J. W. BRYCE.

RECORDING LOCK.

APPLICATION FILED JUNE 26, 1920.

1,417,715. Patented May 30, 1922.

6 SHEETS—SHEET 1.

Fig. 1.

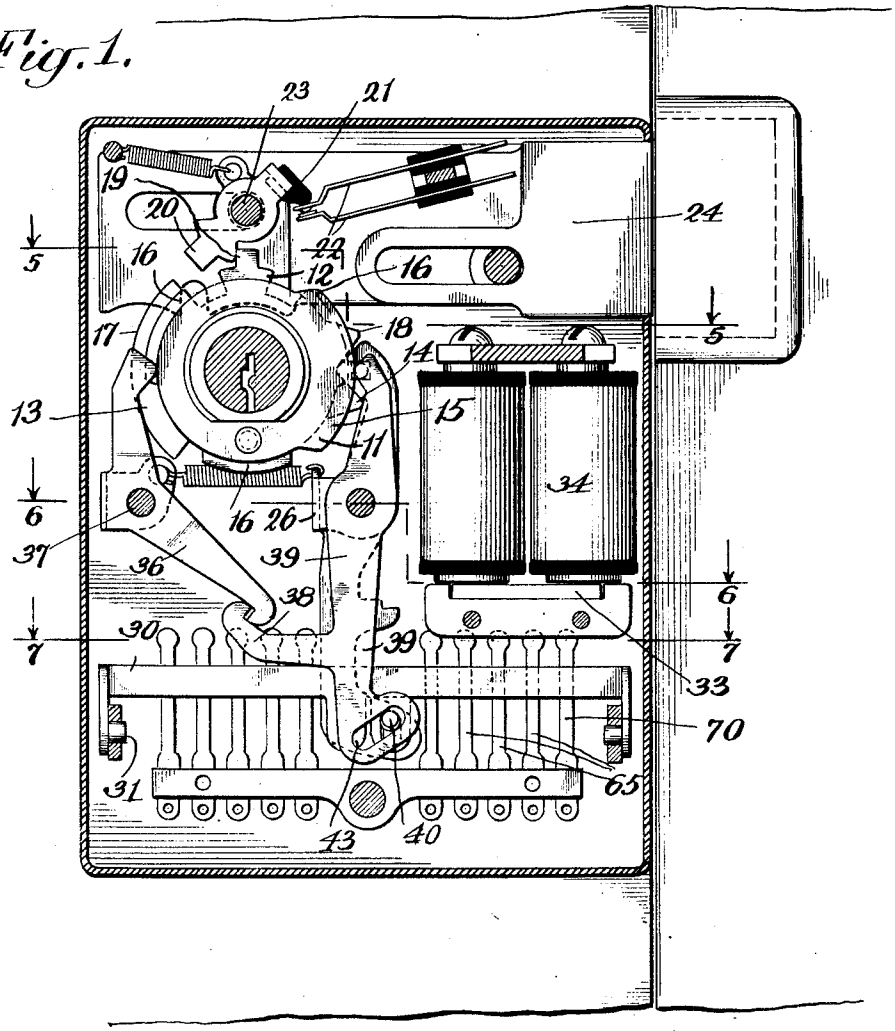
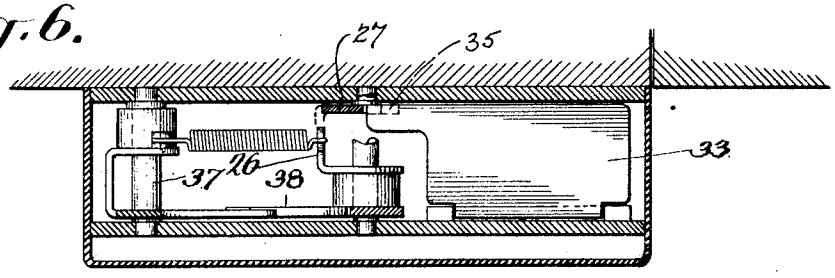


Fig. 6.



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6 SHEETS—SHEET 2.

Fig. 2.

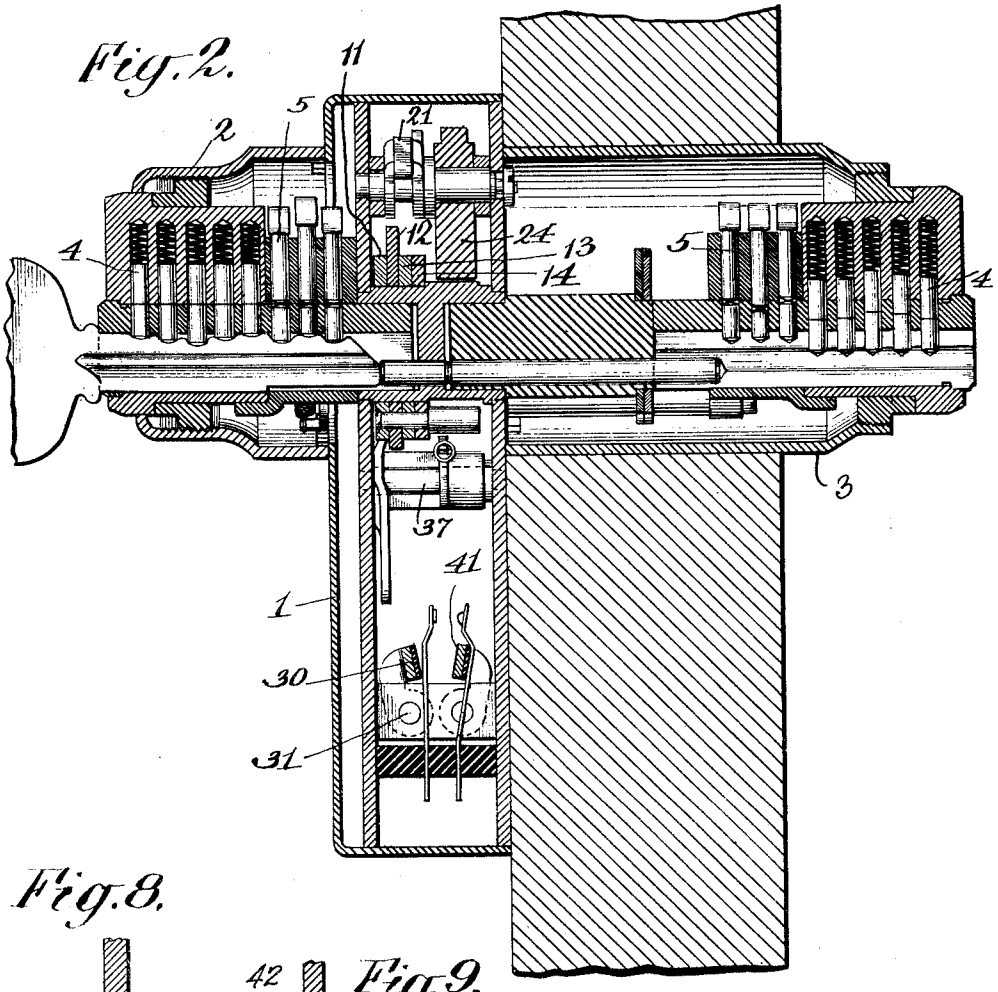


Fig. 8.

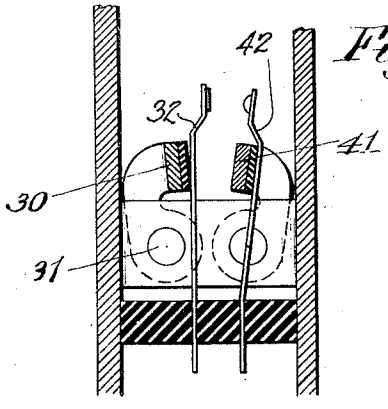
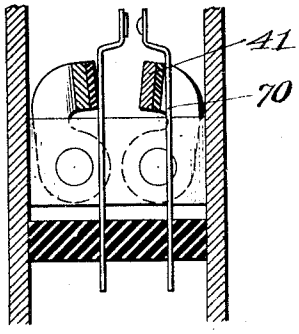


Fig. 9.



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6 SHEETS—SHEET 3.

Fig. 3.

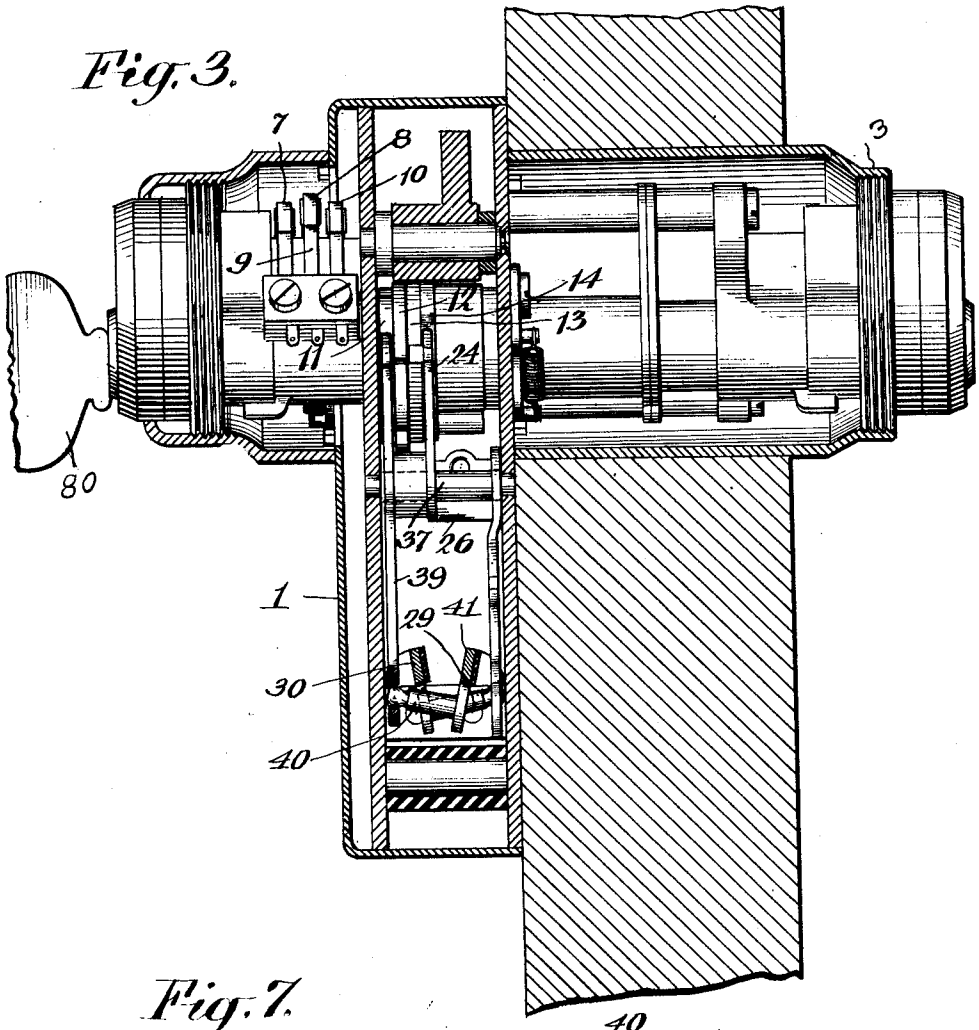
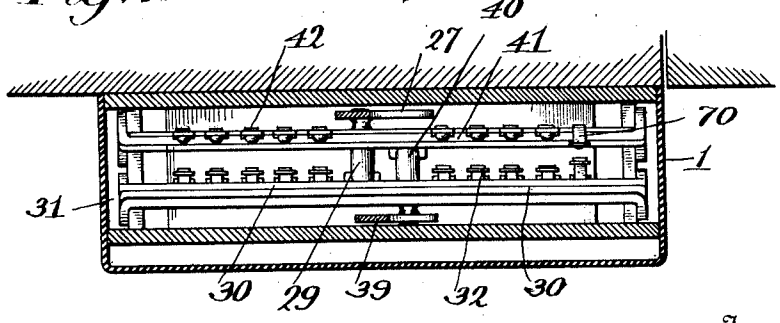


Fig. 7.



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6 SHEETS—SHEET 4.

Fig. 4.

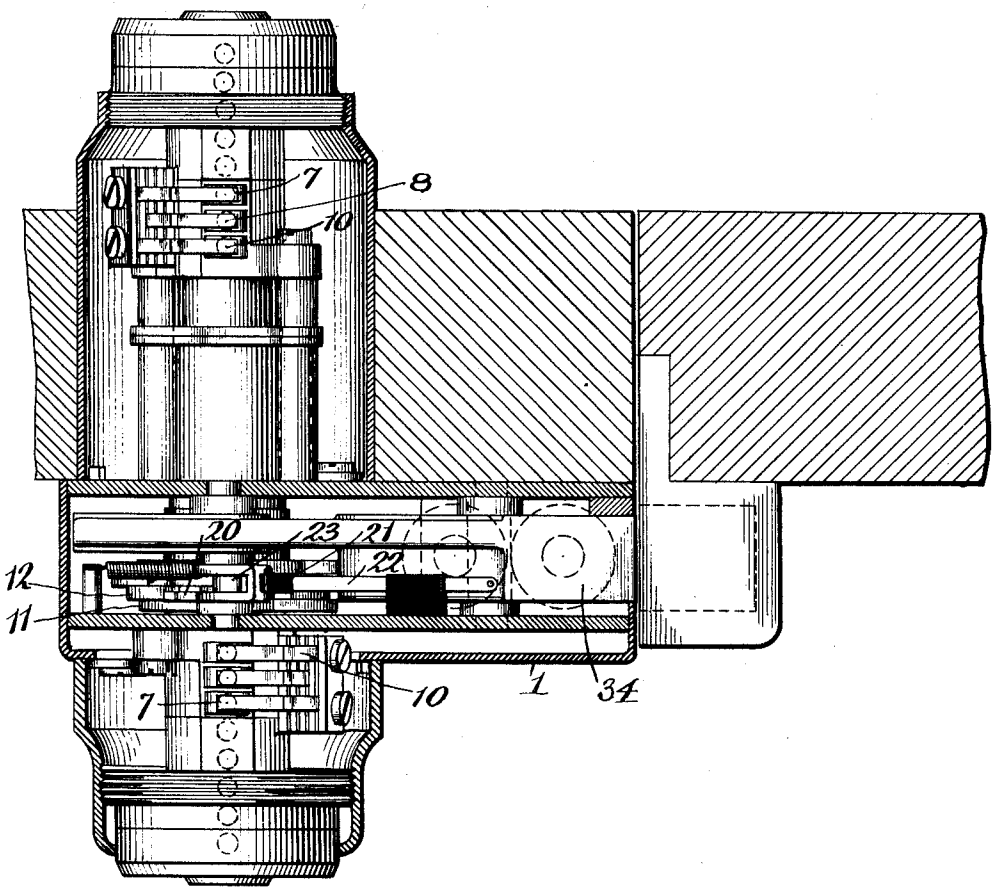
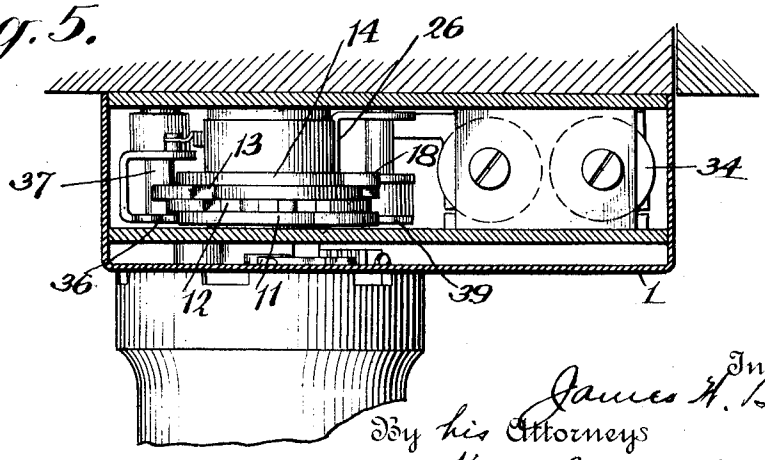


Fig. 5.



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6 SHEETS—SHEET 5.

Fig. 10.

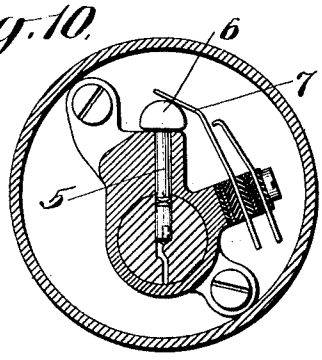


Fig. 11.

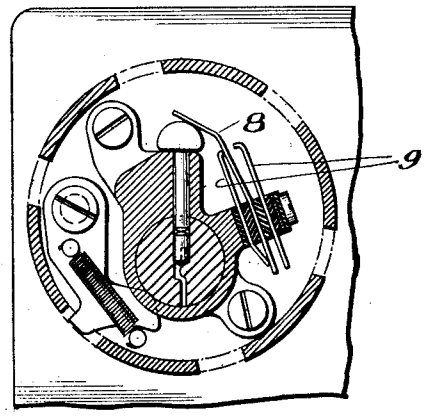


Fig. 12.

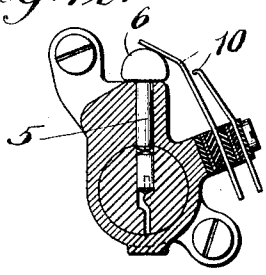


Fig. 13.

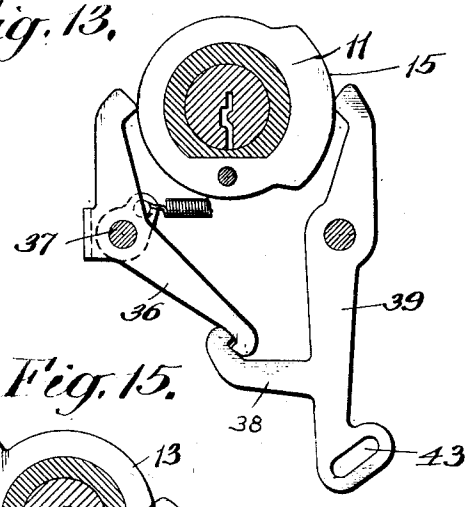


Fig. 14.

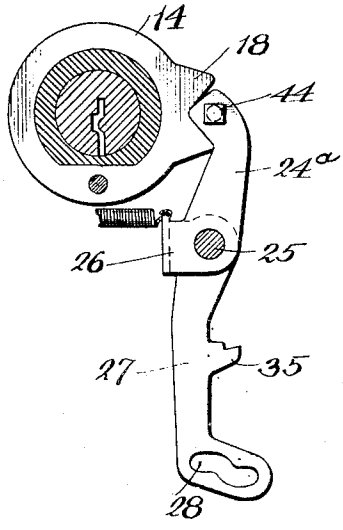
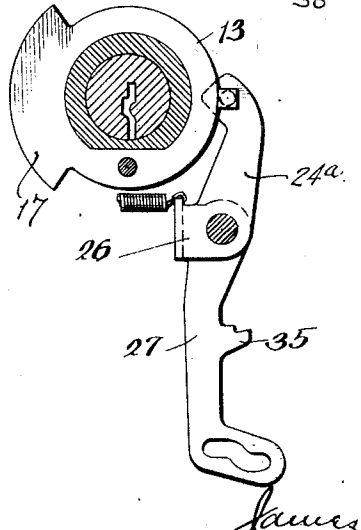


Fig. 15.



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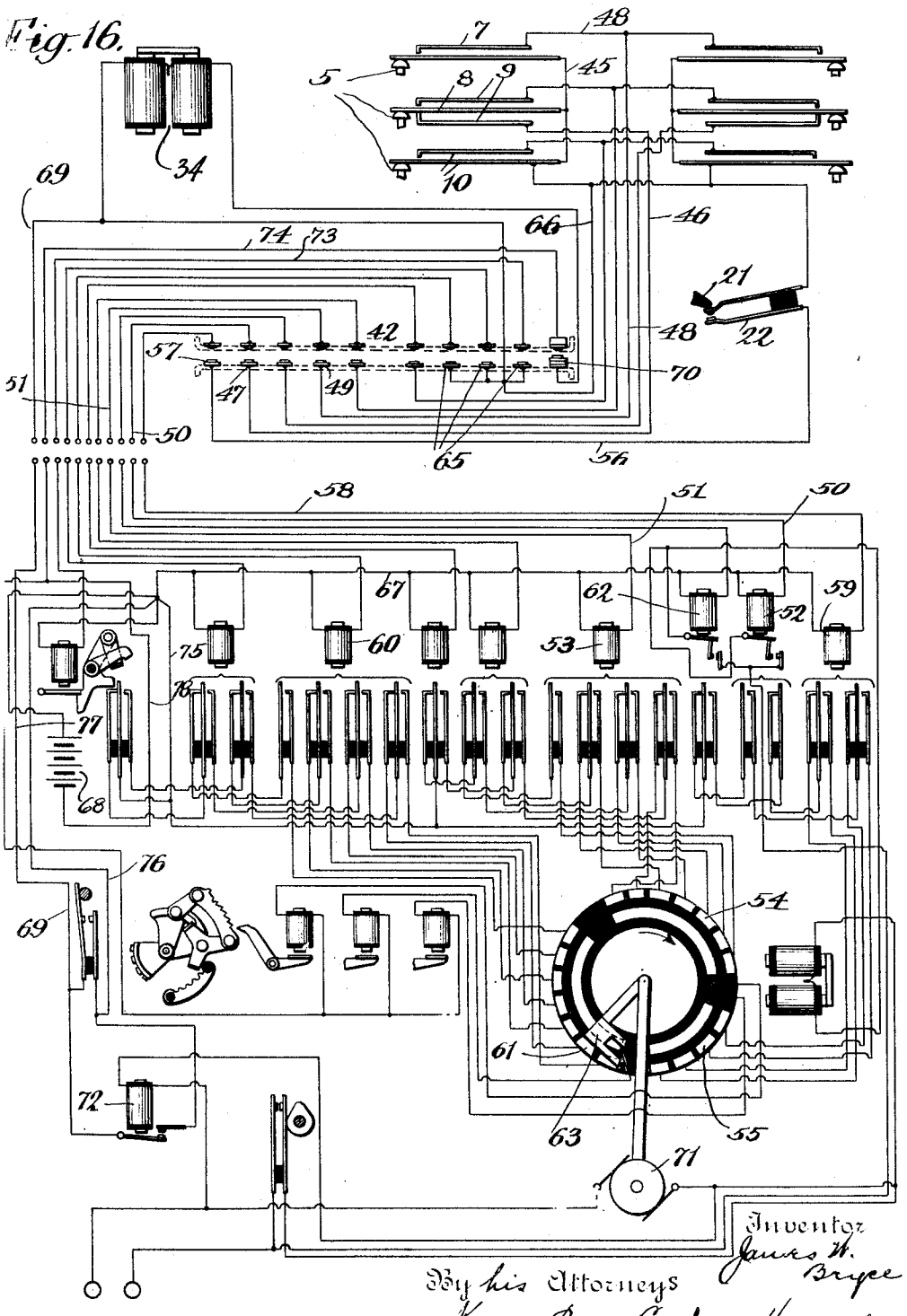
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6 SHEETS—SHEET 6.

Fig. 16.



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UNITED STATES PATENT OFFICE.

JAMES W. BRYCE, OF BINGHAMTON, NEW YORK, ASSIGNOR TO INTERNATIONAL TIME RECORDING COMPANY OF NEW YORK, OF ENDICOTT, NEW YORK, A CORPORATION OF NEW YORK.

RECORDING LOCK.

1,417,715. Specification of Letters Patent. Patented May 30, 1922.

Application filed June 26, 1920. Serial No. 391,972.

To all whom it may concern:

Be it known that I, JAMES W. BRYCE, a citizen of the United States, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Recording Locks, of which the following is a full, clear, and exact description.

The invention which forms the subject of this application for Letters Patent, is an improvement in recording locks. In the systems which involve these instrumentalities, one or a number of locks on the door or doors of a store, office or warehouse, are equipped with means which, operated by special keys, send to a recording device located at any desired more or less remote point, electrical impulses which operate to record, usually by printing, the particular lock operated; the key used; whether such key was inserted from the outside or the inside of the door or lock, and whether it was used for unlocking or for locking the door. In conjunction with the means for giving these indications, the recorders are usually provided with means for printing the exact time of the records and in some cases are designed to receive the autograph of the person who has used a key in the lock.

The mechanism which I have devised and which I shall hereinafter describe is one for accomplishing the operations enumerated above, but it is designed, constructed and operated to do this more certainly, rapidly and effectively than any other device of this character of which I am aware. Primarily the time element in my new system is its most distinguishing characteristic. In other words, in those systems as heretofore carried out, the recording means have been set up or adjusted by a succession of steps or by current impulses of varying strengths. The key, for example, upon insertion into a lock sends by suitable means, impulses to indicate whether it was inserted from without or from within; whether it was used to unlock or to lock the door, and subsequently, by other means successively, impulses to indicate the other items of information, so that a distinct and substantial interval of time was required for the complete operation, and it was generally necessary to maintain the transmitting and receiving devices in synchronous operation.

One of the main purposes of the present invention is to obviate this, which, in practice, has been found to be a positive objection to the system, and to effect the setting up of the transmitting means by a single operation and the printing or recording of all such items of information in the shortest possible interval of time. To this end I connect the lock or a plurality of locks with the recorder by means of a cable containing a plurality of conducting wires, and by the insertion and rotation of a key in the lock, circuits are established through one or more or all of such wires which operate to set up the recording devices to start in operation a recorder motor to print in the minimum of time, the set up record and to restore all parts to their normal condition.

The practical and complete solution of the problems involved in this system requires much more than the recording of a single lock and key, and demands the proper recording of a plurality, perhaps, of both, and to meet all practicable and commercial requirements therefore, I have designed the system for use with eight locks and eight different keys for each lock, for which purpose I require and use eleven separate wires or conductors forming circuits between the locks and the recorder, the locks being connected therewith in multiple. With these circuits I employ three contact controlling plungers on each side of a lock which are adapted, according to the peculiar conformation of the keys to set up permutations and combinations of the contacts that control certain recorder magnets for indicating any one of eight different keys, and in the recorder I use other magnets for indicating whether the key has been inserted from without or within, and whether to unlock or lock a door, all of which magnets are controlled by the circuits intermediate the locks and the recorder. In addition to the above I employ a series of contacts which are primarily set or adjusted to send permutations and combinations of impulses that control certain other recorder magnets which set up the means for indicating which of the series of eight locks has been operated.

Finally I provide non-interference means that will insure the operation of only one lock of the group or series at the same time, and means for controlling the operation of

the recorder motor, the printing mechanism and the like, and generally for securing the certain and efficient operation of the system as a whole.

In the accompanying drawings this invention is illustrated in the most practicable and efficient form which I have devised for carrying it out.

Fig. 1 is a view in elevation of the interior mechanism of the lock.

Fig. 2 is a central vertical cross-section of the lock.

Fig. 3 is a similar section of the lock casing, but showing the elements of the lock in elevation.

Fig. 4 is a horizontal section of the lock casing exhibiting the interior mechanism in plan.

Fig. 5 is a section on line 5—5 of Fig. 1, looking from below.

Fig. 6 is a section on the line 6—6 of Fig. 1.

Fig. 7 is a section on line 7—7 of Fig. 1.

Figs. 8 and 9 are enlarged sectional views of two different pairs of contacts shown in Fig. 7.

Figs. 10, 11 and 12 are vertical sections showing the first, second and third contact controlling plungers and contacts associated therewith.

Figs. 13, 14 and 15 are enlarged detail views of certain controlling levers operating in conjunction with the parts of the lock rotated by the key, and

Fig. 16 is a diagram of a complete system illustrating the circuit connections and relations of the parts of both lock and recorder.

The lock herein shown is of the well known Yale type, and, as best shown in Fig. 2, comprises a casing 1, adapted to be secured to or within the body of a door, and two horizontal cylindrical casings 2 and 3, with key holes on opposite sides of the door. Locks of this character are now well known in the art and require no detailed description beyond the statement that the key plungers 4 for controlling the rotary barrel are of the usual character, and in addition thereto I employ three other similar plungers 5 inside of each group as shown, and such plungers are adapted to be engaged and set according to the conformation of a prolongation of the key used.

Following now in the description of mechanism the order of operation, as far as possible, when a key 80 is inserted and turned in the lock—each plunger 5 has a rounded head 6. Figs. 10, 11 and 12 and above the latter are electrical contacts. Above the first plunger are two separated contacts 7 adapted to be brought together when the plunger rises; above the second are three contacts, the middle contact 8 being normally in engagement with the lower contact 9 but adapted by the raising of the plunger to be brought into engagement with the upper contact 9; and above the third plunger are two separated contacts 10 similar to those in Fig. 10. By the insertion of a key any one, two, all or none of the plungers, according to the shape of the key end, will be raised, thus establishing different permutations and combinations of circuit connections, the nature and purpose of which will be hereinafter described.

The key barrel, which is adapted to be rotated by a key inserted from either without or within, carries four disks 11, 12, 13 and 14. On the disk 11 there is one long cam or projection 15; on the disk 12 are three relatively long projections 16, and a high point or projection 19; on disk 13 is one long projection 17, and on disk 14 are two teeth or cam parts 18, all as shown in Fig. 1.

In the plane of the disk 12 is a pivoted full stroke pawl 20 having an insulating projection 21 adapted when the pawl is swung to the left to engage and close contacts 22. This pawl is engaged and turned by the high point or projection 19 when the key is turned in the lock. The shaft 23 on which this pawl is mounted extends through a slot in the bolt of the lock 24.

A key after its insertion may be turned through a limited angle without affecting any part of the recording device, but if it be turned to a greater angle, the pawl 20 drops, encounters a shoulder on one of the projections 16, and thereby locks the key against backward movement. Hence when any one has turned a key to a certain extent, he must turn it to the full extent to either lock or unlock the door before he can withdraw it from the lock, and in so doing will send a record of the operation which is printed by the recorder.

Assuming, therefore, that a key has been inserted, say for locking the door in which event it must be turned clockwise in Fig. 1, the first effect will be to set up a given permutation or combination of the key contacts 7, 8, 9, or 10. In the initial or normal position of the lock mechanism the two teeth or cam parts 18 on disk 14 embrace the pointed end of a lever 24^a, pivoted at 25. This lever has rigidly attached to it a U-shaped piece 26 from one side of which depends an arm 27 so that such arm will have a movement corresponding to any movement of the lever 24^a. As soon as a key is turned in the lock the high points 18 force back the end of lever 24^a and this rocks the arm 27 with the result that an inclined cam 28 in a lateral extension at the end of said arm is shifted relatively to a pin 29 which passes through said slot, and the end of said pin is lowered. This, as shown in Figs. 2 and 3, rocks a bar 30 in which said pin is set, carried

by arms which are pivoted on a shaft 31 and brings said bar against a series of ten spring contacts 32 forcing the same back toward a row of contacts 42. The parts temporarily remain in this position by the engagement of an extension of a pivoted armature 33, of an electro-magnet 34 in the lock case, with a stepped projection 35 on the arm 27, as shown in Figs. 1, 6 and 14.

The further rotation of the key clockwise brings the long cam 15 against the pointed end of a lever 36, pivoted at 37, and lying in the plane of the disk 11. The lower end of this lever has a hook that normally engages with the hooked extremity of an arm 38, extending laterally from a lever 39, pivoted on the same shaft as lever 24, and shown in detail in Fig. 13.

The lower end of said lever 39 has a lateral extension containing an inclined slot 43 and through said slot extends the end of a pin 40, Fig. 3, which is set in a swinging bar 41 similar to bar 30, and lying in front of the series of spring contacts 42, as shown in Figs. 2, 8 and 9. Normally, or while the lever 39 is engaged by the lever 36, the pin 40 is in the high part of the slot 43, and hence the contacts 42 are held by the bar 41 out of engagement with contacts 32, but when the lever 36 is engaged by the cam 15 the lever 39 is unlocked and the spring contacts 42 pressing against the bar 41 force said bar forward and snap onto the contacts 32.

When the key is turned to its full extent the cam 15 engages lever 39 which lies in the plane of disk 11 and forces it back, whereby the pin 40 travels to the high point of the slot 43, and the contacts 42 controlled by said pin are thrown out of engagement with contacts 32. At the same time lever 39 is engaged and latched in this position by the hooked end of lever 36. It will be observed, however, that during every period while a key is being turned either for locking or unlocking a door, and the backward movement of a key will manifestly have the same general effect as its forward movement, all of the contacts 32 and 42 are for a definite period brought together, and the effect of this will be explained by reference to Fig. 16 in the consideration of which only so much of the recorder shown will be described as is necessary to an understanding of the invention upon which this application is based, and which, as above stated, resides in the lock.

By the insertion of the key, as has been shown, one or more or all or none of the contacts controlled by plunger 5 are shifted, and to take any special case for purposes of illustration, assume that contacts 7 alone are brought in engagement. From the lower contact a wire 45 runs to the middle contact 8 of the second set. This contact being normally in engagement with the lower contact 9, the circuit is continued by wire 46 to that one of contacts 42 which is numbered 47.

The wire 48, which leads from the upper contact 7, leads to that contact 42 which is numbered 49. These two of the contacts 42 are rendered active and when these contacts engage contacts 32, circuits to the recorder are completed through cable wires 50 and 51. One of these circuits includes a magnet 52 which, in addition to its other functions, closes a circuit that starts in operation the motor in the recorder which is adapted to then make one revolution, and the other circuit 51 includes a magnet 53, which together with magnet 52 controls a combination of circuits that will render active that one of seven contacts 54 on the commutator of the recorder which corresponds to the particular key used, and that one of four contacts 55 of the same commutator which corresponds to say the inside insertion of the key. Again the wire 45 also goes to one of the contacts 22 from the other of which runs wire 56 to contact 57. This connects with cable wire 58 which runs to magnet 59, which operates when energized by the locking movement of the key to render active another of the four contacts 55 which corresponds to the locking operation of the door.

Finally, in each lock, the lower contact 7, the middle contact 8 and the lower contact 10 are connected by a wire 66 with the three lock indicating contacts 65, and whatever the position of the key plungers 5, the circuit through wire 66 will always be complete. In each lock one or more or all or none of the contacts 65 are therefore bent back or removed, so that when the groups of contacts 32 and 42 are in engagement one of the possible combinations or permutations of connections capable of being established by the three contacts 65 is set up, and this sends current to one or more or none of the magnets 60 in the recorder energizing them and thus setting up the combination that renders active that one of seven commutator segments 61, which corresponds to the particular lock operated.

None of the key controlled contacts 7, 8, 9 and 10 can be operated without closing the circuit through one of the two magnets 52 and 62 and these magnets control the recorder motor. When, therefore, a key is inserted and turned it sets up the combination that renders the appropriate commutator segments active so that when the brush 63 of such commutator is rotated over the segments by the motor the proper circuits will be closed that record the data corresponding to the active segments. Recorders capable of accomplishing this result are or for the purposes of this case may be assumed to be known, and hence no further descrip-

tion of these constructions or mode of operation is required.

By following the contacts and circuits shown in Fig. 16, any other condition of the plungers and contacts established by a key will be readily traced, and but one more example need be given. Assume, then, that a key is used which moves none of the plungers. The middle contact 8 is normally in engagement with the lower contact 9, and hence the circuit is continued to contact 47, and thence to magnet 52 as has already been described. From magnet 52 the path of the circuit is through wire 67, to one pole of the battery 68, and back to the middle contact 8 and thence lock a magnet 34 and back to the battery through wire 66. In this way the recorder is operated to record a key, a lock, locking or unlocking, and inside and outside insertion of a key, even though the particular key moved none of the plungers 5, and even though the direction of turning of the key does not result in the closing of contacts 22.

Whenever a key is fully turned in a lock, the lever 21 is thrown back and locked in this position by the armature 33 of the magnet 34. But assume that at the moment when a person starts to operate one lock some other of the group of locks connected with the recorder is being operated, then it will be impossible to turn the key in the said one lock beyond a certain point until the said other lock has been fully locked or unlocked. This is accomplished by the use in each lock of a magnet 34 which is in a circuit 69 and which is completed in the lock by any turning movement of a key, and in the recorder by the starting of the motor therein.

It has been shown that when a key is inserted and turned the lever 24 and cam 28 is shifted and the bar 30 controlling contacts 32 is forced back by its pin 29. One of the contacts at the right hand end of the groups shown in Fig. 16 and marked 70 in this figure and also Fig. 9 is set closer to the opposite contacts so as to actually engage with its opposite contact as soon as the lever 24 has been forced back and before any other operation by the lock has been performed. If at such a movement as is now under consideration, therefore, the circuit of the recorder motor 71 has been completed by any other lock, an interlocking magnet 72 in this circuit in the recorder is energized, and this magnet closes the circuit through wires 76 and 77 from one pole of the battery and wires 69, 73 and 78 back to the other pole. The magnet 34 will therefore be energized and the lever 27 released by its armature.

As the key is turned thereafter a pin 44 set in lever 24 and lying in the plane of the disk 13 is engaged by the long projection 17 on that disk and the key is therefore locked and it cannot be turned further until the operation of the other lock is completed, when magnet 34 will be demagnetized. Hence when this condition is met with the user of a key must wait until his lock is free, then turn his key back to reset the lever 24, when he can operate his lock without hindrance.

A feature of this lock which may be inferred from the above description but which has not been specifically set forth in the following: In the normal operation of the lock, the turning of the key steadily in one direction causes the contacts to be brought together and then separated. The construction is such, however, that should a key be left at a position midway of its travel, the contacts are closed, but the operation of the recorder sends an impulse back to the magnet in the lock which raises its armature and trips the catch 35, thus releasing one set of contacts and opening all the circuits. The purpose of this is to prevent anyone from partly turning the key in the lock and permitting the recorder to keep on operating continuously as it would do if this special means were not provided to prevent it.

As I have indicated above I have designed the lock herein described to meet the case where eight locks and eight keys for each lock are provided for, and this involves at least three plungers, as distinguished from lock plungers on each side of the lock. A less number of locks and keys would require fewer plungers, but the fundamental idea in this regard is to provide for the recording of any one of a large number of keys and locks by as few circuits and as few parts as possible. This, as I have shown, is accomplished by setting up permutation and combinations of a limited number of circuit connections.

It will be observed that the lock above described has very few and extremely simple parts for accomplishing the purposes of this invention. These parts are not subject, moreover, to derangement or displacement, which is not true of the devices heretofore used, especially when they are subjected to violent shocks and jars such as may result from the hammering of the door. All problems of synchronous action between the lock and the recorder mechanisms are entirely avoided, and so long as the connecting or line circits remain intact, the system is operative and not likely to get out of order.

The recorder which I use has been specially designed for this system and it will be described in detail in a separate application. In the present case it is shown and described only so far as is necessary to set forth in a general way its functions in relation to the operation of the lock itself.

What I now claim is:

1. In a recording lock the combination

with keys adapted to operate the same but otherwise having special conformation, of a series of key tumblers or plungers adapted to be moved or set in different permutations and combinations by the insertion of a key, circuits controlled by said plungers and running to a recorder, normally separated contacts in said circuits and means for closing the same controlled by the turning of a key in the lock.

2. In a recording lock the combination with key-controlled mechanism of circuits running to a recorder, contacts in said circuits which are normally separated, means controlled by the turning of the key in the lock for simultaneously bringing said contacts together, means for rendering certain of a limited group of said contacts inoperative whereby permutations and combinations of said group of circuits may be set up in the various locks to indicate and record any one of a series of said locks that may be operated.

3. In a recording lock the combination with a series of key tumblers or plungers adapted to be moved or set in various permutations and combinations by an inserted key, circuits controlled by said plungers that when brought into action thereby indicate the particular key inserted and such other data as whether the key was inserted from without or within, or whether it was used to unlock or lock the lock, and other circuits adapted to be brought permanently into action in various permutations and combinations to indicate the particular lock, and means for closing all of said circuits to a recorder operated by the turning of a key in the lock.

4. In a recording lock the combination of a limited number of circuits running therefrom to a recorder, and means in said lock for rendering active and closing said circuits in various permutations and combinations by the insertion and turning of a key to indicate any one of a plurality of keys used, any one of a plurality of locks operated and such other data as to whether the key was inserted from without or within or whether it was used to unlock or lock the lock.

5. In a recording lock the combination with a series of key plungers adapted to be moved or set in various permutations and combinations according to the key inserted in the lock of circuits controlled by said plungers, normally separated contact points in said circuits, a rotary lock barrel having cams and levers operated by said cams to close said contacts when the key is turned and thereby complete the key controlled circuits to a recorder.

6. In a recording lock the combination with a rotary barrel and levers controlled by cams thereon, a series of circuits leading to a recorder and normally separated contact points therein adapted to be brought together by said levers when a key is turned in the lock, a series of key-controlled plungers and contacts in certain of said circuits adapted to be operated in various permutations and combinations by said plungers according to the key inserted in the lock, and certain other circuits adapted to be rendered inoperative in various permutations and combinations, whereby when the said contacts are brought together all of the circuits that have been brought into active condition will be completed by the recorder to indicate the lock operated, the key used and whether inserted from without or within.

7. In a recording lock system the combination of a lock and a recorder, contacts in the lock adapted to be closed by a partial and opened by a complete movement of the key for operating the recorder, and means in the recorder for sending back to the lock a releasing impulse which opens the contacts in case the key has been only partially turned.

In testimony whereof I hereto affix my signature.

JAMES W. BRYCE.