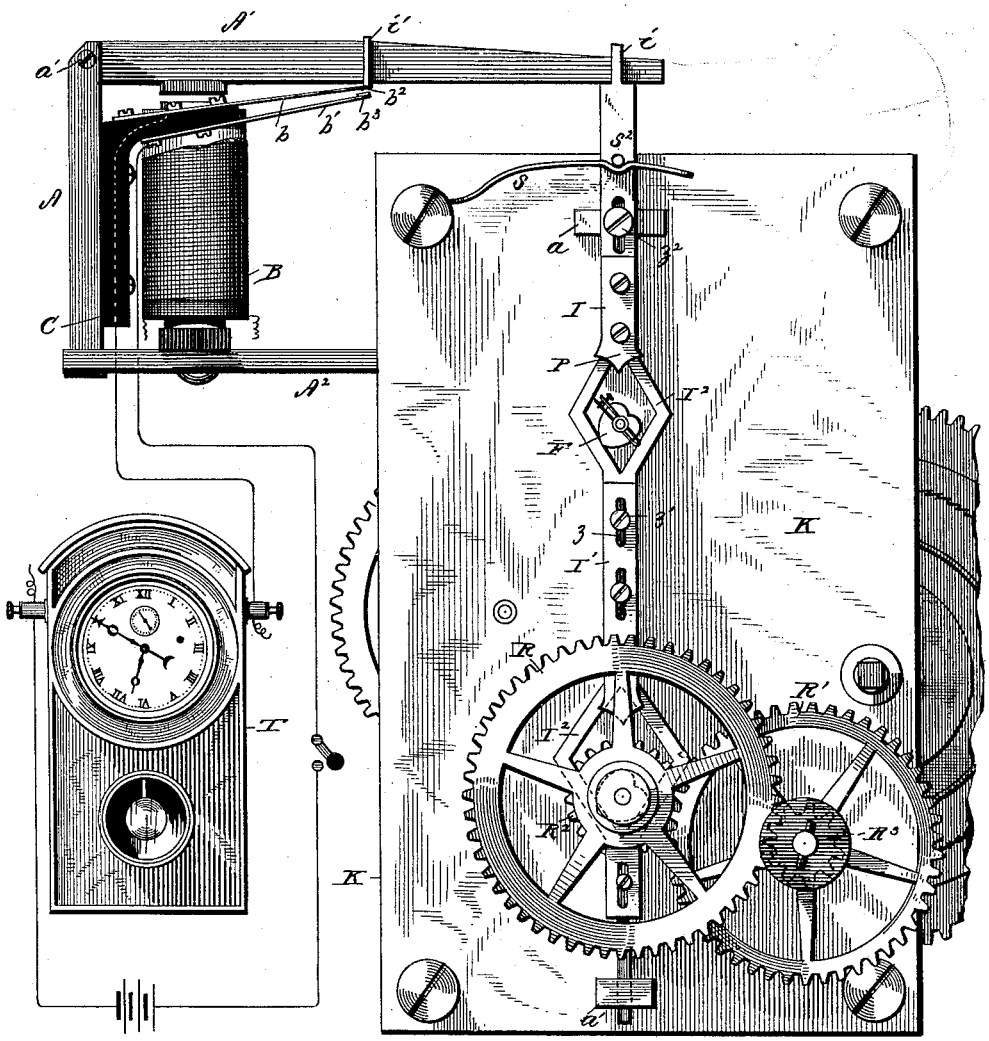
(No Model.) 3 Sheets—Sheet 1.

W. F. GARDNER.

ELECTRIC TIME CONTROLLING SYSTEM.

No. 307,287. Patented Oct. 28, 1884.

Fig. 1.



WITNESSES

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Albert Spriden.

INVENTOR

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J. H. MacDonald Attorney

(No Model.) 3 Sheets—Sheet 2.

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ELECTRIC TIME CONTROLLING SYSTEM.

No. 307,287. Patented Oct. 28, 1884.

Fig. 1.

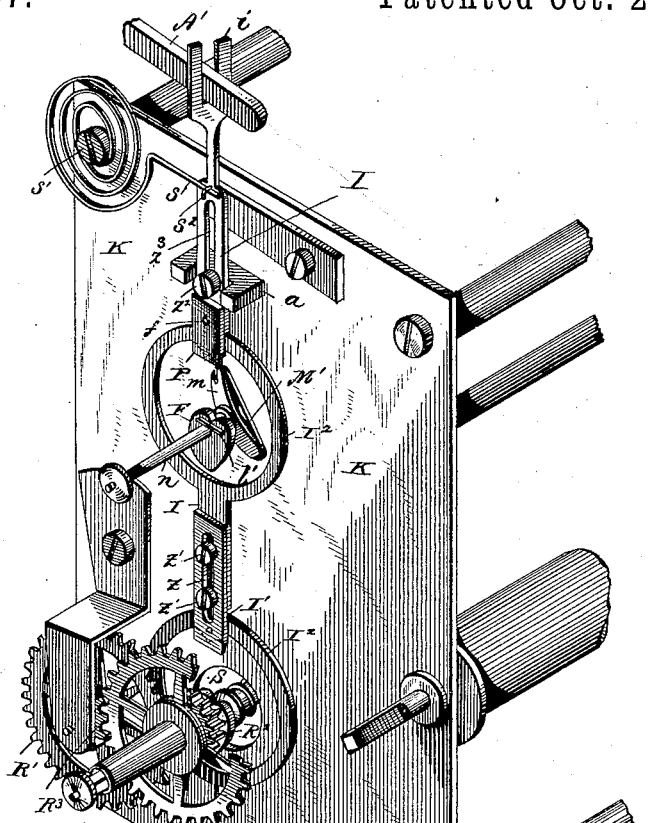


Fig. 3.

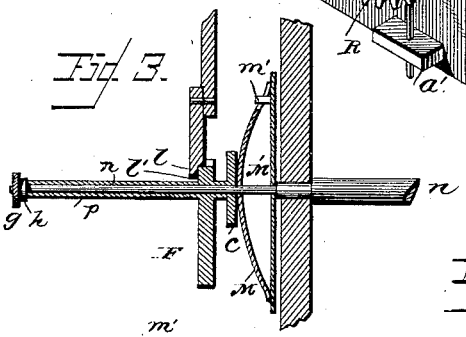


Fig. 4.

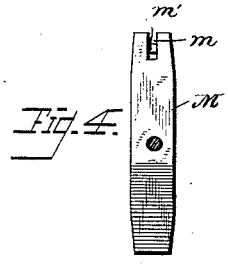


Fig. 5.

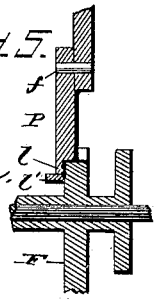


Fig. 2.

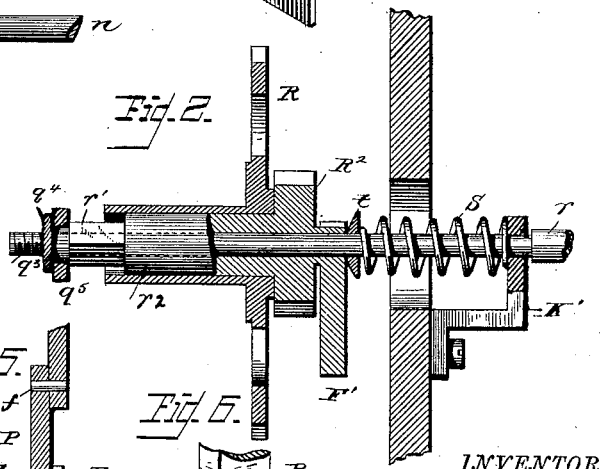
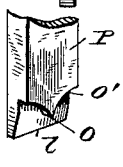


Fig. 6.



WITNESSES

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(No Model.) 3 Sheets—Sheet 3.

W. F. GARDNER.

ELECTRIC TIME CONTROLLING SYSTEM.

No. 307,287. Patented Oct. 28, 1884.

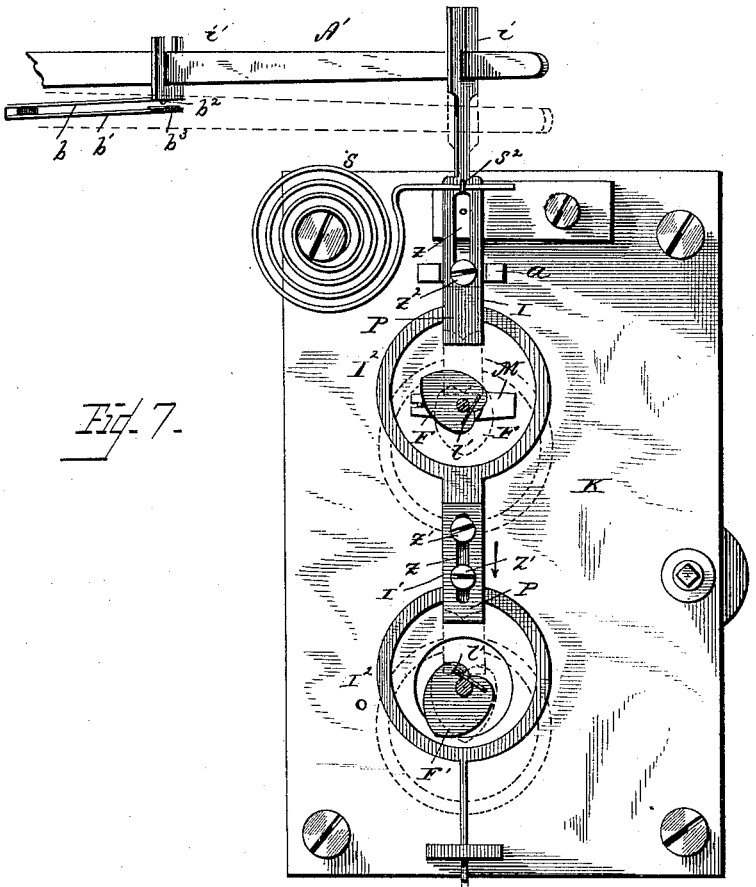


Fig. 7.

Fig. 8.

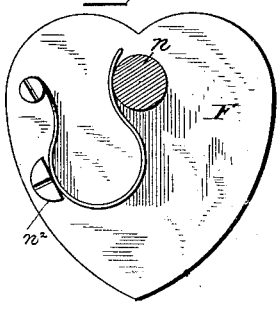


Fig. 9.

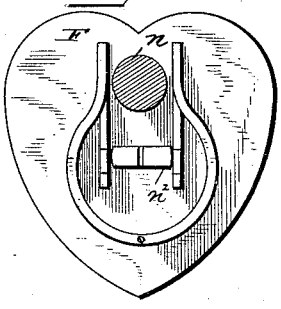


Fig. 10.

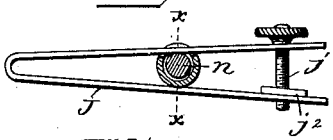


Fig. 11.

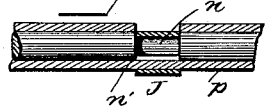
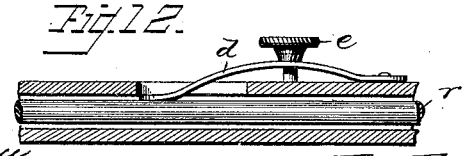


Fig. 12.



WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM FRANKLIN GARDNER, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC TIME-CONTROLLING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 307,287, dated October 28, 1884.

Application filed April 23, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. GARDNER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Time Controlling and Correcting Systems, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a system for automatically controlling clocks and sending time-signals, and is an improvement on the system granted to me in Letters Patent No. 287,015, October 23, 1883.

The invention consists, first, in a clock controlled by a transmitting control-clock in an observatory or other main-line circuit, with means for controlling a series of clocks from a main line and on lines used for telegraphic, telephonic, and other purposes.

It further consists in an adjustable frictional control for the second, minute, and hour hands of said clocks.

It further consists in an adjustable push-bar for actuating the cams on the arbors of the several hands of the clocks; and finally consists in details of construction and operation of the several parts, as will be hereinafter more fully set forth in the specification, and pointed out in the accompanying drawings, in which—

Figure 1 is front elevation of the controlling-clock, showing the hand-train, adjustable cam-actuating bar, the controlling-magnet and its armature-lever, and a controlled clock. Fig. 1ª is a perspective view of the adjustable cam-actuating bar, the cams, adjustable friction-springs on the dial or hands arbors, and the dial-train. Fig. 2 is a longitudinal section through the minute-hand arbor and the adjustable friction-spring; Fig. 3, a longitudinal section through the seconds hand arbor and the adjustable friction-spring; Fig. 4, a plan view of the seconds hand friction-spring; Fig. 5, a vertical section through one of the cams and the cam push-point; Fig. 6, a detail perspective view of the lower part of one of the cam push-points; Fig. 7, a front elevation of the cam-actuating bar and cams with the hands train removed; Figs. 8 and 9, detail plan view of the cams and modifications of the adjustable friction-springs; Fig. 10, a perspective view of one form of adjustable friction-spring, the hand-arbor being shown in section; Fig. 11, a section on the line $x\,x$, Fig. 10; Fig. 12, a transverse section through the minute-hand arbor and sleeve, showing another form of friction-spring.

The object of the invention is to provide a time controlling and correcting system in which any corrected and controlled clock may be used as a central transmitting-clock for a series of clocks in a local circuit, and thus avoid the use of an expensive primary transmitter.

The clocks herein described are not electric clocks, but are actuated by an independent dial-train entirely free from electric currents, so that no matter whether the daily correction is made or not the clocks continue to run. This system, like the one referred to in my former patent, is applicable to cities, railways, steamship-lines, factories, &c.

I will now proceed to describe the cam-actuating mechanism. The front plate, K, of the clock forms a support for said mechanism. The cam-actuating bar, which in my former patent was made in one piece, is now made in two pieces or sections, I I′, vertically adjustable with relation to each other. The upper section, I, projects above the top of plate K, and is provided with two arms, *i*, which receive the free end of the armature-lever A′ and prevent any side movement or slipping of said lever from positive contact with the bar. This upper section is slotted, as at z^3, to receive a guide-screw, z^2, which passes into a block, *a*, attached to plate K. This guide-screw and slot insure a positive vertical movement and prevent any slipping or side movement of said bar. A spring, *s*, engages with a hook, s^2, on the cam-bar and returns the bar to its normal position. At a point about midway the length of the piece I said section is enlarged so as to form a circular or rectangular opening, I^2, within which the cam moves when the bar is actuated. Said section is then continued downward in a straight form until it unites with the lower piece, I′, which overlaps it, and is slotted at z^3, in which the adjust-

able set-screws *z* enter, and said screws enter the piece I. By means of this slot and set-screws the adjustment of the bar is effected, as it is only necessary to unloose said screws and slip the lower section up or down and then tighten up the screws. This adjustment is valuable and important, in that a cam-actuating bar can be adjusted to clocks of different size, (by lengthening or shortening the bar,) and thus I avoid the necessity of making a particular size cam-bar for each particular size clock. This lower section also has an opening, I², like the one just described, and its lower end passes through a guide-block, *a'*. The slot *z²* in the upper section of the bar and the block *a'* limit the stroke of the cam-bar, and thereby check all undue strain on pivots or any part of the movement. As the cam-bar is raised above the plate K by means of the blocks *a a'*, there is no friction of the bar on said plate. Each section of the bar is provided with a detachable push-point, P, to engage with the cams. These push-points are secured to the bar by pins *f*, (or in any other suitable manner,) and are cut away at the end and on their inner face, as shown in Fig. 6, so as to leave the outer and lower portion, *l*, flat. The inner part just above is curved, as at *o'*, to fit the groove at the top of the cam, the point *o* centering with the center of the cam. The flat part *l* of course extends slightly beyond the outer face of the cam, and is intended to strike a ledge or lip, *l'*, on the cam, (*vide* Fig. 5,) so that when the cam has been struck by the push-points the flat part *l* will rest squarely against the lip of ledge *l'*, the center *o* centering in the cusp of the groove. This prevents any forward or backward movement of the cams, and therefore of the hands. The top of the cam may be flat and the part *o* of the bar flat, so that the cam may be struck squarely. I prefer, however, the construction above described. It is preferred to have the push-points detachable, so that if they become worn they can be replaced without the necessity of making a new cam-bar. With the exception of the ledge or lip *l'* on the cams, said cams are plain, and are substantially the the same and operate the same as in my former patent.

I will now proceed to describe the friction-springs on the minute and seconds hands arbor, and which form an important and essential element of my device. The cams are mounted on the seconds and minute hands arbors and are turned by the push-points. This action, which centers the cams, also turns the hands to a predetermined zero-point, as explained in Patent No. 207,015, and this movement carries the hands with them. It is essential that an adjustable friction be placed on said arbors, so as to prevent the hands being carried beyond the zero-point, or, in other words, to bring about exact coincidence of the hands, and prevent the cams and hands moving too far either to the right or left, according as the clock is fast or slow. To accomplish this result I have constructed the cams, push-points, and friction-springs as shown in the accompanying drawings.

In Fig. 3 the friction-spring for the seconds hand consists of a piece of metal, M, perforated centrally and passing over the arbor *n* of said hand, and is curved, as there shown, and has at one extremity a slot, *m*. The plate M' is flat, and has a pin, *m'*, which enters the slot *m* of the spring. This engagement of the spring and slot causes the parts to move in unison, and serves another purpose, of preventing the spring M from becoming disengaged and slipping off the flat plate M. It will be understood that the spring and cams move with the hands arbors. The curved part M abuts against a collar, *c*, integral with the sleeve *p*, through which the arbor *n* passes. The outer extremity of the arbor *n* is screw-threaded to receive a nut, *g*, which is in contact with a washer, *h*, at the end of sleeve *p*. If it is desired at any time to increase the friction of the spring on the arbor, and therefore against the collar *c*, it is only necessary to tighten up nut *g*, which presses forward washer *h*, and this in turn presses forward sleeve *p* and collar *c* against spring M and expands said spring, causing a greater degree of friction to be exerted by it and plate M' on the arbor. The reverse of this lessens the friction. This adjustment is of course very slight, the turning of nut *g* the hundredth part of an inch giving all the adjustment usually necessary. This friction is made necessary by changes of temperature and power employed. The spring S on the minute-hand arbor *r* passes through the plate K. One end abuts against the bridge-plate K', the opposite end being secured to a collar, *t*, made integral with or attached to the cam F'. The outer end of arbor *r* is screw-threaded to receive a nut, q^4, and washer q^5. This washer rests against the square shoulder *r'* of the sleeve r^2 of wheel R^2, so that when the nut q^4 is tightened the washer presses against shoulder *r'*, and this presses inward the sleeve r^2, cam F', and collar *t*, thus compressing spring S, and therefore increasing the friction on the arbor.

Figs. 8 and 9 show forms of springs secured to the cams on the seconds hand arbor, the adjustment being made by turning an eccentric head-screw, n^2.

In Fig. 10 I have shown a bent spring secured in a shoulder on the seconds hand arbor and sleeve, said spring being adjusted by means of a set-screw, *j*, and nut *j'*.

Fig. 11 shows the shoulders cut in the sleeve and arbor of the seconds hand.

Fig. 12 shows the form of spring adjustment for the minutes hand in which a bent spring, *d*, enters a slot in the sleeve and bears on the arbor, the adjustment being made by a set-screw, *e*, which passes through the spring.

Having now described the cam-bars, the cams, and friction-springs, I will describe the

auxiliary transmitting and controlling mechanism. I will premise by stating that the cam-bar is acted upon by an armature-lever, A′, of magnet B, as in my former patent. The arm A^2, Fig. 1, which supports this magnet B, is a part of the metal frame on which the clock-movement is mounted, although it may form a part or outward projection of plate K. Secured to the horizontal arm A^2 is a vertical bar, A, to which the armature-lever A′ is pivoted at a'. Secured to the standard A is a bar of vulcanite, C, to which an upper and lower contact-spring, b b', are fastened by screws or otherwise, as desired. The spring b has two projecting pins or arms, i', which pass around the lever A and hold the bar evenly in position. This spring has also a platinum contact-point, b^2, near the extremity of its free end. The lower spring, b', is provided with a platinum contact-plate, b^3, in a local circuit of a corrected clock or series of clocks, but one of which, T, is here shown. These springs are placed immediately below and in the path of the armature-lever A′, so that when said lever is depressed the springs are brought into metallic contact and a local circut closed through clock T, or series of clocks, and these clocks are simultaneously controlled at the same time and in the same manner.

It is a desired feature in time-controlling and clock-correcting systems that any primary controlled clock may be a controlling-clock for a series of clocks in a local circuit, thus avoiding the use of a large number of expensive primary transmitting-clocks. It will be seen from the foregoing that this has been attained by my device, and that any controlled clock outside of an observatory may be a transmitting-clock for a series, or may be used as a central transmitter, and all the clocks for hundreds of miles be corrected in one second, as is accomplished in my former patent.

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

1. In a time controlling and correcting system, a controlled clock in an observatory or other main-line circuit, provided with a magnet and armature-lever, as described, to actuate the controlling mechanism, said lever acting upon contact-springs in a local circuit of a series of clocks in such manner as to form a transmitting-clock of such controlled clocks, and thereby automatically and simultaneously control the clock or clocks in the local circuit, substantially as and for the purpose set forth.

2. In a time controlling and correcting system, a controlled clock the movement of which is not actuated by electric impulses, said clock having a magnet in a controlling-circuit, the armature of said magnet operating a cam-actuating bar in said controlled clock, and contact-springs for closing a circuit in a series of local controlled clocks, whereby the first controlled clock becomes a transmitting-clock for the series, substantially as and for the purpose set forth.

3. In a controlled clock, as described, the combination, with a magnet, B, and its armature-lever, arranged to actuate the controlling mechanism, of contact-springs secured to an insulating-bar in such a manner that the said springs will be brought into contact when the magnet is energized, to complete a circuit to one or more secondary controlled clocks, as and for the purpose set forth.

4. In a time-controlling system, a controlled clock provided with a cam-actuating bar made in sections adjustably secured to each other, substantially as and for the purpose set forth.

5. In a time-controlling system, a clock provided with a vertical and adjustable cam-actuating bar, said bar having two pins or arms, i, to receive the free end of the armature-lever, substantially as and for the purpose set forth.

6. In a time-controlling system, a clock having a vertical cam-actuating bar made in two or more sections and slotted to receive guide and adjusting screws, as set forth.

7. In a time-controlling-system, a clock having a cam-actuating bar provided with detachable push-points, as and for the purpose set forth.

8. In a time-controlling system, a clock having a cam-actuating bar provided with push-points the ends of which simultaneously strike two separate points on the cams, substantially as set forth.

9. In a time-controlling system, a clock provided with a cam-actuating bar, said bar having circular or rectangular portions l^2, within which the cams move when acted upon by the push-points, as set forth.

10. In a time-controlling system, a clock provided with a cam-actuating bar and push-points therefor, each point having a flat edge, l, and points o, as and for the purpose set forth.

11. In a time-controlling system, a clock provided with cams F F′, having a projection, lip, or ledge, l', as and for the purpose set forth.

12. In a time-controlling system, a clock, the hands arbors of which are provided with adjustable friction-springs, and cams acted upon by push-bars, as and for the purpose set forth.

13. In a time-controlling system, a clock, the seconds hand arbor of which is provided with a cam actuated by a push-bar, and an adjustable friction-spring, M, having a slot, m, as and for the purpose set forth.

14. In a time-controlling system, the seconds hand arbor of a clock, provided with a cam actuated by a push-bar, and the adjustable spring M, having slot m, in combination with the flat plate M′, having the pin m', as and for the purpose set forth.

15. In a time-controlling system, a clock the minutes hand arbor of which is provided with a cam actuated by a push-bar, and an adjustable spiral friction-spring, S, as described.

16. In a clock in a time-controlling system, the combination, with the hands arbors provided with screw-threaded ends, a nut, and adjustable friction-springs, of the movable sleeves moved forward and backward by said nut, whereby the adjustment of the springs on the arbors is effected, substantially as and for the purpose set forth.

17. In a time controlling and correcting system, the combination, with independent clock-movements, of a cam-actuating bar, the magnet B and its armature-lever, the insulating-bar C, and contact-springs in the path of the armature-lever, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM FRANKLIN GARDNER.

Witnesses:
EMMA M. GILLETT,
J. G. KROHR.