(No Model.)

4 Sheets—Sheet 1.

C. E. BUELL.

ELECTRIC CLOCK SYSTEM.

No. 280,715. Patented July 3, 1883.

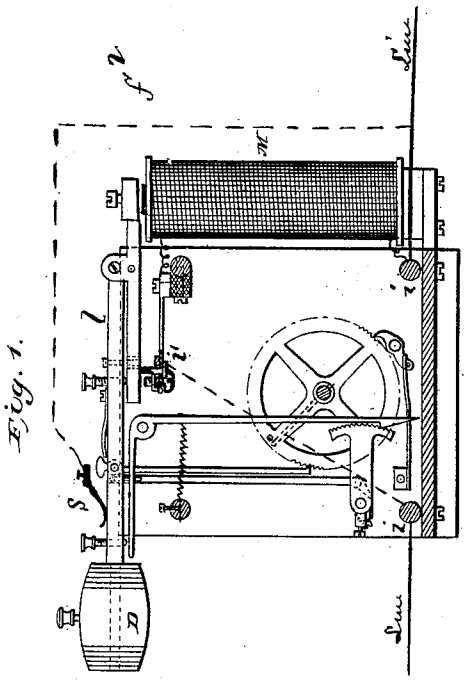

Fig. 1.

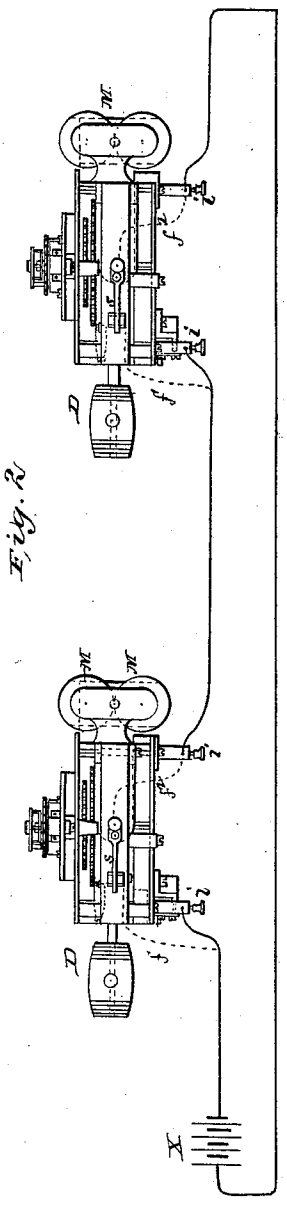

Fig. 2.

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(No Model.)

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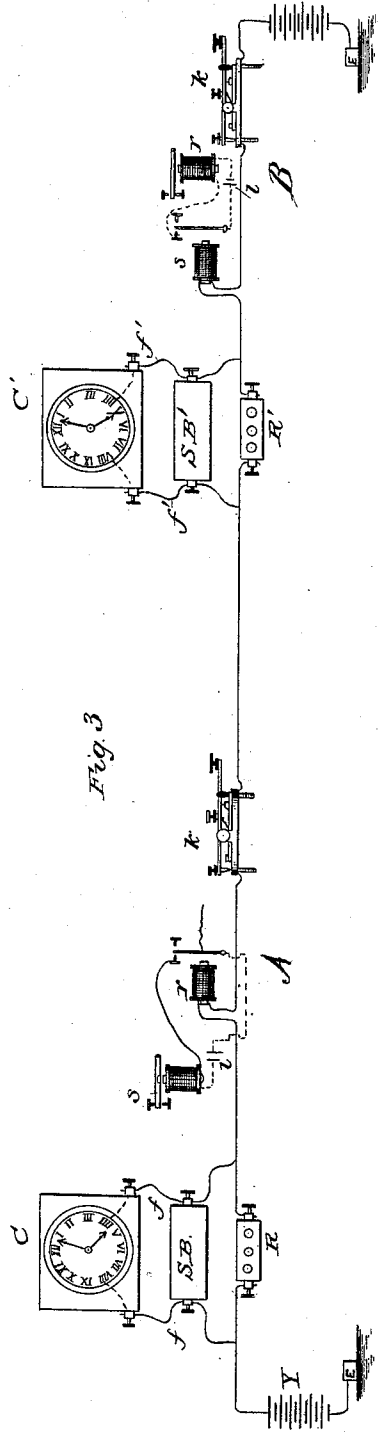

Fig. 3

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ELECTRIC CLOCK SYSTEM.

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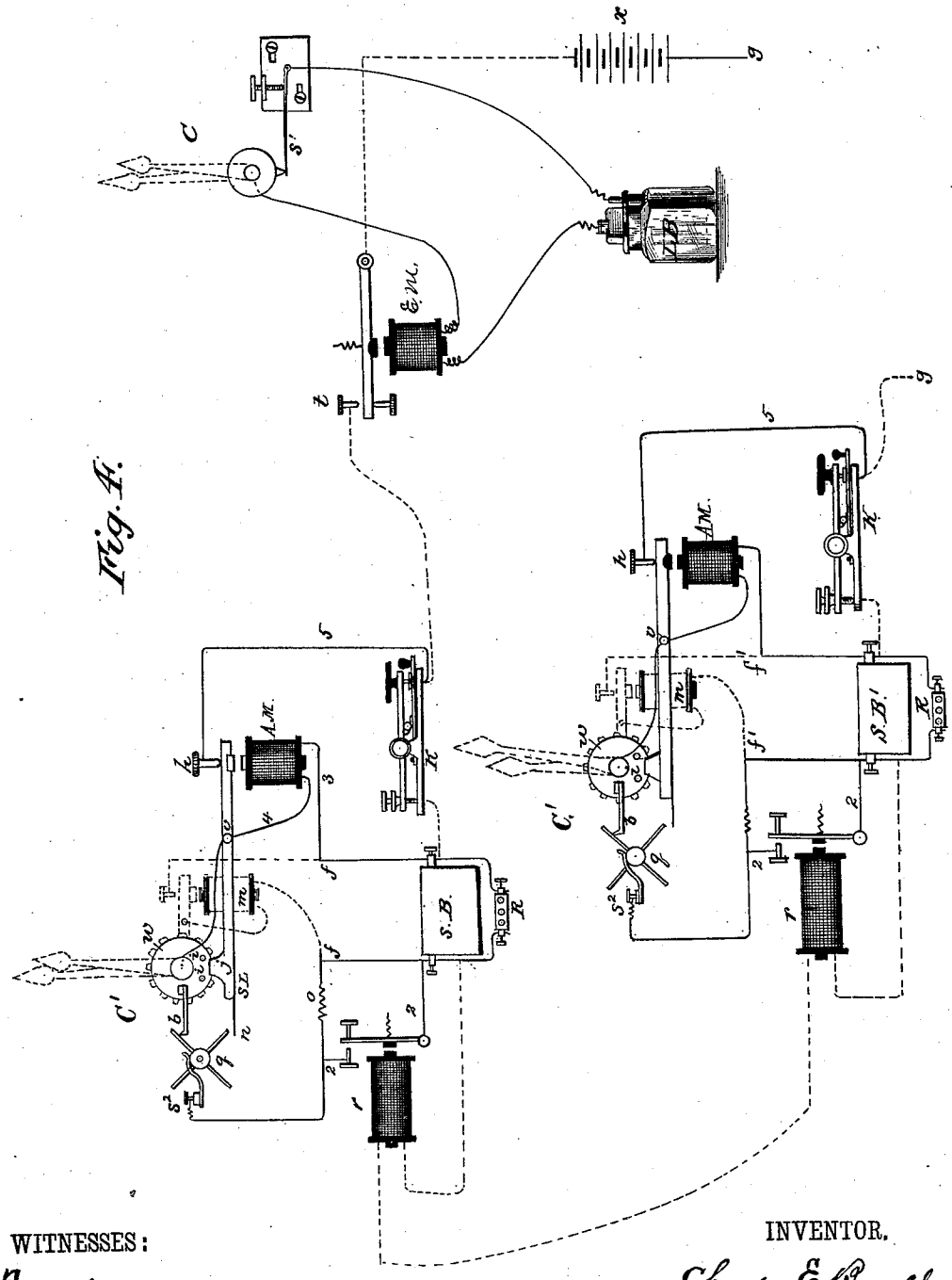

WITNESSES:

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(No Model.) 4 Sheets—Sheet 4.

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ELECTRIC CLOCK SYSTEM.

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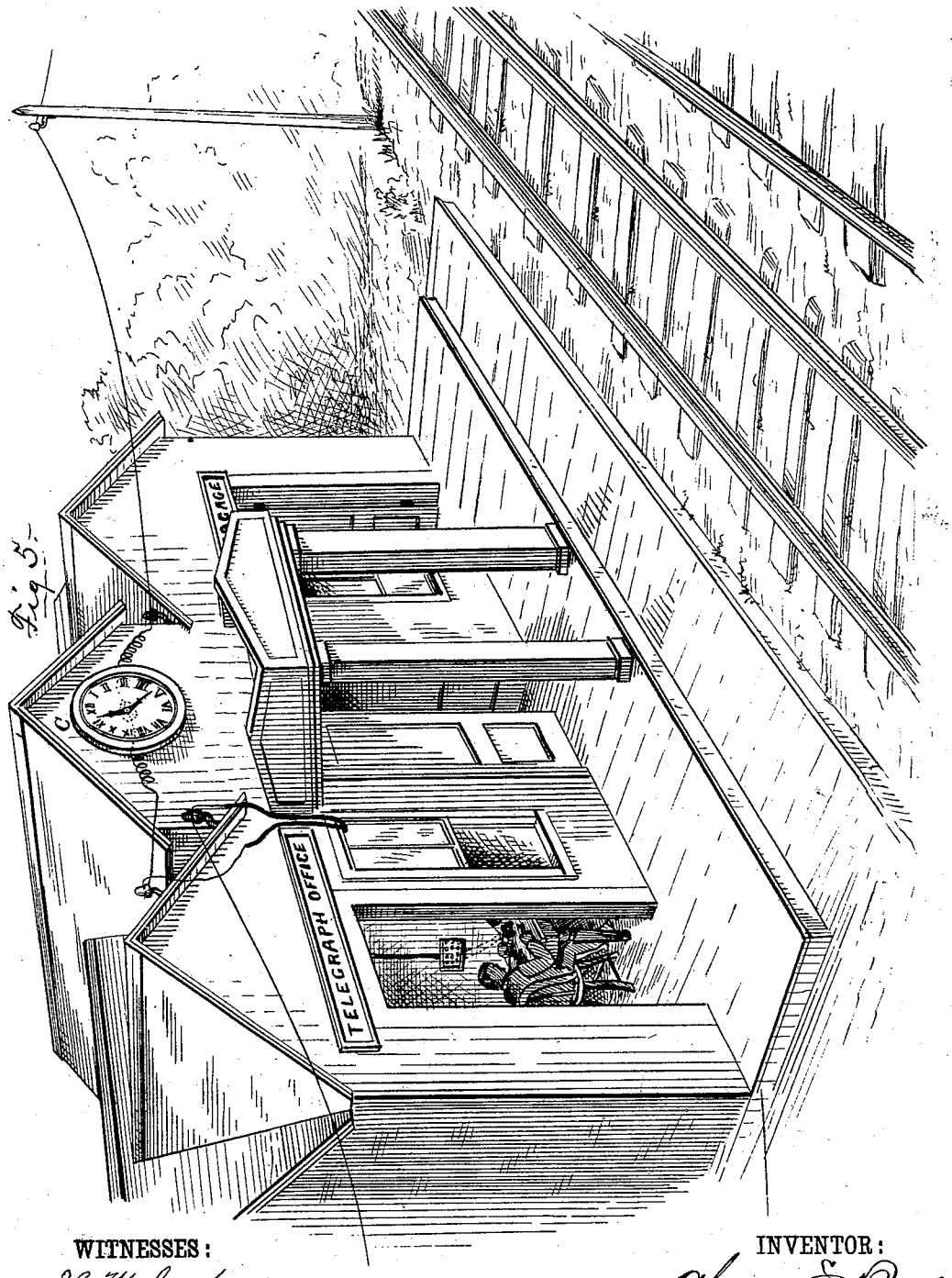

Fig. 5.

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A. C. Buell.

INVENTOR:

Charles E. Buell

BY

ATTORNEYS:

UNITED STATES PATENT OFFICE.

CHARLES E. BUELL, OF NEW HAVEN, CONNECTICUT.

ELECTRIC-CLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 280,715, dated July 3, 1883.

Application filed May 8, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BUELL, of the city and county of New Haven, State of Connecticut, have invented Improvements in Electric-Clock Systems, of which the following is a specification.

My invention relates to combining electric clocks and communicating telegraphs upon the same electric circuit; and it consists of the combination, with a main circuit and batteries for charging said circuit, of a series of stations along said circuit, each provided with apparatus adapted to transmit and receive signals other than time-signals, a clock at each station that is actuated by electricity or by mechanism that is wound up by electricity, with means for setting said clocks to correct time over said circuit, and a controlling or regulator clock located at some suitable point to act at predetermined periods to set all the clocks, substantially as hereinafter described.

My invention consists in other combinations and sub-combinations, which will be hereinafter described.

In the accompanying drawings, Figure 1 is a sectional elevation of an electric clock. Fig. 2 is a plan view of two electric clocks in electrical connection with one circuit. Fig. 3 shows electric clocks and storage batteries arranged according to my invention, together with means for transmitting and receiving signals other than time-signals. Fig. 4 shows a combined system of clocks and communicating telegraph upon the same circuit. Fig. 5 represents a railway-station with a telegraph-office and clock arranged according to my invention.

Referring to Fig. 1, the electric clock shown is of well-known construction, adapted to be actuated by the weight D, which is raised by the action of the electro-magnet M, by the automatic interposition of said electro-magnet into a charged electric circuit when the weight D has moved the armature-lever to a predetermined degree. This may be accomplished by the use of a shunt-wire, f^2, and spring s, in contact with the lever l, and adjusted to break contact with the lever l when it has been depressed to a desired point by the descent of the weight D, thereby including the electro-magnet M in the circuit to again raise the weight D, and thus keep the clock in motion.

Fig. 2 is a plan view of two electric clocks, (shown in Fig. 1,) with their electro-magnets included in a main charged circuit, each of said clocks being provided with a shunt-circuit, (shown in dotted lines,) which is adapted to be opened automatically when the weight D of the respective clocks has descended to a predetermined degree, thereby allowing the current charging the circuit to flow through the electro-magnets to again raise the weight D, and keeping the several clocks wound up by the currents flowing upon a main electric circuit, which may be employed for other uses.

Fig. 3 is a view of an electric circuit which includes storage or secondary batteries S B S B′ in a manner to charge said batteries. At each secondary battery is shown a clock, C C′, with wires $f\,f$ and $f'\,f'$, respectively, to direct the stored electricity from their respective storage-batteries through the electro-magnet of the clocks, when the actuating-weight, by descending, closes the wires $f\,f$ or $f'\,f'$, as the case may be, and, raising the weight, thus keeping the several clocks wound up by the stored energy of currents flowing over a main line. A resistance, R, may be placed in a branch or derived circuit to regulate the charging of the secondary battery S B and to increase the conductivity of the circuit. In the same main circuit I have shown a relay electro-magnet, r, a sounder electro-magnet, S, and a transmitting-key, K, of ordinary construction, for telegraphing by a make and break of the circuit, and a local battery for operating the sounder electro-magnet, the relay electro-magnet, sounder, key, and local battery being arranged as for so-called "Morse telegraphing," and, together with the main batteries X and Y, are well-known elements, requiring no description. Any number of stations thus equipped with clocks and telegraph apparatus may be made operative by one electric circuit without employing a regulating-clock; but I prefer to employ a controlling or regulator clock at some point along said circuit to act at predetermined periods to set all the clocks to standard time.

Fig. 4 shows a main circuit in dotted lines,

in which are included the secondary batteries S B S B′, the relay electro-magnets *r r*, and transmitting-keys K K, and the clocks C′ C′ are shown with their winding electro-magnets M M connected to be energized by the stored energy of the secondary batteries over the wires *f f* and *f′ f′*, as previously described. The electro-magnet E M has its armature-lever and contact *t* forming part of the main circuit. This electro-magnet is in a local circuit charged by the battery L B, and controlled by the controlling or regulator clock, C, so as to close the local circuit at predetermined intervals for a short time by the contact of the spring *s′* with the mechanism of the clock. The closing of the local circuit attracts the armature of the electro-magnet E M away from its contact-stop *t* and disconnects the main battery X from the main circuit. The clocks C′ C′ are arranged to connect a synchronizing electro-magnet A M to the wires *f f f′ f′* by the contact-bar *b* of the clock mechanism touching the rotary contact *q*, and by the wires 1 3 4, spring s^2, the armature of their respective relays, and branch wires 2 2, so that the attraction of the armature of the relay electro-magnet will energize the electro-magnet A M, which will attract its armature and force the projection *j* on the armature-lever between the pins *i i*, that are on a wheel attached to the minute-hand, and set the minute-hand to XII if it should be too fast or too slow.

The synchronizing mechanism shown, as well as the controlling-clock and devices for manipulating the main circuit at predetermined periods, are well-known devices.

A wire, 5, and branch O, containing a resistance, are shown for temporarily cutting out the key K.

The contact-bar *b* is adapted to touch the rotary contact *q* a minute or so before the minute-hand reaches XII, and to remain touching the rotary contact till a minute after XII, when it would pass unaided out of contact. I have, however, provided a projection, *n*, on the lever S L, that will at once rotate the contact *q* away from the bar *b* when the lever S L is raised, and leave another arm of contact *q* in position to be touched by the bar *b* the next hour or other predetermined time for synchronizing.

The operation of the system is as follows: The clocks C′ C′ are wound up by the action of their respective electro-magnets M M when they are nearly run down, the said electro-magnets being energized by the storage-batteries or other charging-batteries over the wires *f f f′ f′*. Two minutes before the minute-hand of the controlling-clock C indicates XII, the said clock and devices open the main circuit and the armatures of the several relays are retracted. Very soon thereafter the contact is made by bar *b* with rotary contact *q* at each clock in outlying stations, perfecting a circuit over which to make operative their synchronizing-magnets A M. At the instant the minute-hand of the controlling-clock C points to XII, the clock C transmits a time-signal, which causes the armatures of the several relays to be attracted while the synchronizing electro-magnets are connected to the secondary batteries, causing them to set all the clocks to standard time and disconnect themselves from their secondary battery, leaving the line from station to station in condition for telegraphic communication, and closed at the controlling-clock C. The clocks being adjusted in the usual way to a fair degree of accuracy, but a brief period is required to accomplish the process of setting.

By this mode of winding and setting clocks no care is required to keep the clocks in running condition and set to standard time.

Any of the well-known modes of running clocks by electricity without a separate circuit-breaking clock may be employed in place of the form shown, and the controlling-clock may directly control the main circuit.

I may use other arrangements of devices and circuits than those shown without departing from my invention.

Fig. 5 shows a railway-station, with a clock visible from the platform, and a telegraph-office in the building, the clock and telegraph apparatus being combined upon a main line, according to the showing in Fig. 4 and its accompanying description. Such arrangement of clocks may be made with fire-alarm circuits or other analogous systems of electric circuits, or upon electric-light circuits.

I reserve the right to claim in another application anything disclosed in this application and not now claimed.

What I claim is—

1. A main line, a battery or batteries for charging said line, a controlling-clock and devices adapted to transmit time-signals over said line at predetermined intervals, a series of stations along said line, each provided with devices adapted to transmit signals other than time-signals, and a clock at each, adapted to be actuated or wound by electricity from said main line or the stored energy of said line, and provided with synchronizing mechanism adapted to be electrically connected to the main line at predetermined periods, whereby said clocks may be set to correct time by said transmitted time-signals, and a device at each clock for automatically disconnecting said synchronizing mechanism from the main line by said transmitted time-signals, the whole arranged and operating substantially in the manner and for the purpose described.

2. A main line, batteries for charging said main line, devices for automatically transmitting time-signals over said main line, a series of stations, each provided with apparatus for transmitting and receiving signals other than time-signals, and a clock at each that is actuated by currents of electricity derived from said main circuit, and synchronizing mechanism at each clock, adapted to be made opera-

tive by time-signals over said main line for regulating said clocks to correct time.

3. A main line, and batteries for charging said main line, a series of stations along said main line, each station provided with a circuit-breaking key and a relay electro-magnet in the main line, a secondary battery at each, connected to the main line in a manner to be charged thereby, and a clock at each station, adapted to be kept in motion by mechanism that is actuated by the energy of said secondary battery, and a synchronizing mechanism adapted to be made operative by said secondary battery, to set the said clock to correct time by time-signals transmitted over said main line, through the intermediate action of said relay electro-magnet, and automatic devices for transmitting time-signals over said main line at predetermined intervals, substantially as described.

4. The combination of the following elements as the equipment of a station: a main electric circuit, the secondary battery S B, resistance R, key K, and relay electro-magnet *r*, in electrical connection with said main line, the clock C′, the actuating-magnet M, the synchronizing-magnet A M, and the wires *f f*, 1, 2, 3, 4, 5, and 0, and contacts, the whole arranged and operating substantially as and for the purpose set forth.

5. A main electric circuit, batteries for charging said circuit, and a controlling-clock and devices for automatically transmitting time-signals over said circuit, a series of clocks along said circuit, each adapted to be actuated or wound by electricity from said main line or the stored energy of said line, and each provided with synchronizing mechanism adapted to be electrically connected to said main circuit by the movement of the clock, whereby said clocks will be simultaneously set to correct time by said transmitted time-signals.

CHARLES E. BUELL.

Witnesses:
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ARTHUR F. FRAZIER.