

(No Model.)

2 Sheets—Sheet 1.

S. L. G. KNOX.

DIFFERENTIALLY ACTUATED TRIPPING MECHANISM.

No. 578,569.

Patented Mar. 9, 1897.

FIG. 1.

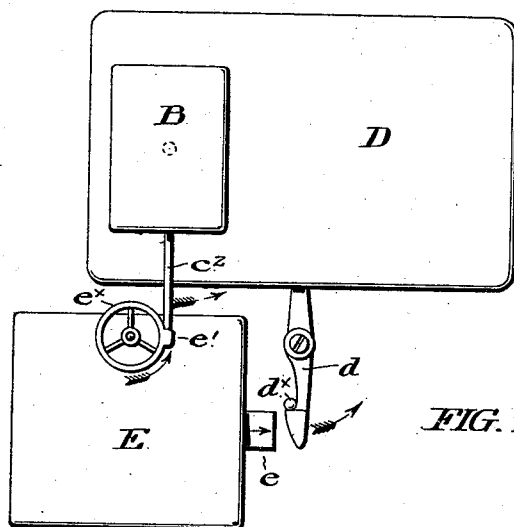
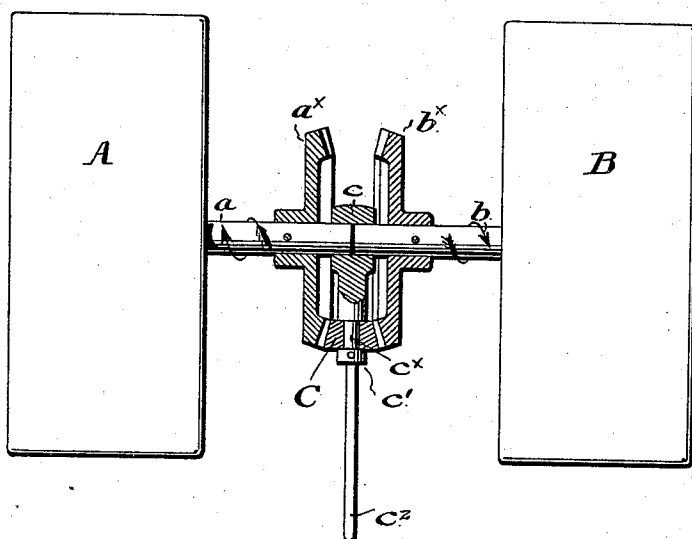


FIG. 2.

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(No Model.)

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FIG. 3.

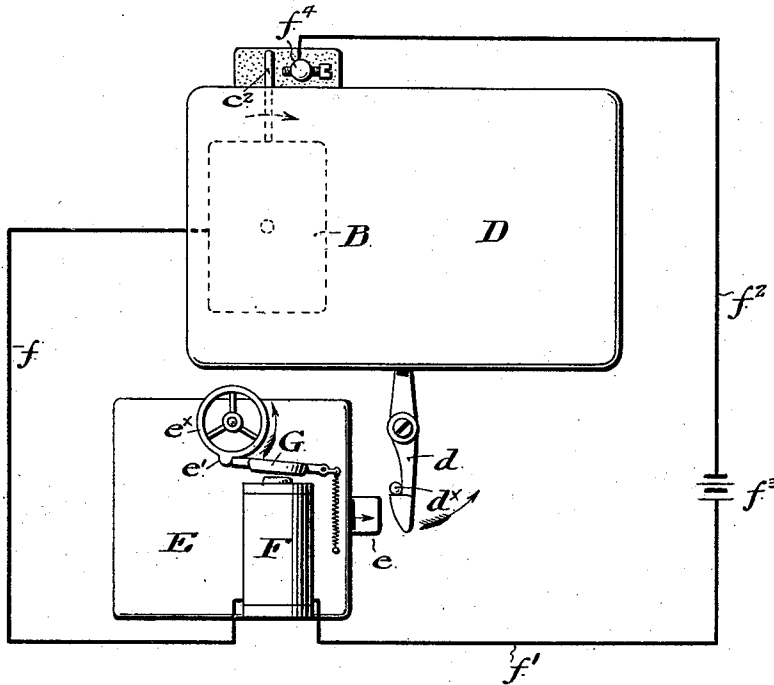
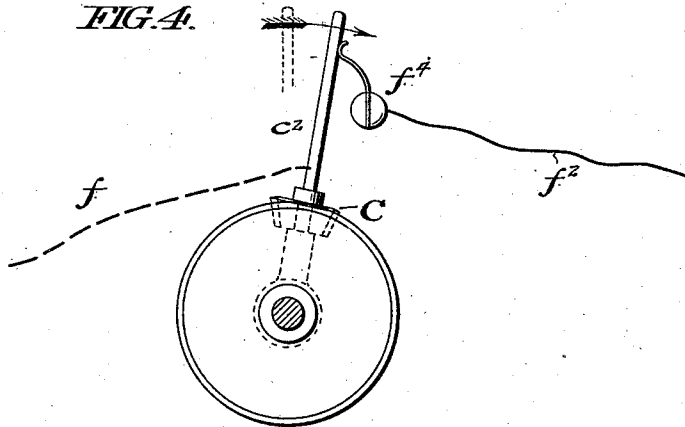


FIG. 4.



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UNITED STATES PATENT OFFICE.

SAMUEL L. GRISWOLD KNOX, OF NEW YORK, N. Y.

DIFFERENTIALLY-ACTUATED TRIPPING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 578,569, dated March 9, 1897.

Application filed June 18, 1896. Serial No. 595,992. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL L. GRISWOLD KNOX, a citizen of the United States, residing at New York city, in the State of New York, have invented certain new and useful Improvements in Differentially-Actuated Tripping Mechanisms, of which the following is a specification.

My invention, generally stated, comprehends a group or assemblage of differentially-related members, by the conjoint operation of which a tripping action, performed by a selected instrumentality, may be effected by the movement of a given member of the group, occasioned by the differential movement of one or two other differentially-related members of said group, and acting upon or in relation to the said instrumentality.

The assembled devices which compose my mechanism as an entirety are, as will be readily understood, susceptible of various applications in the arts,—as, for instance, the regulation and control of the speed of an independently-driven motor, or independently-driven mechanism generally, capable of performing work which the mechanism preferably constituting my invention is itself too weak to perform,—but are of peculiar applicability in connection with time locks for safes, in which latter application I have particularly illustrated them and described them hereinafter.

In the application of my invention to time locks for safes and vaults, the result which I have in view is the tripping and consequent release of the bolt-controlling mechanism, in the event of its associated time lock mechanism stopping, or failing from any cause whatever, to perform its normal function.

In other words it is my aim to so couple or associate the devices which compose my invention with those composing and controlling the ordinary safe time lock, that in the event of the failure of the time lock mechanism to effect the release of the safe door at the desired time, they will occasion the performance of its function.

The release of a hook lever, or other retaining device, of any preferred character, being the ultimate object to be performed by my devices in their preferred application to a time lock, that release may obviously be oc-

casioned either through mechanical or electrical connections between the hook lever and the devices which compose my invention,—and in the accompanying drawings I have, therefore, typically illustrated my devices as applied to a typical safe time lock by means of both mechanical and electrical connections.

In the drawings,

Figure 1 is a view partially in elevation and partially in central vertical section, of a pair of independently actuated but associated motors of any preferred character, and also of an instrumentality connective of said motors and being a typical differential gear.

Figure 2 represents in side elevation the mechanism represented in Fig. 1 as applied by means of mechanical connections to a hook lever retentive of the "automatic" of a safe time lock.

Figure 3 is a similar view of a type of variation of the device represented in Fig. 2, wherein the connection through which the release of the hook lever is effected, is electrical and not mechanical.

Figure 4 is a fragmentary elevational detail of a portion of the differential gear of the mechanism represented in Fig. 1, included in an electrical connective circuit.

Similar letters of reference indicate corresponding parts.

In the drawings,

A represents a motor of any preferred character for the actuation of a time lock; which I term the lock motor,—and B designates an independently actuated motor of any preferred character, incapable, however, of performing the work of the lock motor, which I term the auxiliary motor.

Assuming, to simplify the description, that each of the foregoing motors is a clock movement,—a, b, represent respectively the main arbors of said respective clock movements, which are assumed to be disposed in alignment, and to be normally driven in opposite directions at the same speeds.

Whatever, however, their character, or however they may be driven, these arbors are near their outer ends fixedly provided each with a counterpart beveled toothed spur-wheel, of which that applied to the lock motor arbor a is designated a^x, and that applied

to the auxiliary motor arbor b , b^x , and which are oppositely disposed so as to face each other at a little distance apart.

Upon the ends of the respective arbors a and b , which, as stated, are in alinement, are preferably of the same diameters, and almost abut, there is journaled a hub-like device which I term the pinion carrier c , upon a radial extension or arm of which, I term the pinion journal c^x , is journaled an idle beveled toothed pinion in mesh with the teeth of both beveled spur wheels $a^x b^x$.

Extending radially beyond a collar c' , which conveniently secures the pinion in position with respect to its carrying journal, and being a continuation of the pinion-carrying arm c is what I term a pinion bar c^2 , which, being an extension of the same, has its axis in the hub of the pinion carrier upon the meeting extremities of the arbors of the two motors.

Obviously, when the arbors and their applied beveled spur-wheels are rotating at equal speeds in opposite directions, the pinion is simply spun idly upon its journal by and with respect to said beveled spur-wheels, and the pinion-carrier and bar occupy in radial relation to said arbors and beveled spur-wheels a given stationary position.

When, however, either arbor and beveled spur-wheel stops or rotates at a speed slower than that of its counterpart neighbor, a given rotation will, as by a rack, be imparted to the pinion and will occasion its own travel and that of its carrier and bar circumferentially with respect to its axis and in the direction of the moving, or the more rapidly moving, beveled spur-wheel.

The foregoing devices, it is almost unnecessary to state, constitute a typical differential gear of a character not novel with me, but which, as an entirety, forms a member of the fundamental combination in which my invention primarily resides,—and which, as already indicated, comprehends the assemblage of two definitely-related motor members or motors the normal opposite and equal movement of which occasions no work-performing movement of the third or differential gear member, but the differential movement of which occasions the work-performing movement of said third member, for the purpose of, through it, accomplishing the end in view.

It is to be understood that while I prefer the particular differential gear illustrated and described, it is not the only differential gear,—in the sense of a mere mechanical movement of that character,—which may be employed as connective of and as operated upon by the motors.

Before referring to the accessory mechanisms with which my combined devices as above set forth are intended to operate,—it is proper to explain that as time locks, generically considered, are ordinarily constructed, there is contained within the safe or vault a time lock mechanism which at the expiration of a predetermined period is adapted to push

or pull a lever in turn adapted to trip a spring forming a part of or connected with a mechanism popularly known in the art as an “automatic,” which throws back the bolts and thereby unfastens the door,—and that my improvements are adapted to be applied to or connected with the motive mechanism of the time lock.

D, in Figure 2, typically represents a safe time lock of any preferred character, and E a spring hammer mechanism, likewise of any preferred character, the outward throw of the hammer e of which is normally prevented by the locking action of a typical controlling-wheel e^x which is provided with a peripheral stop-lug e' ,—and the outward throw of which hammer upon the release of the controlling-wheel is adapted to occasion the release of a hook lever d normally engaging and retaining the stud d^x , and the trip or release of which is, by the stroke of the hammer, adapted through any preferred and well-known mechanism to operate the “automatic” of the lock and effect its release for action.

It is proper to state that the spring hammer mechanism referred to forms but a component of a tripping mechanism of the character discussed, or of any preferred character, adapted to operate upon the “automatic” of a time lock, and that the entire assemblage and character of these devices last above described is but one of selection for which many equivalent devices may, at the will of the constructor, be substituted.

I illustrate and describe them as typical merely of a tripping mechanism, in order that a preferred application of my invention to a time lock may be understandingly described.

Assume now that in the typical illustration of Figure 2, the lock motor, the auxiliary motor, and their connective differential gear, are so applied relatively to the time lock and spring hammer mechanism, as that the pinion bar c^2 of the differential gear will, in its normal position, as to its free end operate tangentially against the stop-lug e' of the controlling wheel e^x and prevent the release of that wheel,—it is obvious that, in the event of the stoppage of the lock motor, the pinion bar will, through the operation of the differential gear above described and the continuing operation of the auxiliary motor, be deflected in the direction of the arrow applied to it in Figure 2, with the result that its free end will move away from the stop-lug to permit of the actuation of the spring hammer mechanism and thereby of the hook lever of the “automatic” of the bolt work.

In Figures 3 and 4 I have illustrated a means of applying my invention to a time lock, through the medium of typical electrical connections between the differential gear and the tripping mechanism.

In this application the pinion bar c^2 of the differential gear, is in circuit through the conductor f , with an electromagnet F, from which

the circuit is continued, through the conductors f' , f^2 and the battery f^3 , to a contact point f^4 , of any preferred character, within range of but not in contact with which the pinion bar normally is.

Upon the stoppage of the lock motor, the pinion bar is, through the continuing action of the auxiliary motor and the differential gear, assumed to be moved in the direction of the arrows applied to it in said Figures 3 and 4, until its stoppage by abutting against and making electrical contact with said contact point closes the circuit, with the result that the magnet is energized, and a suitably-constructed and applied, preferably spring-controlled pivoted, armature lever, such for instance as G in Figure 3, which as to its free end normally abuts tangentially against the stop-lug of the controlling-wheel of the hammer mechanism, is drawn to the magnet, with the result of releasing the controlling wheel and thereby permitting of the actuation of the said mechanism as an entirety, as before explained.

The foregoing circuit connections and their associated elements are, as is obvious, typical merely of the application of an electric connecting mechanism as an intermediate means for the association of the hook lever releasing mechanism with the differential gear motor mechanism.

Having now described the devices in which my improvements reside, and also varied typical applications of them to a safe time lock, it will be understood that,—as there is no likelihood of both motors failing to act at the same time,—my auxiliary motor and differential gear applied in connection with the lock motor of a time lock, afford an efficient safeguard against the injurious results which arise when a time lock motor for any cause fails to act.

I have not deemed it necessary to illustrate in the drawings the application of the invention to the control of the relation of speed of the auxiliary motor and an independently driven motor or machine of any assumed character,—because, as is obvious, the lock motor may itself be assumed a type of an independently driven machine the speed of which the auxiliary motor and the differential gear are adapted to control,—the pinion bar being simply, for instance, in the manner above described operatively connected up in a circuit of the controlled machine if an electric motor,—or, in any preferred manner, to admit or shut off the motive fluid in the case of a mechanical prime mover,—or to release or hold the weight or spring, when the controlled machine is mechanically and not electrically driven, and to thereby cut off the source of power when the regulated machine runs at too high a speed, and to restore the power when the machine from loss of power slows down.

By my invention, therefore, a motor of any desired power can, under the control, for in-

stance, of a clock movement, be made to make any desired number of revolutions in a given period; or motors in different parts of a machine, which it is desired should have the same speed, but which cannot conveniently be geared together, can be made practically isochronous.

Having thus described my invention, I claim—

1. In combination,—two independently actuated motive mechanisms normally driven in opposite directions at the same speed,—a normally idle differential gearing connective of said two mechanisms, which is thrown into action by a variance of the speed or the stoppage of either mechanism,—and a tripping mechanism connected with and operated by the action of the differential gearing,—substantially as and for the purpose specified.

2. In combination,—two independently actuated motive mechanisms normally driven in opposite directions at the same speed,—a normally idle differential gearing connective of said two mechanisms, which is thrown into action by a variance of the speed or the stoppage of either mechanism,—a tripping mechanism connected with and operated by the action of the differential gearing,—and a safe time-lock mechanism the actuation of which the operation of the tripping mechanism occasions,—substantially as and for the purpose specified.

3. In combination,—two independently actuated motive mechanisms having each a driven shaft, and the shafts of both of which are alined and normally rotated in opposite directions at the same speed,—a normally idle differential gearing connective of said two shafts, which is thrown into action by the differential movement of either, and which is composed of a pair of counterpart beveled spur-wheels respectively affixed to the respective shafts, and of a beveled pinion engaged with both wheels and mounted upon a pinion-carrying-bar the axis of which is coincident with the common axis of the shafts, and which is adapted to be circumferentially shifted by the differential movement of either wheel,—and a tripping mechanism connected with and operated by the action of the pinion-carrying-bar of said differential gearing,—substantially as and for the purpose specified.

4. In combination,—two independently actuated motive mechanisms having each a driven shaft, and the shafts of both of which are alined and normally rotated in opposite directions at the same speed,—a normally idle differential gearing connective of said two shafts, which is thrown into action by the differential movement of either, and which is composed of a pair of counterpart beveled spur-wheels respectively affixed to the respective shafts, and of a beveled pinion engaged with both wheels and mounted upon a pinion-carrying-bar the axis of which is coincident with the common axis of the shafts, and which is adapted to be circumferentially shifted by

the differential movement of either wheel,—
a tripping mechanism connected with and op-
erated by the action of the pinion-carrying-
bar of said differential gearing,—and a safe
5 bolt work mechanism the actuation of which
the operation of the tripping mechanism oc-
casions,—substantially as and for the pur-
pose specified.

In testimony that I claim the foregoing as
my invention I have hereunto signed my name to
this 13th day of June, A. D. 1896.

SAMUEL L. GRISWOLD KNOX.

In presence of—

JAMES C. KNOX,
MARY CONLEY.