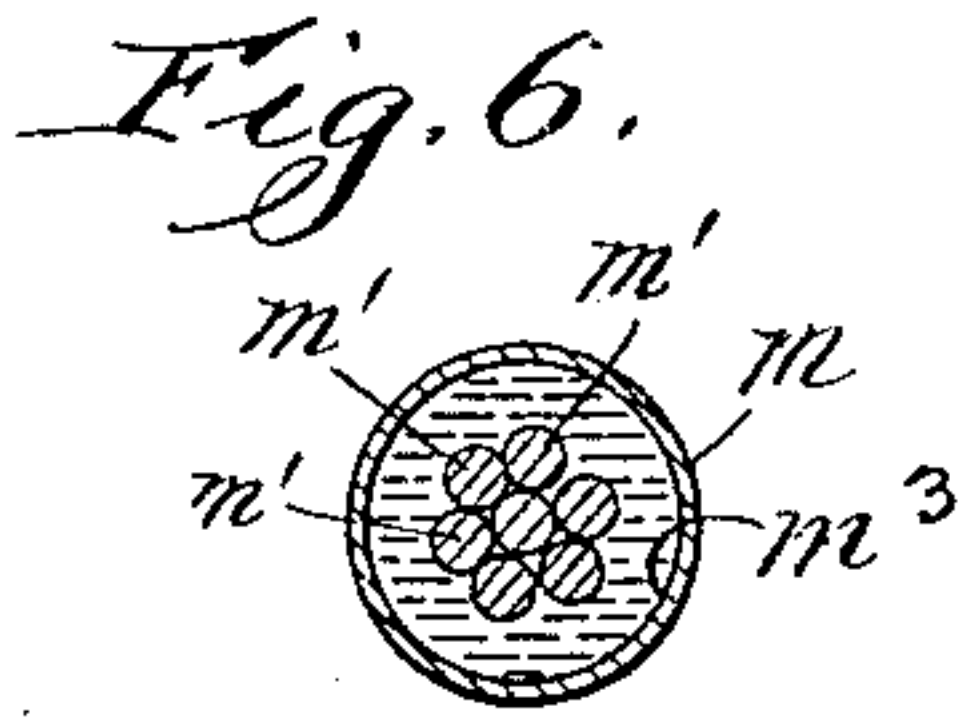
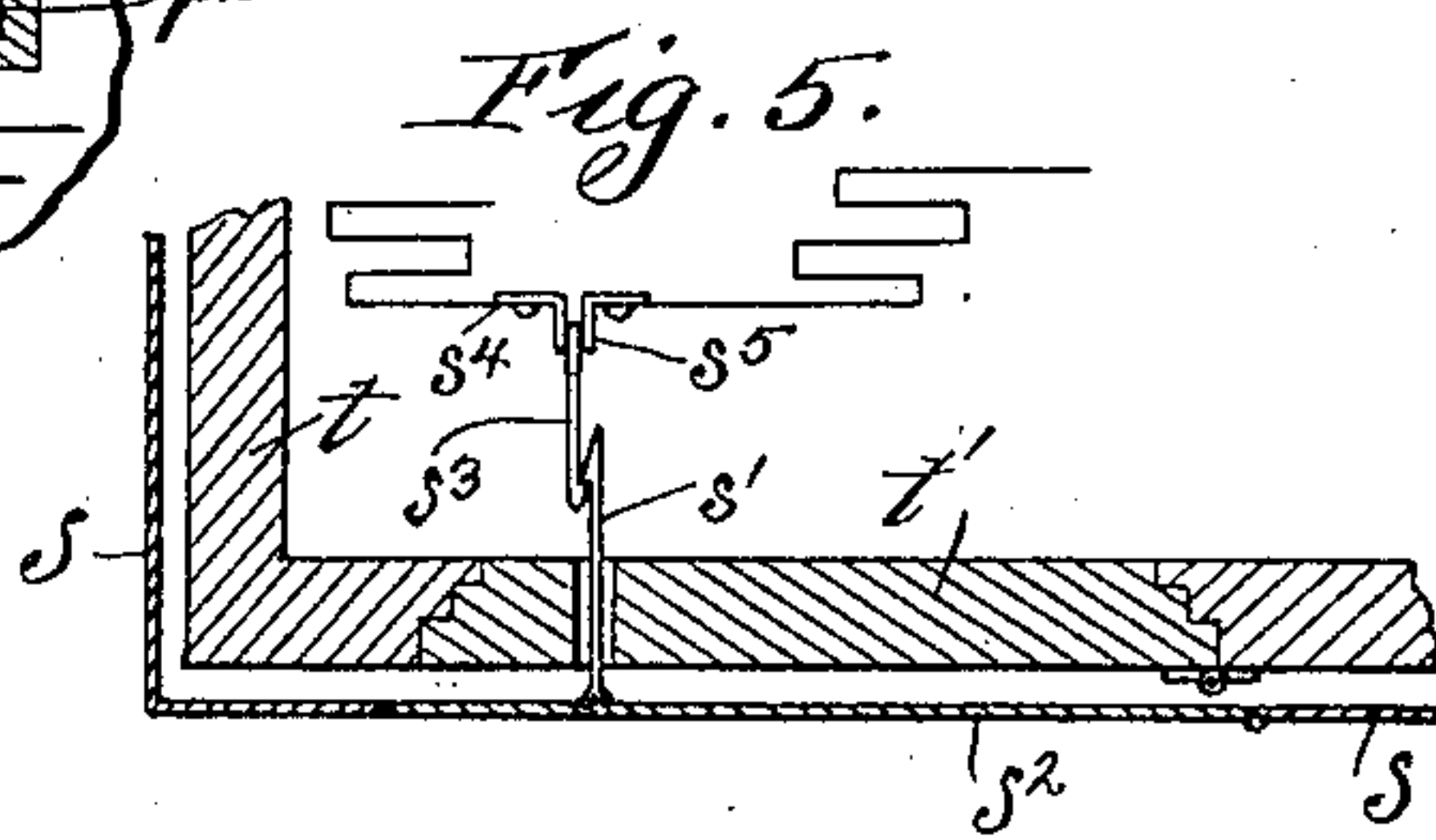
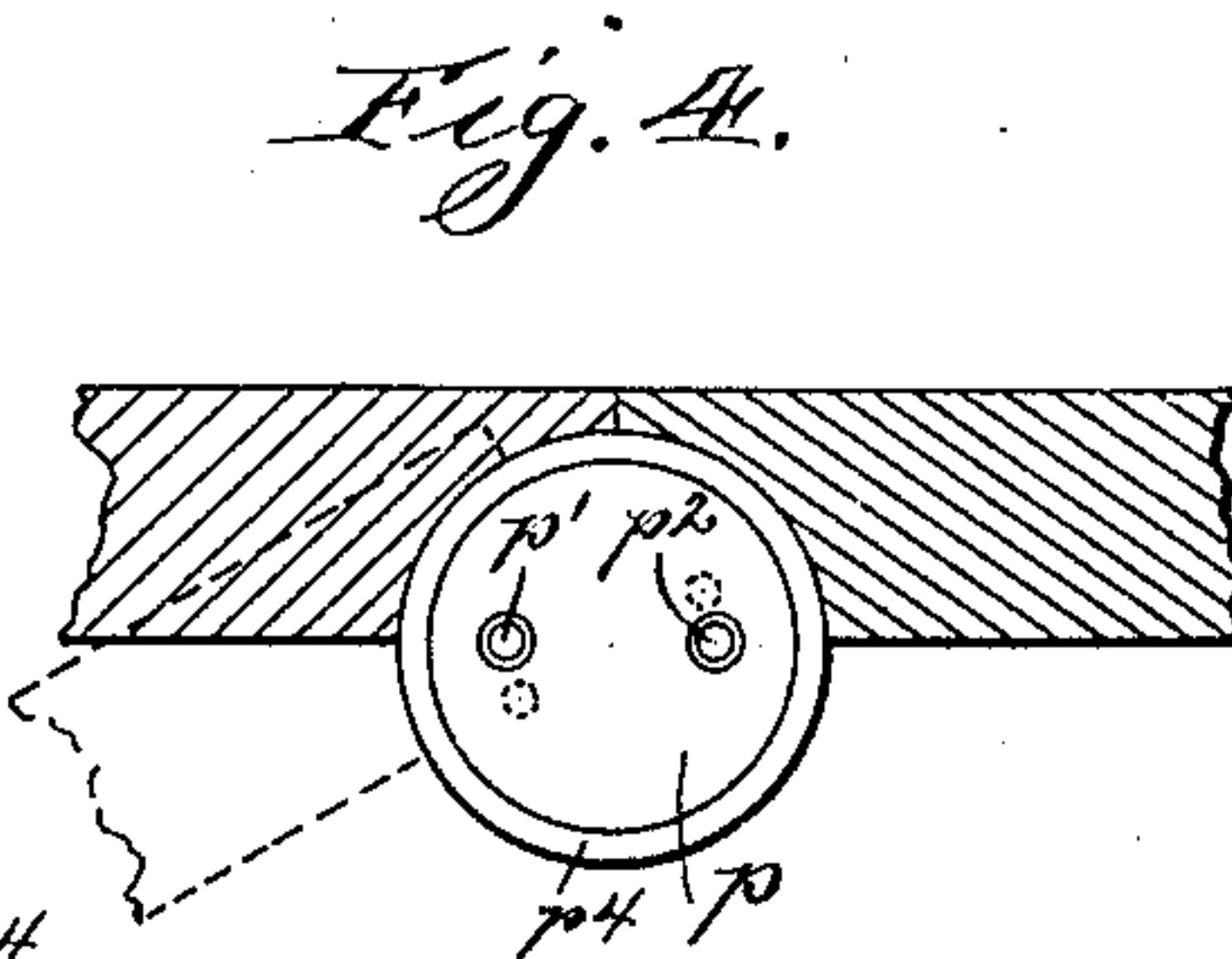
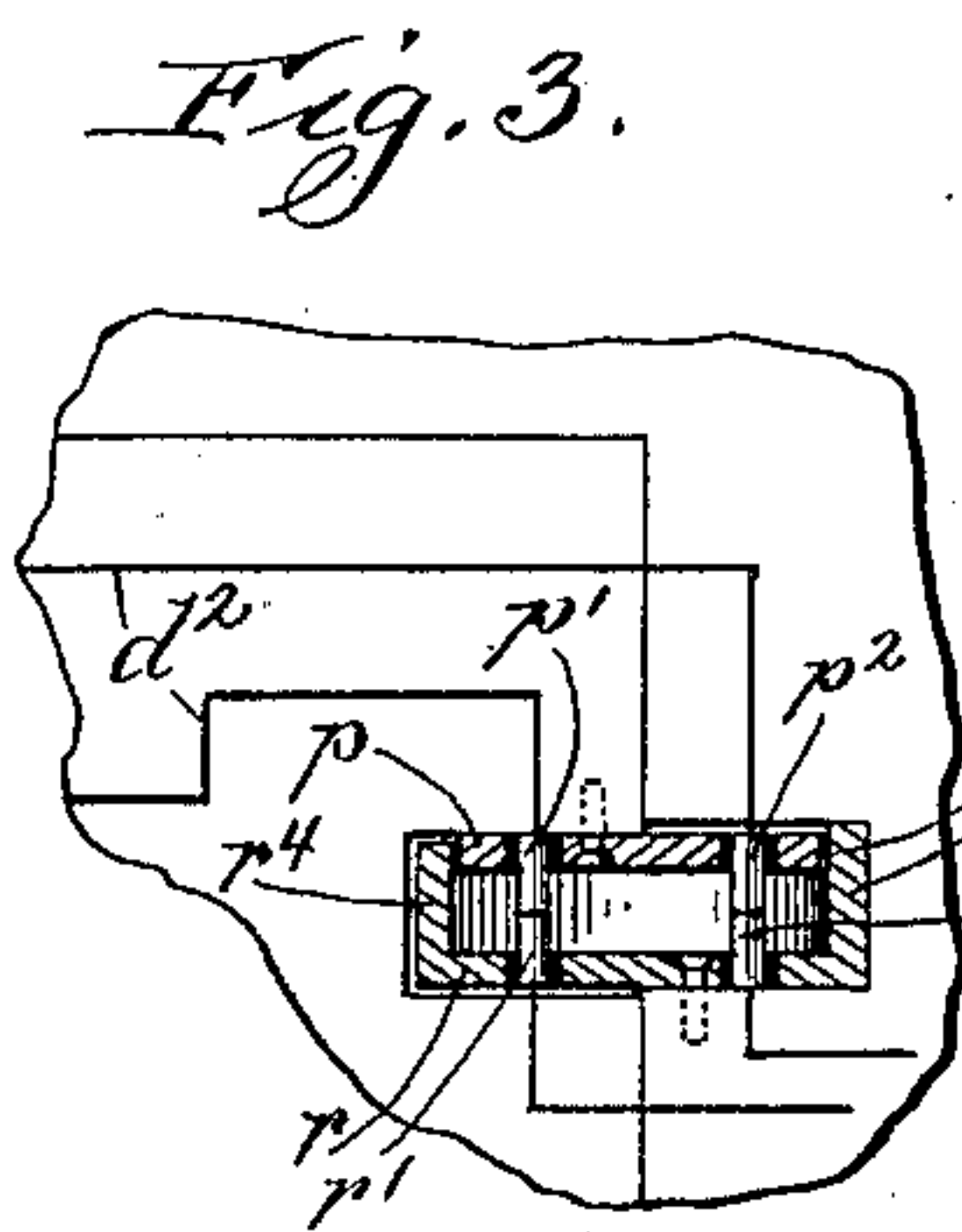
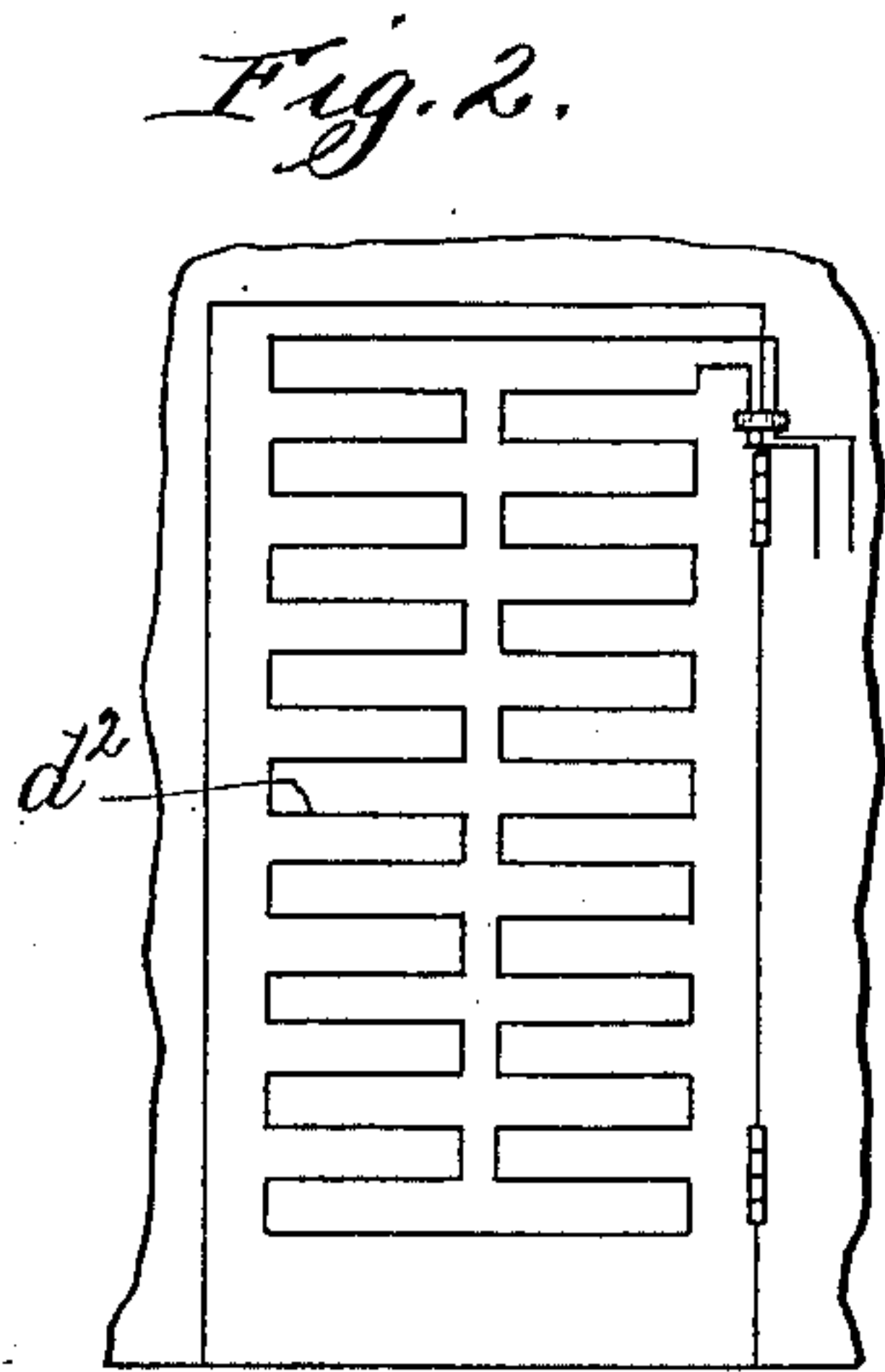
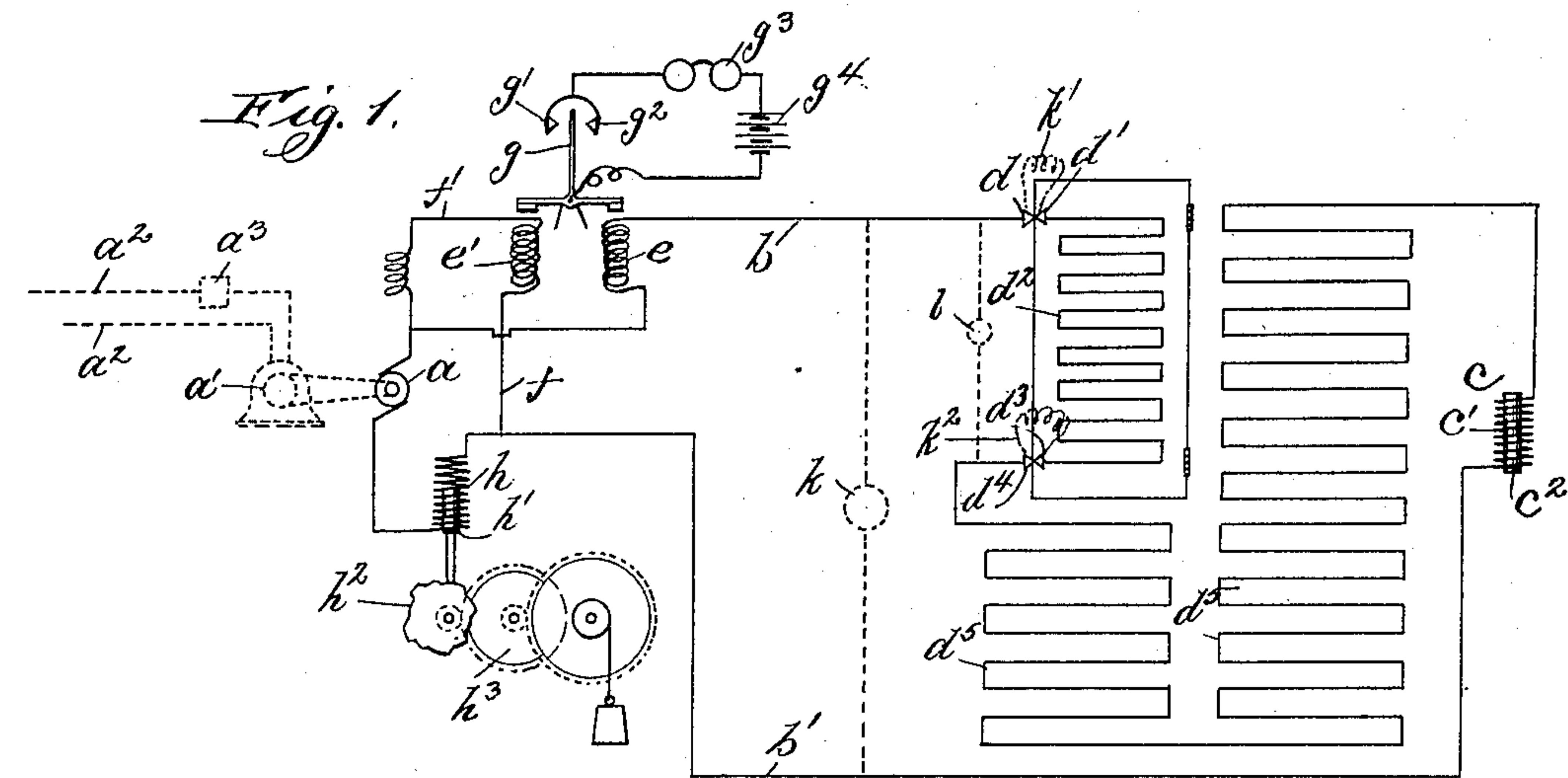
No. 652,734.

Patented June 26, 1900.

C. COLEMAN.
ALARM SYSTEM.

(Application filed Oct. 18, 1897.)

(No Model.)



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UNITED STATES PATENT OFFICE.

CLYDE COLEMAN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE BANKERS ELECTRIC PROTECTIVE COMPANY.

ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 652,734, dated June 26, 1900.

Application filed October 18, 1897. Serial No. 655,524. (No model.)

To all whom it may concern:

Be it known that I, CLYDE COLEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Alternating-Current Alarm Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an alternating-current alarm system, one object being to provide a system operated through the agency of an alternating current in such a manner that any attempt to tamper with or defeat the system will effectually sound an alarm.

A further object of my invention is to provide means whereby any attempt to loop the door-circuits of the vault or other inclosure to be protected may effectually be prevented.

In practicing my invention I provide a protective circuit extending from the protected structure to the alarm-station and supply the circuit with current from an alternating-current generator, which is preferably located at the alarm-station. At the alarm-station is provided a responsive device which remains irresponsive to the normal condition of the current while responding readily to any changed condition to sound an alarm. Within the alarm-station is provided an electrical element the character of which is varied from time to time to defeat any attempt to measure its value and interpolate in the circuit exterior to the protected structure an equivalent element. A reaction-coil may be employed as the varying element and may be formed by providing a winding upon a core of soft iron or other magnetic material. The reaction-coil offers a certain resistance to the passage of the current due to the ohmic resistance of the winding and also produces a counter electromotive force when subjected to an alternating or vibratory current which acts as a virtual resistance, so that the total resistance to which the current is subjected is equal to the ohmic resistance plus the reactive resistance. Means are provided whereby the reactive resistance is varied from time to time to thus change the total resistance. In order to interpolate an equivalent device,

it will therefore be necessary to determine the ohmic and reactive resistances of the element, which is practically impossible, because the reactive resistance is constantly varied. For the purpose of varying the reactive resistance any one of a number of equivalent means may be employed. For instance, the current may be varied to thereby vary the reactive resistance of the coil, or the electromotive force of the current supplied may be varied, or the frequency of the alternations may be varied by changing the speed at which the supplying-generator is driven or by changing its winding, or any other change may be made in the nature of the circuit or the current whereby the reactive effect of the coil, and consequently the total resistance to the passage of the current, is varied.

My invention also contemplates the provision of means whereby any attempt to loop the contacts of the door or other cover of the inclosure to be protected during the time that the character of the circuit remains constant will be frustrated. To accomplish this, the door-contacts are arranged so that they are manually inaccessible, and it will thus be impossible to defeat the system by interpolating exterior to the protected structure an equivalent device during the interval that the current is constant, then throwing open the door and loop the contacts, and afterward disconnecting the interpolating device before the constancy in the character of the circuit changes, to thereby render the alarm system intact and irresponsive notwithstanding the fact that the door has been open during the time that the character of the circuit remains constant.

The door-contacts may be rendered inaccessible in any one of a number of ways—for instance, the contacts may be provided at the swinging edge of the door and inclosed within a housing, whereby the contacts are always mechanically inaccessible when the door is open, so that it will be impossible to reach the contacts for the purpose of looping them together without first breaking into or destroying the housing. Again, where a separate electrical barrier or inclosure surrounds the vault one or both of the contacts may be located upon the interior of the vault, where-

by they are inaccessible even though the door of the electrical barrier be open. My invention in this particular contemplates a protective system wherein the nature of the circuit is altered at intervals and a vault door or covering having the contacts manually inaccessible, whereby the looping of the door-contacts during the time the circuit is of constant character is prevented.

In the accompanying drawings, Figure 1 is a view showing the circuit arrangements in diagram. Fig. 2 is a view of the door and inaccessible contacts thereon. Fig. 3 is a sectional view of the inaccessible contacts. Fig. 4 is a plan view thereof. Fig. 5 is a view of a modification of the inaccessible contacts. Fig. 6 is a sectional view of the electrical conductor. Fig. 7 is a view of the alarm device therefor.

Like letters refer to like parts in the several figures.

The alternating-current generator a is provided at the alarm-station and is connected by conductors b b' with the protected structure. Within the protected structure is provided a reactive coil c , comprising a winding c' and a magnetic core c^2 . The protective circuit at the vault extends to contact d , thence to contact d' on the door of the vault, through the door-circuits d^2 to contact d^3 , thence to contact d^4 , through circuits d^5 , protecting the walls of the vault, and thence to winding c' . In the circuit of the alarm-station is provided the coil e of a responsive device, having also a coil e' , which is connected in an independent and parallel circuit f f' . The coils e e' act upon a pointer g to normally balance the same between contacts g' g^2 , connected in a local circuit with the bell g^3 and battery g^4 . Any unbalancing of the coils e e' thus causes the sounding of the alarm. To vary the inductive or reactive resistance of the element at the protected structure, any preferred means may be employed. I have illustrated one form of varying device, comprising a winding or coil h , included in the circuit of generator a and provided with a core h' , arranged to be moved into and out of the winding a greater or less extent at intervals, to thereby vary the current to vary the reactive resistance of the reactive coil c at the alarm-station. The core h' may be raised or lowered by means of a cam h^2 , driven by clockwork h^3 or in any other desired manner. The reactive coil h affects both of the coils e e' of the responsive device alike, and the same remains irresponsive. I have illustrated in dotted lines means for varying the frequency of the alternations by varying the speed of the generator a . The generator may, as illustrated in dotted lines, be driven by an electric motor a' , supplied with current from mains a^2 a^3 . By means of a rheostat a^3 or other speed-regulating device the speed of the driving-motor a' may be varied, to thereby change the speed of the generator a , and consequently the frequency of the alterna-

tions, to thus vary the reactive resistance of the reactive coil c .

During the intervals between the changes of the character of the current it may be attempted to interpolate between the conductors b b' and exterior to the protected structure a device k , which will maintain the current normal during the period of constancy of the character of the circuit, the interpolating device being connected in circuit, the door then quickly thrown open, and the contacts d d' and d^3 d^4 looped by means of looping-conductors k' k^2 , the interpolated device k then being thrown out of circuit before any change of the character of the current occurs. It may be possible to thus maintain the alarm system intact and irresponsive notwithstanding the fact that the door has been opened. To avoid this, I arrange the contacts so that they will be inaccessible, and in consequence the opening of the door will not permit the looping of the contacts, and the alarm will therefore be sounded if such an attempt to defeat the system is made.

In Figs. 2, 3, and 4 I have illustrated one form of an inaccessible contact in which a plate p is mounted upon the hinged edge of the door, while upon the casing is mounted a plate or disk r , having a flange r^4 , which surrounds the periphery of the plate p , thus forming an inclosure within which the contacts are placed. The door-circuit d^2 is connected with pins p' p^2 , mounted upon the disk p , while the circuit exterior to the door is connected with pins r' r^2 , mounted on the disk r . When the door is closed, the contacts rest in engagement to complete the door-circuit. When the door is open, the contacts are separated. A housing is thus provided upon the contacts which renders the same manually inaccessible.

In Fig. 5 I have illustrated a modification in which an electrical barrier s is provided upon the exterior of the vault t . Through the vault-door t' extends a rod s' , carried upon the door s^2 of the electrical barrier. The rod s' engages by the end a plug s^3 , normally resting between contacts s^4 s^5 , included in the protective circuit and united through the plug. Any attempt to open the door s^2 will withdraw the plug s^3 from between the contacts, and the contacts being inaccessible it will be impossible to loop the same. Contacts are thus provided which will be separated upon the opening of the door to sound an alarm, and the contacts are manually inaccessible, whereby it is impossible to gain access to the contacts to loop the same to prevent the sounding of the alarm.

A switch l is preferably provided whereby the door-circuit may be shunted when desired to permit the opening of the door without sounding the alarm. The switch l may be operated by means of a combination-lock or otherwise protected, whereby it can be opened only by authorized parties.

I preferably combine the electrical contacts

into a cable extending between the protected structure and the alarm-station, whereby access to the contacts cannot be had without sounding an alarm. The cable which I preferably employ comprises a casing or sheathing m , which may be made of lead or other suitable material and in which are inclosed the conductors m' m' , &c. Within the casing m and surrounding the conductors is a body of liquid, and at some convenient point, preferably at the alarm-station, the casing m is connected with a well or reservoir m^2 , whereby the casing may be maintained continuously filled with the liquid. The liquid within the casing is preferably of mercury or similar conducting liquid, whereby the liquid may form one of the conductors of the circuit. When the liquid is one of the conductors, it is preferably separated from the metallic sheathing or casing by means of a layer of insulation m^3 . Any attempt to pierce the casing will permit the conducting liquid to make contact with the casing, thereby closing an alarm-circuit. Furthermore, the escape of the liquid from the casing is preferably arranged to operate a signal. Thus a float m^4 may be preferably provided in the reservoir m^2 , adapted upon its descent below or ascent above a certain point to engage one or the other of the contacts m^5 m^6 to close a local alarm-circuit.

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

1. The combination with an electrical protective circuit extending from the protected structure to the alarm-station; of a generator for supplying an alternating, vibratory or varying current thereto, means for varying the reactive resistance of the circuit within the protected structure and a signaling device irresponsive to the prearranged variations but responding to abnormal variations, substantially as described.

2. The combination with an electric protective circuit extending from the protected structure to the alarm-station, of a generator for supplying an alternating or vibratory current thereto, a responsive device within the protected structure for varying the reactive resistance of the circuit, and means situated at the alarm-station for actuating said device, substantially as described.

3. The combination with an electric protective circuit extending from the protected structure to the alarm-station, of a generator for supplying an alternating or vibratory current thereto, and a variable reactive resistance within the protected structure, substantially as described.

4. The combination with an electric protective circuit extending from the protected

structure to the alarm-station, of a generator for supplying an alternating or vibratory current thereto, a reactive coil within said protected structure, and means for varying the reactive resistance thereof at intervals substantially as described.

5. The combination with an electric protective circuit extending from a protected structure to the alarm-station, of a reactive resistance within the protected structure and means for varying the frequency or periodicity of the current to thereby vary the reactive resistance, substantially as described.

6. The combination with an electric protective circuit protecting a vault or other inclosure and extending through separable door-contacts, of means for varying the nature of the circuit at the protected structure at intervals, and means for rendering said door-contacts manually inaccessible when the door is opened whereby the electrical uniting of the door-contacts when the door is opened is prevented, substantially as described.

7. In an electrical conductor, the combination with a casing or sheath of conducting material, of an insulated lining therefor, a conducting liquid within said casing and an insulated conductor surrounded by said liquid, substantially as described.

8. In combination, a casing or sheath of conducting material, an insulated lining therefor, a conducting liquid within said casing, an insulated conductor surrounded by said liquid, and alarm mechanism arranged to be actuated by the escape of said liquid or by the contact of said liquid with said casing, substantially as described.

9. In an alarm system, the combination with a covering swinging about one edge, of a pair of disks occupying parallel positions perpendicular to the axis upon which the covering swings and secured one to the covering and the other to the casing, a pair of relatively-insulated contacts provided upon the disk secured to the covering and connected with the protective circuit on the covering, a pair of relatively-insulated contacts provided upon the disk secured to the casing and connected with the protective circuit, and remaining in contact with the contacts on the disk carried on the covering while the covering is closed and breaking contact therewith when the covering is opened, substantially as described.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

CLYDE COLEMAN.

Witnesses:

W. CLYDE JONES,
M. R. ROCHFORD.