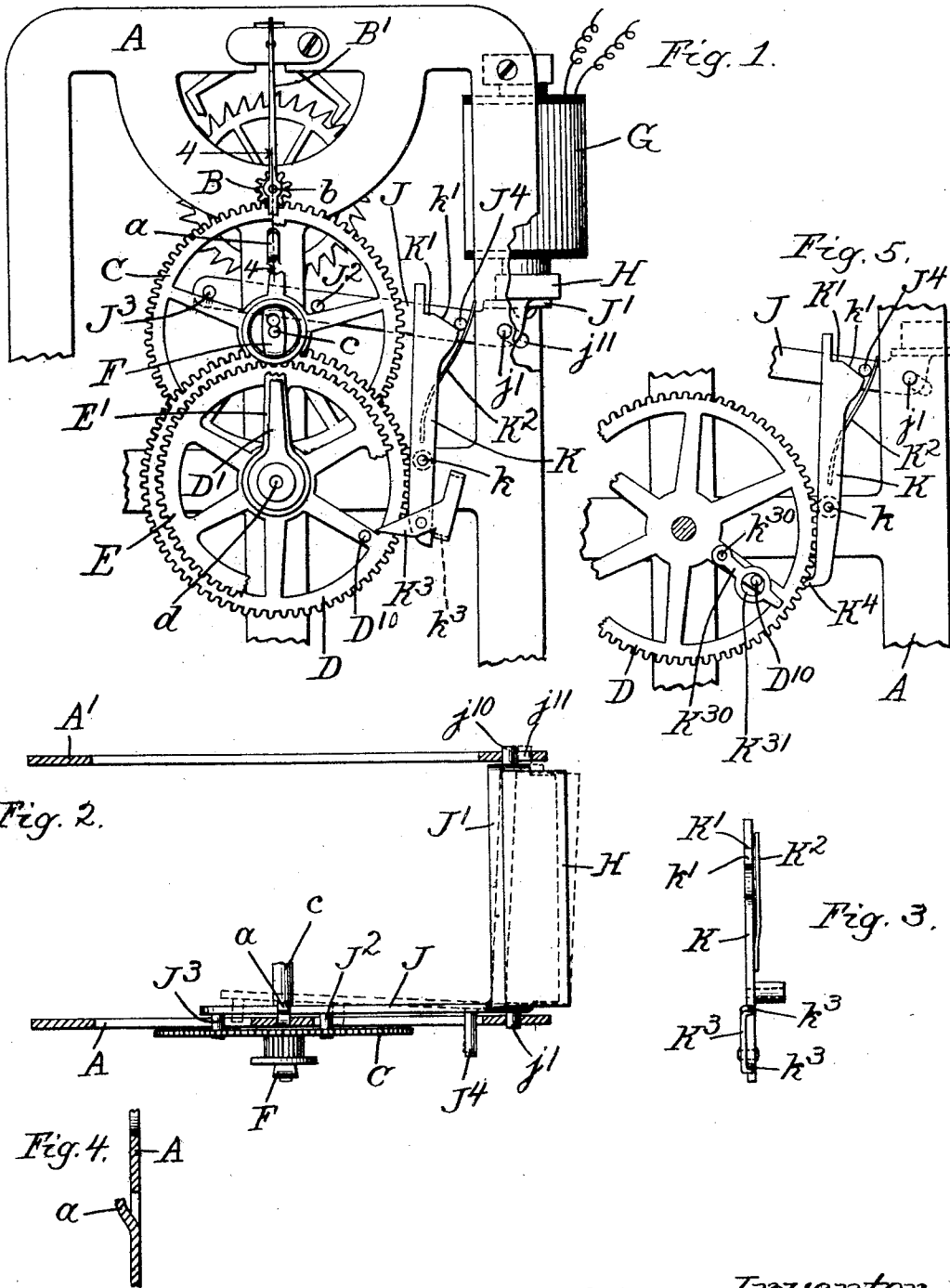


(No Model.)

C. M. CROOK.
ELECTRIC CLOCK SETTING MECHANISM.

No. 578,976.

Patented Mar. 16, 1897.



Witnesses.

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UNITED STATES PATENT OFFICE.

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ELECTRIC CLOCK-SETTING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 578,976, dated March 16, 1897.

Application filed January 11, 1897. Serial No. 618,805. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. CROOK, a citizen of the United States, residing at Elgin, county of Kane, and State of Illinois, have invented certain new and useful Improvements in Electric Synchronizing Mechanism for Clocks, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to devices for synchronizing clocks, connected in a system with a central or controlling clock, by which all the clocks in the system are synchronized or set in agreement by means of an electric circuit controlled by said central clock.

It consists of details of construction set forth in the claims.

In the drawings, Figure 1 is a front elevation of a portion of a clock mechanism. Fig. 2 is a detail sectional plan of the armature and lever connected therewith, which are shown in relation with the wheel upon which the synchronizing action is performed, the clock-frame being shown in section through the bearings of said wheel and armature. Fig. 3 is a detail edge elevation of the locking-lever. Fig. 4 is a detail section of the frame at the plane of the line 4-4 on Fig. 1. Fig. 5 is a detail elevation showing a portion of the synchronizing mechanism modified in respect to the locking device.

A is the forward frame-plate; *b*, *d*, and *c*, the staffs, respectively, of the seconds-hand *B'*, minute-hand *D'*, and intermediate wheel *C*.

B, *C*, and *D* are wheels in the train connecting said hands, and *E* is the wheel in the same train, whose staff, (not shown,) being a sleeve of customary form, carries the hour-hand *E'*. The principal train, with which this train is frictionally connected, may be of usual type and is not shown. The device for frictional connection is partly shown on the wheel *C*, consisting of the locking-spring *F*, which need not be further described, all that is necessary for the purpose and understanding of this invention being that it should be understood that the train shown is frictionally connected with the principal train by the connecting of the wheel *C* with its staff *c*, which

frictional connection is effected by means of the locking-spring *F*.

G is the synchronizing-electromagnet.

II is the armature. This armature is mounted on the lever *J*, which is fulcrumed on the frame, the lever having the portion *J'* extending across from the front plate *A* to the back plate *A'* and provided with trunnions *J'* and *J''*, which take in the front and rear plates *A* and *A'*, respectively. The lever-arm *J* extends from the fulcrum of the lever across toward the left beyond the front plate and is provided with two forwardly-projecting studs *J²* and *J³*. These studs are adapted to protrude through the openings in the front plate, one at the right and the other at the left of a fore-and-aft plane through the vertical staff *c*.

The bearing in the plate *A'* for the rear trunnion *J''* of the armature-lever *J* is slotted or elongated in a direction obliquely downward and outward—that is to say, to the right, viewing it from the forward side—so that the position normally assumed by the armature and lever under the action of gravity is that shown in dotted line in Fig. 2, the armature being oblique to the plane of the axes of the magnet-poles and also oblique to the horizontal plane in which said poles terminate—that is, the rear end of the armature drops downward and outward under the action of gravity, causing the lever-arm *J* to extend from its fulcrum obliquely rearward as it extends over toward the left behind the plate *A*, this position being shown in dotted line in Fig. 2. At this position, which is the position assumed when the magnet is deenergized or neutral and does not attract the armature, the studs *J²* and *J³* do not project into the plane of the wheel *C* and do not in any manner affect the action of the train. When, however, the magnet is energized and the armature is lifted into contact with the magnet-poles; the rear trunnion *J''*, traveling upward in the slotted bearing *J''*, comes into the position shown in full line in Fig. 2, causing the lever-arm *J* to extend in a plane parallel with the plate *A* and to thrust its studs *J²* and *J³* forward past the plane of said plate and into and across the plane of rotation of the wheel

C. This movement takes place substantially simultaneously with the rocking movement of the lever about its fulcrum caused by the upward movement of both the forward and rear end of the armature, so that being first thrust forward through the wheel C the studs are carried downward with the lever-arm J and collide with the spokes of the wheel below them, respectively, coming to rest when the armature reaches the limit of its movement toward the poles, which, being an unvariable position, brings the wheel C to an unvariable position—to wit, that shown in Fig. 1—wherein the studs J^2 and J^3 are upon the spokes, respectively, which were next below them on opposite sides of the vertical plane of the axis of the wheel at the instant when the synchronizing action caused by the energizing of the magnet occurred. The movement which will be given to the wheels by the contact of the studs J^2 and J^3 with its spokes depends upon the variation of the position of the wheel at that instant from the position to which it would be forced by such contact of the studs with the spokes, this position being the true position at the instant of synchronizing—to wit, the position which the wheel should occupy at twelve o'clock m., for example, if that is the hour for synchronizing—all of the hands being in line. In so far as the wheel varies from this position, being either faster or slower, it will be moved, thus correcting the variation of the clock from the true time.

When the clocks of a system designed to be synchronized together are used in such situations as permit the employment of a telegraph-line to be used as the connecting-circuit—as, for example, in the case of clocks of the several stations of a railroad—it is desirable to avoid the necessity of constructing an independent circuit, and for this purpose it is customary to connect the clocks by proper switches with the telegraph-line for a very short time about the time of synchronizing, the line being for that time held out of other use. If after the synchronizing action has occurred the operator in charge neglects to disconnect the clock, an impulse will be experienced by the armature at every closing of a telegraph-key in the ordinary use of a line for sending messages, and in the absence of any device to prevent such a result the clock would be reset at every such impulse back to twelve o'clock, thus defeating the synchronizing action which was performed at the proper time. Such a result is avoided in my invention by the use of the locking-lever K, which is fulcrumed on the frame at k , extends up past the lever-arm J, and has a shoulder K' , affording a positive seat for a stop-pin J^4 , provided on the lever-arm J, said lever-arm being locked against the movement which would be imparted to it by the magnet attracting the armature when the pin is thus lodged on the shoulder. The lever normally, both by gravity and by the action of the

spring K^2 , which bears against the pin J^4 , as illustrated in Fig. 1, stands in the position at which its said shoulder seats the stop-pin, and thus locks the lever-arm J. The wheel D has an abutment on one of its spokes, into whose path, as the wheel revolves, a dog K^3 , pivoted on the lever K below its fulcrum, normally protrudes when said lever is at said locking position—to wit, with its shoulder stopping the pin J^4 . The dog assumes this normal position under the action of gravity upon its outer end, which is stopped at the lower side against the outer edge of the lever K by means of the slight abutment k^3 with which the dog is there provided in Fig. 3. As the wheel D revolves the abutment D^{10} , coming into contact with the dog K^3 on the upper side thereof, produces no effect upon the lever K until the dog K^3 has first been rocked over its pivot away from normal position far enough to bring the abutment k^3 , provided at the outer end of the dog, against the outer edge of the lever K, whereby the dog is stopped in its motion about its pivot, so that the continued rotation of the wheel C causes the abutment D^{10} , since it can no longer rock the dog about its fulcrum on the lever, to swing the lever about its fulcrum k on the frame, the lower end of said lever being forced outward and the upper, which has the shoulder K' , being carried inward, whereby said shoulder is carried out from under the pin J^4 , which thus overhangs the incline k' at the upper end of said lever. The interval during which the lever K is thus held in non-locking position—that is, with its shoulder out from in under the pin J^4 —is calculated to be sufficiently in excess of all ordinary variation of the clock between the intervals of the synchronizing action to cover that variation safely—that is, to insure that the synchronizing action will take place in that interval.

When the synchronizing-magnet is energized by the controlling-clock at the instant of synchronizing, the lever J being rocked over its fulcrum, as above described, and the pin J^4 being thereby forced downward, said pin, operating upon an incline k' of the lever, swings said lever inward at its upper end and outward at the lower end far enough to carry the point of the dog K^3 clear of the abutment k^3 , which is presumed not yet to have been carried clear of said dog by the rotation of the wheel D, and thereupon the dog, resuming its normal position under the action of gravity, has its point lifted past the abutment D^{10} , so that when the instant of synchronizing action is over, the magnet being deenergized by the breaking of the circuit at the controlling-clock, the armature falling, and the lever K swinging upward at its inner end, and the pin J^4 being lifted off the end of the lever K, said lever is restored by the action of gravity or the spring K^2 to its locking position and the dog has its point thrust inward above or behind the abutment D^{10} . By this means when the lever J is kept unlocked during a

sufficient interval to cover the synchronizing action as soon as that synchronizing action has occurred it is again locked, and no matter how often the magnet is reenergized the lever cannot be actuated until the wheel D has made another revolution and the abutment D¹⁰ again engages the dog and disengages the lever K from the pin J⁴.

It will be observed that notwithstanding the locking of the lever J in the manner described by the lever K against possibility of swinging the former lever about its fulcrum said lever might only be pulled up at the rear end by the energizing of the magnet, and this would thrust the pins J² and J³ forward into the plane of the wheel C with a tendency to interrupt the action of that wheel, although the lever could not be rocked in the manner described and designed for the purpose of synchronizing. To prevent this action, I strike from the plate A inward a tongue *a* in position to check any forward movement of the lever-arm J until after said arm has been depressed below said finger *a*. Since such depression cannot take place while said lever-arm is locked by the lever K, the forward movement cannot take place until the unlocking occurs.

It will be evident that it is not necessary to locate the dog K³⁰ on the lever K, but that a dog might instead be pivoted on the wheel D with the same effect. Such a structure is shown in Fig. 5, the dog K³⁰, loosely pivoted at *h*³⁰ on the wheel D, having a range of play about its pivot determined by the extent of the opening K³¹, in which the pin D¹⁰, fixed in the wheel D, protrudes. The nose at the free end of the dog engages with the nose K⁴ on the lever K, which is modified in form to this extent from the form shown in Fig. 1, and by such engagement the dog K³⁰ is held while the wheel D rotates far enough to carry the pin D¹⁰ across the opening K³¹, and only after that amount of travel the further rotation of the wheel causes the dog to actuate the lever K with the same effect as in the form shown in Fig. 1. When the synchronizing action takes place, the dog K³⁰ is entirely released from the nose of the lever K and drops again to the position shown in Fig. 4, so that the lever K, when it swings back to locked position, is above or behind the nose of the dog.

I claim—

1. In combination with the hands-train of a clock, an electromagnet mounted on the clock-frame and a circuit in which the same is energized; an armature for said magnet and a lever connected thereto and actuated by the movement of the armature toward and from the magnet-poles, said lever having a pin or projection which, in said movement of the lever, is protruded through the plane of rotation of a wheel in said train and moved laterally after such protrusion to encounter a spoke or web of said wheel and rotate the same.

2. In combination with the hands-train of a

clock, an electromagnet and a circuit in which the same is energized; a lever fulcrumed on the clock-frame and adapted to swing obliquely toward the plane of rotation of a wheel in said clock and having a pin or finger which, in such oblique movement, extends through and moves laterally in the plane of rotation of said wheel, and an armature for the magnet connected with said lever, whereby said movement of the lever is caused by the energizing of the magnet.

3. In combination with the hands-train of a clock, an electromagnet and a circuit in which the same is energized; an armature for the magnet and a lever connected to and actuated by the armature in the movement of the latter toward and from the magnet-poles, such lever having two pins or fingers which in such movement of the lever are protruded through the plane of a wheel of said train and moved laterally after such protrusion, said pins or fingers being so located that in such lateral movement they encounter the web or spokes of said wheel at opposite sides of the center of the wheel; whereby they tend, one to rotate the wheel, and the other to arrest its rotation.

4. In combination with a hands-train of a clock, an electromagnet and a circuit in which the same is energized, an armature for the magnet; a lever to which the same is attached having trunnions by which it is fulcrumed on the clock-frame, the bearing for one of said trunnions being elongated to permit one end of the armature to drop away from the magnet farther than the other, whereby the armature's movement toward and from the magnet causes the lever to swing toward and from the plane of rotation of a wheel in said train and also to oscillate in the general direction of such plane, said lever having a pin or finger which is protruded through the plane of such wheel by the first-mentioned movement of the lever, and moved laterally in such plane by the second-mentioned movement as and for the purpose set forth.

5. In combination with the clock-frame having front and back plates, the hands-train mounted on the front plate, the electromagnet mounted on the frame and the circuit in which it is energized; the lever-arm J having the trunnions *j*¹ and *j*¹⁰, the former journaled in the front plate, and the latter in the back plate, the journal-bearing in said back plate being elongated or slotted in a direction approximating the general direction of the lever-arm; whereby said rear trunnion may have a movement in a direction to cause the lever-arm J to approach and recede from the front plate, said lever-arm having the pins J² and J³ adapted to be protruded through a wheel in said hands-train by such movement of the rear trunnion, whereby the movement of the armature toward the magnet-poles after the pins are thus protruded causes the latter to encounter the web or spokes of such wheel to actuate the latter.

6. In combination with the hands-train of a clock, an electromagnet mounted on the frame and a circuit in which it is energized; an armature for such magnet and a lever connected thereto and actuated thereby and adapted to act upon a wheel in said train when the magnet is energized; a second lever adapted to lock the first lever against the movement in which it may actuate the said train-wheel, and an abutment on a wheel of the train adapted as such wheel rotates to actuate said locking-lever and disengage it from the first lever, whereby the synchronizing movement of the first lever is permitted only after the second lever has been actuated by said abutment.

7. In combination with a hands-train of a clock and an electromagnet mounted on the frame and a circuit in which such magnet is energized, an armature for the magnet; a lever connected to and actuated by the armature and adapted when so actuated to actuate a wheel of the hands-train to set the hands; a second lever adapted to lock the first lever against such setting movement; a wheel in the hands-train adapted to actuate the locking-lever, the means for the actuation of the lever by such wheel consisting of a dog pivoted on one of said parts and having a limited range of movement about its pivot and adapted to normally stand at one limit of said range of movement, and an abutment on the other of said parts adapted to encounter said dog as the wheel revolves, and cause it to be moved to the opposite limit as the wheel continues to revolve; whereby, at such opposite limit the engagement of the wheel and lever becomes positive and the lever receives the unlocking movement; the synchronizing-lever having an abutment which acts upon the locking-lever in the synchronizing movement to move said locking-lever in a direction to disengage the abutment and dog and permit the latter to resume its normal position, whereby the return of the locking-lever to locking position is permitted without causing a re-encounter of the dog and abutment.

8. In combination with the hands-train of a clock, an electromagnet mounted on the frame and a circuit in which such magnet is energized; an armature for the magnet; a lever

to which the same is attached having trunnions by which it is fulcrumed on the clock-frame; the bearing for one of said trunnions being rotated to permit one end of the magnet to drop away from the trunnion farther than the other, said lever having a pin or finger which is protruded through the plane of rotation of a wheel in said train by the lateral movement of the lever which results from the straightening up of the armature when attracted toward the magnet; a locking device which prevents the oscillation of the lever about its fulcrum in a direction to permit the armature to approach the magnet and a stop projecting from the frame which prevents said lateral movement of the lever while the armature is prevented from approaching the magnet; whereby the finger of the lever is prevented from protruding into said wheel of the train without also moving in a direction to actuate said wheel.

9. In combination with the hands-train of a clock and an electromagnet mounted on the train and a circuit in which such magnet is energized, an armature for the magnet; a lever connected to and actuated by the armature and adapted when so actuated to actuate a wheel of the hands-train to set the hands; a second lever adapted to lock the first lever against such setting movement; a dog pivoted on said lever and having a limited range of movement with respect thereto and tending normally to stand at one limit of said range; a wheel in the train having an abutment which, as the wheel rotates, engages the dog when said dog is in said normal position and the lever is in locking position; the hand-setting lever having an abutment which engages the locking-lever in the setting movement of the former and actuates the locking-lever in a direction to disengage the dog from the abutment, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 7th day of January, 1897.

C. M. CROOK.

Witnesses:

CHAS. S. BURTON,
JEAN ELLIOTT.