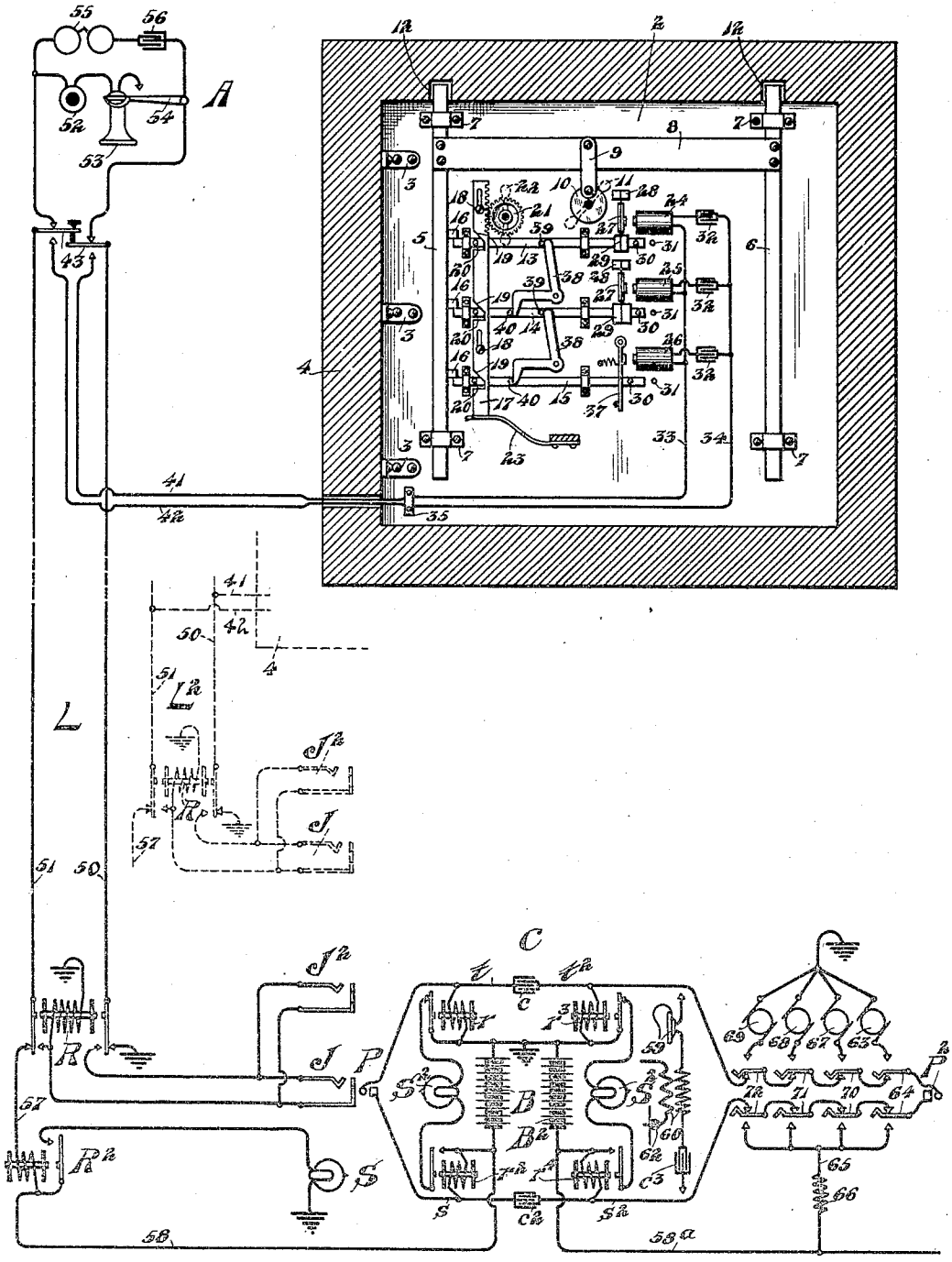
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W. W. DEAN.

SYSTEM FOR UNLOCKING SAFES OR THE LIKE.

APPLICATION FILED AUG. 10, 1903.



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UNITED STATES PATENT OFFICE.

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SYSTEM FOR UNLOCKING SAFES OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 792,404, dated June 13, 1905.

Application filed August 10, 1903. Serial No. 168,860.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Systems for Unlocking Safes or the Like, of which the following is a specification.

My invention relates to systems for electrically unlocking safes and the like, and has for its object generally the provision of a system for unlocking safes and the like by electric currents having certain distinctive characteristics.

A second object is to provide an unlocking system in which the currents required are not only of inherent distinctive characters, but which must also be of a definite combination.

A further object of the invention is to thus unlock safes and the like from a central office having charge of this class of service for an entire community and from which lines radiate to the several safes; and another object is to apply such a system of unlocking safes to a telephone-exchange in which the safes are connected with the telephone-lines radiating from the central office of the exchange and provision is made at the said central office or at a common point to apply to the lines the proper current for the unlocking of the safes.

In carrying out my invention in one commercial form I provide the safe with a lock whose unlocking is controlled by a plurality of magnets each capable of responding to current of a distinctive character only and the whole number of magnets being incapable of operation except in a definite order. There is then arranged at a certain point, and which, as hereinafter pointed out, may be common to a large number of safes and may be at the central office of a telephone-exchange, means to apply to the circuits of said magnets currents of the necessary kind and combination to suitably operate them to thereby control the unlocking of the safe.

My invention is illustrated in the accompanying drawing, in which the figure is a diagram of such a safe-unlocking system applied to the subscribers' lines of a telephone-exchange.

In the figure, 2 represents the inside of a safe or other door that is secured by the hinges 3 3 3 to the walls 4 of the safe. The bars 5 and 6, sliding in suitable straps 7, secured to the inside of the door, are secured together by the horizontal bar 8, a link 9 connecting the latter with an eccentric or crank 10, that may be rotated from the outside of the safe by the handle 11, shown in dotted lines, to cause said bars 5 and 6 to engage in suitable apertures 12 or other coöperating locking means to hold the door closed. The bars 5 and 6 are prevented from being drawn back by suitable locking-bolts, in this instance three in number, (designated as 13, 14, and 15.) Each bolt is adapted to engage behind a lug 16, carried by the bar 5, when the door is locked. The bolts may be moved into locking position by a sliding bar 17, secured to the door by the screws or pins 18, working in suitable slots in the said bar. Said bar is provided with notches having inclined edges 19 adjacent pins 20, carried by the locking-bolts 13, 14, and 15, whereby when the bar 17 is moved downwardly the said slanting edges 19 engage said pins on the bolts and slide the same laterally to engage behind the locking-lugs 16, carried by bar 5. A small pinion 21, operated manually from the other side of the door by a suitable knob or handle 22, shown in dotted lines, engages in teeth formed in the edge of said bar 17 and serves to shift the same longitudinally to move the locking-bolts 13, 14, and 15 into locking position. A spring 23 serves to move the bar 17 to its uppermost position when the handle 22 is released, so that the bolts 13, 14, and 15 may be drawn back without hindrance therefrom.

In order to unlock the safe electrically, I employ the magnets 24, 25, and 26, that are arranged to act upon and withdraw the bolts 13, 14, and 15, and in order that such magnets may each respond to currents of a particular kind only I attune the same to respond to a pulsating, preferably alternating, current of a definite frequency. This attuning may be

done mechanically or electrically, or by both methods. Thus in the drawing I have shown magnets 24 and 25 mechanically attuned, a reed 27 being provided for each and secured at 28 to the door and having a weight 29, preferably square, at the lower free end of the reed. These reeds may be constructed in any desired or usual manner and are capable of vibration only at a definite rate. Each bears an armature for the magnet, and the weights 29 of different sizes upon the lower ends of said reeds indicate that they have different rates of vibration. In the present invention the magnet 24 is adjusted to respond to a current having a frequency of one thousand and magnet 25 to a frequency of two thousand. The balls or strikers 29 when the reeds are set in vibration engage pins 30 upon the bolts 13 and 14 and serve to withdraw them from behind the lugs 16. Other pins 31 upon the door act as stops for said bolts. Condensers 32 are placed in the branches of these magnets 24 and 25, which are bridged across the circuit of conductors 33 and 34, leading to the binding-posts 35. Magnet 26, on the other hand, is electrically attuned to respond only to current of a frequency of three thousand, this being accomplished in the well-known manner and in accordance with well-known laws of electrical phenomena by adjusting the capacity of the condenser 32 and the retardation of magnet 26, so that the said bridge is resonant to currents of that frequency only and is substantially opaque to currents of all other frequencies. An armature-lever 37 is adapted to engage pin 30 of bolt 15 when the magnet 26 is energized to withdraw the bolt.

Either method or both methods of attuning may be employed with each magnet, if desired, or some may be adjusted in one way and the others in the other ways.

In order that the magnets may be operated only in a definite order and by a certain current combination, I provide the two interlocking catches 38, pivoted at the angle of their arms to the door and having their vertical arms engaging pins 39 on the adjacent bolts 13 and 14, while the catches at the ends of their horizontal arms are adapted to fall behind pins 40 on the bolts 14 and 15 when the latter are in locked position. Thus it is necessary to actuate magnet 24 first, magnet 25 second, and magnet 26 third. If currents even of the proper characters be sent through the magnets in any other order, they will fail to operate, owing to the catches 38.

The magnets 24, 25, and 26, together with the corresponding condensers and their circuit-conductors, are suitably supported in working position upon the door in any usual manner, the conductors 33 and 34, forming a single circuit, leading away from the same. This single circuit therefore suffices for all the magnets used, it being only necessary to connect them with a suitable current source to complete the system. For this purpose wires 41 and 42 extend from posts 35 through a suitable aperture formed in the masonry or other wall of the safe or other part to which the door belongs and preferably concealed and so located that the said wires are not broken in the swinging of the door. Any of the usual methods of forming like connections may obviously be employed—as, for instance, by insulating certain metallic parts of the safe extending through the walls thereof and connecting the wires 33 and 34 thereto on the inside and the wires 41 and 42 thereto on the outside of the safe. This source of power may be located in the same building as the safe or like part—as, for instance, in the basement of the building—and be entirely controlled from within the building or a central office may be provided from which all of the safes in the system may be unlocked, or, as I have shown in the drawing, the radiating lines of a telephone-exchange may be employed for this purpose. Thus the wires 41 and 42 are shown as adapted to be connected by switch 43 with the conductors 50 and 51 of the telephone-line L, extending from the subscriber's station to the central office C. At the substation the usual transmitter 52 and receiver 53 are placed in a bridge of the line conductors that is normally open at the switch-hook 54, while a call-bell 55 and a suitable condenser 56 are placed in a permanent bridge of said conductors. This substation outfit is intended merely to typify any usual or desired subscriber's apparatus.

At the central office the line is provided with a line-signal S and with multiple jacks J J^2 in any number. The line conductor 50 is normally grounded, but is adapted when the cut-off relay R of the line is actuated to be disconnected from ground and to be connected with the sleeve conductor of the jack-section of the line. The line conductor 51 is normally connected with a conductor 57, leading to the line-relay R^2, which controls the local circuit of the line-signal S, the said relay being connected by conductor 58, common to a large number of the telephone-lines and leading to the live pole of the central common battery B. When the cut-off relay R, which has its winding legged to ground from the sleeve conductor of the jack-section, is operated, the said line conductor is disconnected from conductor 57 to render the line-signal inoperative and is connected with the sleeve conductor of the jack-section.

At the central office of the exchange each operator is provided with a number of cord-circuits for establishing connections for conversation, each cord-circuit having an answering-plug P and a calling-plug P^2, having tip and sleeve contacts adapted to register with the corresponding contacts of the spring-jacks of the lines, the said tip-contacts of the plugs being connected by the flexible strands *t*

and t^2 and the interposed condenser c, while the sleeve conductors are similarly united by the strands s and s^2 and the interposed condenser c^2. Supervisory relays r and r^2 are connected upon either side of the battery B across the answering end of the cord-circuit and together control the local circuit of the supervisory signal S^2, associated with the answering-plug P, while the other supervisory relays r^3 and r^4 are similarly connected across the calling end of the cord-circuit upon either side of the battery B^2 and together control the local circuit of the supervisory lamp S^2, associated with the calling-plug P^2. The operator's head-telephone 59, the secondary of her induction-coil 60, and a suitable condenser c^3 are adapted to be connected across the calling end of the cord-circuit by any suitable listening-key, while her transmitter 62 and the primary of her induction-coil 60 are charged from any suitable source of current, which may be either the battery B or B^2.

For ordinary ringing purposes the operator at the central office is provided with but a single ringing-generator 63, which is adapted to be connected between ground and the forward portion of the tip-strand t^2 of the cord-circuit by the springs 64 of a suitable ringing-key, the return-path for the ringing-current being completed through the conductor 65, including a resistance 66, and the common lead 58^a through the battery B^2, so that with this arrangement the operator is enabled to call any subscriber of the system, the cut-off relay R of the called telephone-line being held up during ringing by current from the battery B^2. For the purpose of unlocking safes and the like located upon the lines by currents of different character and combination, as hereinbefore described, an additional set of generators 67, 68, and 69 may be provided and that are capable of generating pulsating currents, preferably alternating, corresponding to the frequencies required for operating the unlocking mechanism of the safes. Under the operative frequencies ascribed to the magnets 24, 25, and 26 of the unlocking mechanism of the safe shown in the drawing the said generators 67, 68, and 69 would be designed to generate currents having frequencies of one thousand, two thousand, and three thousand alternations, respectively. Additional ringing-keys 70, 71, and 72 are provided by means of which the said generators may be connected with the cord-circuit in any desired order, so that the proper current combination can be thrown upon the line.

When it is desired to have the safe unlocked, the subscriber takes up his telephone and calls the central office in the usual manner by operating the line-signal S. Upon observing this signal the operator inserts the answering-plug P of her cord-circuit in the jack of the calling-line, and upon being informed that the safe is to be unlocked she withdraws the answering-plug P and inserts the calling-plug P^2, and if she is informed beforehand of the proper circuit combination she depresses the ringing-keys 70, 71, or 72 in the proper order, and, as hereinbefore pointed out, the safe is unlocked. If the operator does not know the combination, it may be repeated to her by the person calling. The person calling as soon as the order is given depresses the push-button 43 to connect the safe mechanism with the line. If this class of service is handled at a separate section of the switchboard at the central office of the telephone-exchange, only the operators at such section are provided with cord-circuits connected with the ringing-generators 67, 68, and 69, the call for the unlocking of a safe being received in the ordinary manner by the answering operator, who then by means of an order-circuit or a trunk-circuit or by other means notifies the said special operator that a certain safe is to be unlocked. Again, a certain password between the operator and the subscriber may be required before the former will apply the unlocking-current to the line. Another method of carrying out this service is to have the central office open the safes at a definite time each day, so that it is unnecessary for the subscribers to first call up the central office. In case this method is employed, the safes are permanently connected with the lines.

In order that the unlocking-current may not operate the subscriber's bell in case the connection of the safe is permanent, the said bell may be adjusted not to respond to the unlocking-currents. It will be also understood that in case the subscribers' bells are adapted to respond to the unlocking-currents under the method of operation described in connection with line L the additional generator 63 need not be employed, since one of the other generators may be used for ordinary ringing. A second line L^2 is shown in dotted lines upon which another safe 4 is located and has its wires 41 and 42 permanently connected with the line conductors 50 and 51. When thus permanently connected with the telephone-lines, the condensers 32 in the unlocking-magnet branches prevent the flow of steady current from the battery, which is normally connected with the lines at the central office.

While I have shown and described one practical method of carrying out my invention, I do not wish to be limited thereto in all respects, as various modifications may be made therein without departing from its scope or principle. Thus the safe shown and described is unlocked only by currents of a definite kind and combination; but it will be understood that less than the whole plan thus described may be depended upon for the operation of the unlocking mechanism, but of course with the omission of certain advantages. It is also apparent that the invention may be applied to unlocking other than safe-doors.

I claim—

1. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same responsive only to currents of a distinctive character, and means for applying such currents to the said mechanism, substantially as described.

2. In a system of the class described, the combination with a safe or the like, of a single electric circuit, an electromagnetic unlocking mechanism for said safe comprising a plurality of electromagnetic units all connected to said circuit, and responsive in operative manner to a definite and distinctive combination or sequence of currents in said circuit only, together with means for applying such distinctive combination of currents to the circuit to operate said mechanism, substantially as described.

3. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same responsive only to electric currents of a distinctive character and combination, and means for applying such currents to said mechanism, substantially as described.

4. In a system of the class described, the combination with a safe, or the like, of an electromagnetic unlocking mechanism for the same responsive only to varying currents of definite frequency and combination, and means for supplying such currents to said mechanism, substantially as described.

5. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same responsive only to varying currents of definite frequency, and means for supplying such currents to said mechanism, substantially as described.

6. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same responsive only to alternating electric currents of definite frequencies and applied thereto in sequence and in a definite order, and means for applying such currents to said mechanism, substantially as described.

7. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same responsive only to alternating electric currents of definite frequency, and means for applying such currents to said mechanism, substantially as described.

8. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same including a plurality of magnets tuned to respond only to currents of a definite frequency, means to prevent the operation of said magnets except in a definite order, and means for supplying currents of the proper frequencies to said magnets and in the proper order to operate the same, substantially as described.

9. In a system of the class described, the combination with a safe or the like, of an electromagnetic unlocking mechanism for the same including a plurality of magnets tuned to respond only to currents of a definite frequency, and means for supplying currents of the proper frequencies to said magnets, substantially as described.

10. In a telephone system of the class described, the combination with a central office, of circuits radiating therefrom, safes or the like located at outlying points on said circuits, electromagnetic unlocking mechanisms therefor connected with said circuits, and means at said central office for applying such currents to said circuits to operate said mechanisms, substantially as described.

11. In a system of the class described, the combination with a central office, of circuits radiating therefrom, safes or the like located at outlying points on said circuits, electromagnetic unlocking mechanism therefor connected with said circuits, the said mechanisms being responsive only to currents of a distinctive character and combination, and means at said central office for applying such currents to said circuits to operate said mechanisms, substantially as described.

12. In a system of the class described, the combination with a central office, of circuits radiating therefrom, safes or the like located at outlying points on said circuits, electromagnetic unlocking mechanism therefor connected with said circuits, the said mechanisms being responsive only to currents of a distinctive character, and means at said central office for applying such currents to said circuits to operate said mechanisms, substantially as described.

13. In a system of the class described, the combination with a central office, of circuits radiating therefrom, safes or the like located at outlying points on said circuits, electromagnetic unlocking mechanisms therefor connected with said circuits, said mechanisms being responsive only to currents of a particular combination, and means at the said central office for applying such currents to said circuits to actuate said mechanisms, substantially as described.

14. In a system of the class described, the combination with a central office, of circuits radiating therefrom, safes or the like located at outlying points upon said circuits, electromagnetic unlocking mechanisms for said safes connected with said circuits, said mechanisms being responsive only to currents of definite frequencies and applied thereto in a definite order, and means at the said central office for applying currents to said circuits of the required type and in the proper order to operate said mechanisms, substantially as described.

15. In a system of the class described, the

combination with subscribers' lines of a telephone-exchange, of safes or the like at outlying points on said lines, electromagnetic unlocking mechanisms for the safes, and means at the central office of the exchange for supplying current to the lines to operate said mechanisms, substantially as described.

16. In a system of the class described, the combination with subscribers' lines of a telephone-exchange, of safes or the like at the substations, electromagnetic unlocking mechanisms for the safes responsive to currents of a distinctive character and combination, and means at the central office of the exchange for supplying such currents to the lines to operate said mechanisms, substantially as described.

17. In a system of the class described, the combination with subscribers' lines of a telephone-exchange, of safes or the like at the substations, electromagnetic unlocking mechanisms for the safes responsive to currents of a distinctive character, and means at the central office of the exchange for supplying such currents to the lines to operate said mechanisms, substantially as described.

18. In a system of the class described, the combination with subscribers' lines of a telephone-exchange, of safes or the like at outlying points on said lines, electromagnetic unlocking mechanisms for the safes responsive to currents of a particular combination, and means at the central office of the exchange for supplying such currents to the lines for operating said mechanisms, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 8th day of August, A. D. 1903.

WILLIAM W. DEAN.

Witnesses:
ROBERT LEWIS AMES,
EVA A. GARLOCK.