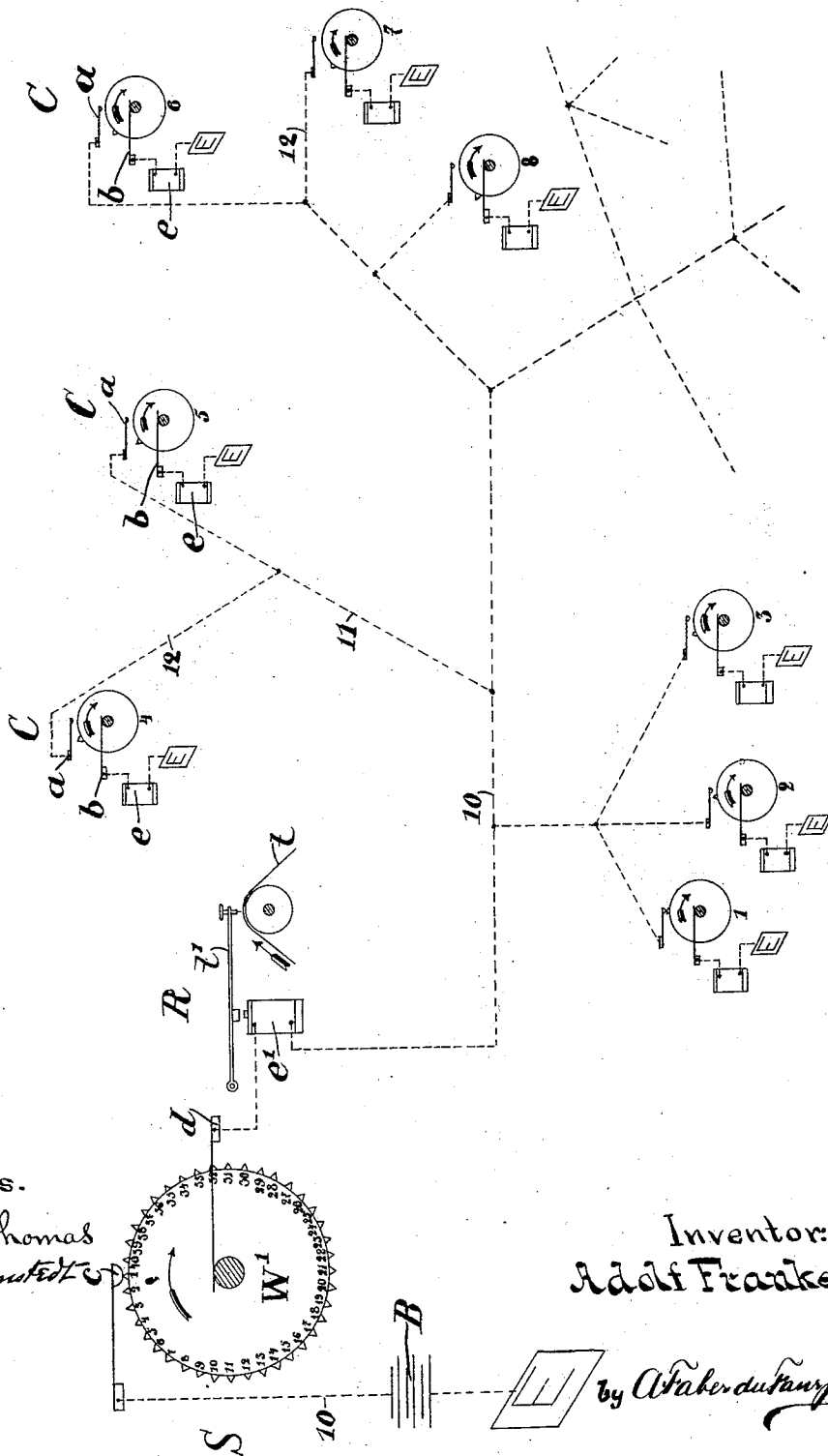


A. FRANKE.
ELECTRIC CLOCK SYSTEM.

No. 549,715.

Patented Nov. 12, 1895.

Fig. 1.



Witnesses.

Chas. W. Thomas
Wm. H. Permut

Inventor:
Adolf Franke,

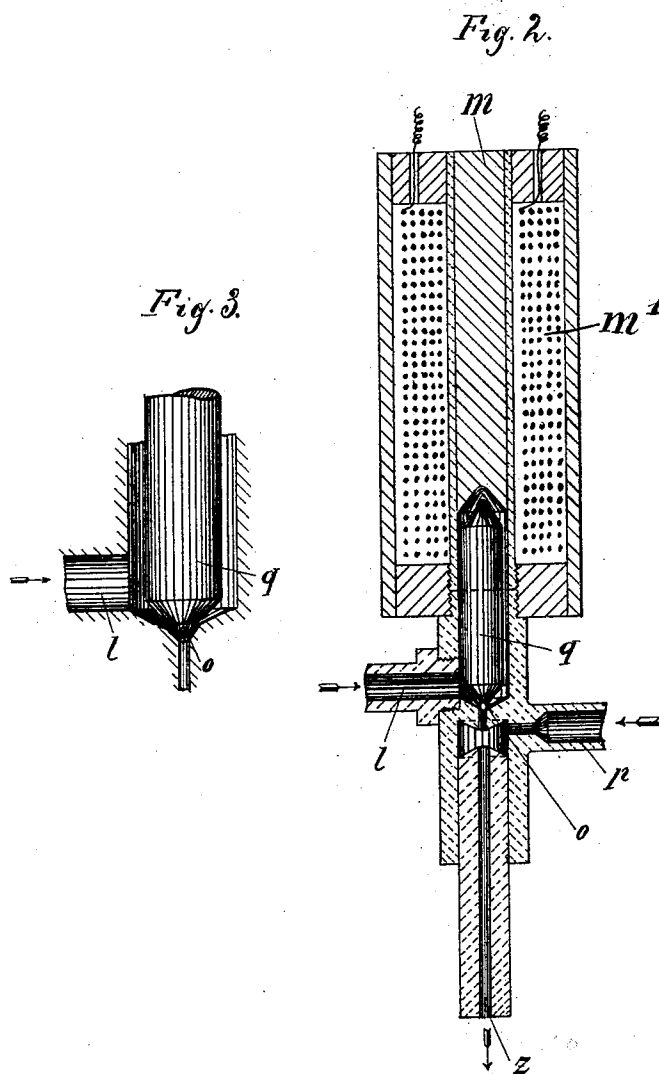
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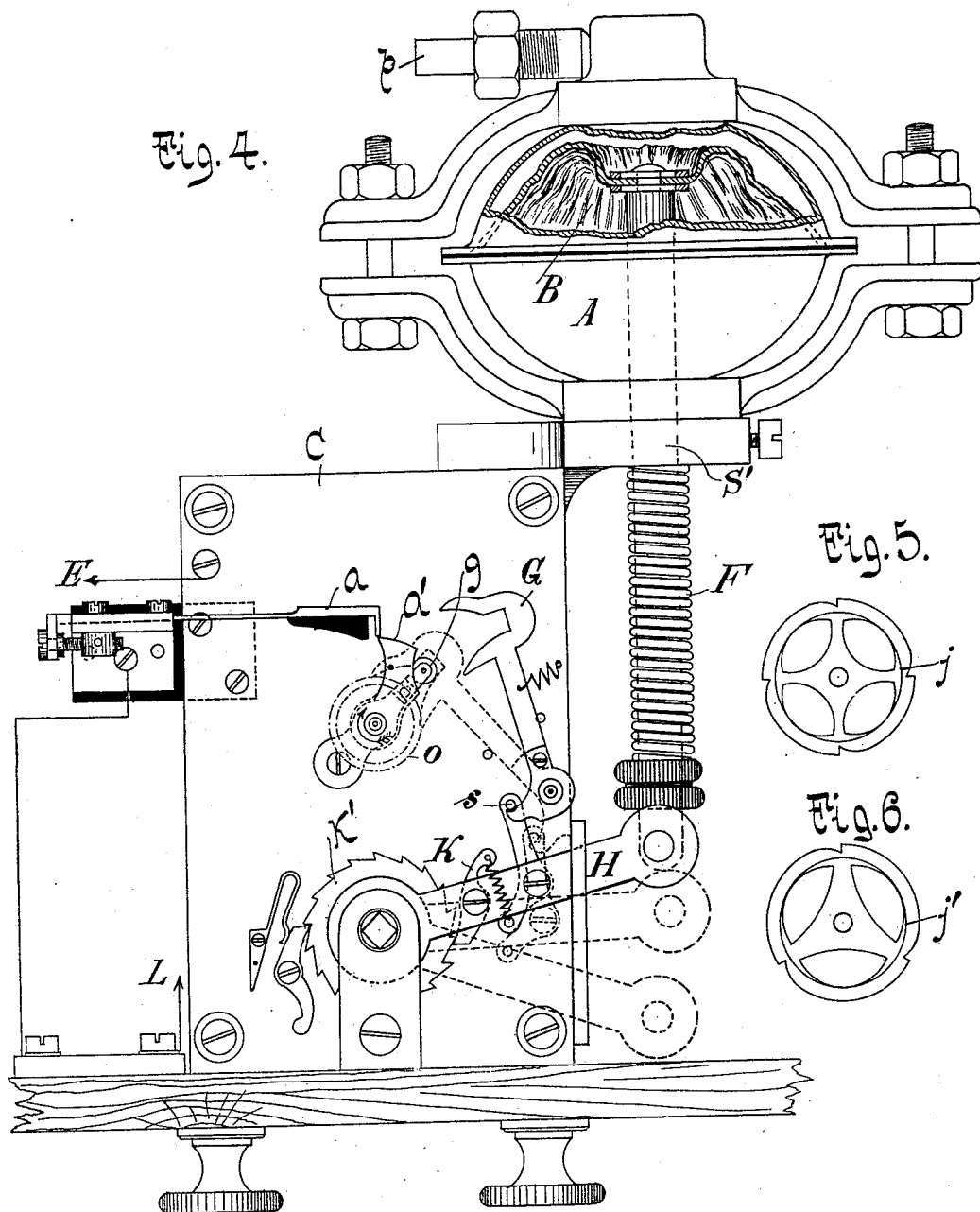
(No Model.)

3 Sheets—Sheet 3.

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By

Inventor:
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UNITED STATES PATENT OFFICE.

ADOLF FRANKE, OF BERLIN, GERMANY.

ELECTRIC-CLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 549,715, dated November 12, 1895.

Application filed September 19, 1893. Serial No. 485,850. (No model.) Patented in Germany March 7, 1893, No. 73,850; in Switzerland August 12, 1893, No. 6,978; in England August 14, 1893, No. 15,450; in Norway August 17, 1893, No. 3,362; in Belgium August 19, 1893, No. 106,030; in France August 21, 1893, No. 232,285, and in Italy September 30, 1893, XXVIII, 34,703, LXVIII, 123.

To all whom it may concern:

Be it known that I, ADOLF FRANKE, doctor of philosophy, a subject of the King of Prussia, Emperor of Germany, residing at Berlin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in or Relating to the Regulation of Clocks from a Central Clock-Station, (for which I have obtained patents in Switzerland August 12, 1893, No. 6,978; in Norway August 17, 1893, No. 3,362; in France August 21, 1893, No. 232,285; in Belgium August 19, 1893, No. 106,030; in Italy, Reg. Gen., Vol. XXVIII, No. 34,703, Reg. Att., Vol. LXVIII, No. 123, September 30, 1893; in England August 14, 1893, No. 15,450, and in Germany March 7, 1893, No. 73,850,) of which the following is a specification.

My invention has reference to a system for synchronizing a series of clocks from a primary or master clock; and it consists, essentially, in combining with a master-clock a series of secondary clocks provided with circuit-closers operated by the individual secondary clocks for closing the circuit to throw the synchronizing-magnet of said clocks into action in succession, so that the hand-setting mechanism of only one clock at a time is synchronized, and consequently a comparatively weak battery can be used for the purpose of synchronizing. I also provide means at the central station for indicating or recording the times of closing and breaking the circuit for the purpose of detecting possible irregularities of action in the system.

The nature of my said invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a clock system embodying my invention. Fig. 2 is a sectional elevation of a device for actuating the synchronizing or hand-setting devices. Fig. 3 is an enlarged detail view of the same. Fig. 4 is a face view, on an enlarged scale, illustrating the construction of the hand-setting mechanism. Figs. 5 and 6 are face views of detail parts.

Similar letters and numerals of reference designate corresponding parts.

Referring at present to Fig. 1, the letter W' designates the rotary contact-disk at the central station, which, in conjunction with the spring-contact *c*, closes the circuit of battery B—one pole of which is grounded—at predetermined regular intervals. In this example I have assumed forty clocks 1 2 3, &c., included in the system, which are to be successively synchronized, and have assumed two hours for complete synchronization of the system. Consequently said circuit-closer is constructed to close the circuit every three minutes. The disk W' may form an operative part of the master-clock, or it may be actuated in any other suitable manner. The shaft of the disk is electrically connected by a brush *d* with the main wire 10, and from the latter are conducted the several branch wires 11 12, &c., to the secondary clocks.

Each secondary clock is provided with a complete time-keeping movement, which actuates the disk or cam of a circuit-closer *a* to close the circuit at predetermined intervals (in this instance every two hours) and just before the circuit is closed at the circuit-closer W' *c* of the central station. The circuit thus closed through the individual clock passes through an electro magnetic device *e*, which throws the hand-setting device into operation. Shortly after synchronization the circuit is again broken. The clocks are thus synchronized in succession and not simultaneously, as heretofore, and a comparatively weak battery will answer.

The circuit-closing and hand-setting devices may be of any well-known construction. I have herein shown a peculiar device for the purpose of actuating the hand-setting devices, the construction of which I will presently describe.

In order to determine if the secondary clocks are being properly synchronized, a suitable recording device R is interpolated in the main wire 10 at the central station. This may be any well-known register containing an electromagnet *e'*, operating an armature-lever *t'*, carrying a style arranged to mark upon a tape *t*, fed in usual manner. The tape may be a time-strip, or a second style may be used

to indicate the time on the tape. If an impression is missing or found misplaced, failure of the corresponding secondary clock to act or to act at the proper time is indicated.

- 5 Knowing the time at which each clock is synchronized, the attendant perceives from the recording device which clock is not operating properly. If desired, any ordinary galvanoscope may be substituted for the register
10 which will indicate to the attendant the closing of the circuit.

It is of course to be understood that the synchronizing mechanism of the secondary clocks can be caused to operate upon the interruption of the circuit at the master-clock instead of at the time of closing the same. As usual, the circuit is first closed at the master-clock and then at the corresponding secondary clock.

- 20 In Figs. 2 and 3 I have shown a device for operating the hand-setting mechanism, the same consisting of a solenoid m' , connected at one end with the shaft of the disk of the circuit-closer a by a brush b , Fig. 1, and having
25 its opposite end grounded. The solenoid m' contains a soft-iron core q , having a conical end fitted to a valve-seat o of a fitting, to which are attached an inlet-pipe l for water under pressure, an inlet-pipe p for air, and a
30 discharge-pipe z for the water. When the solenoid m' is vitalized, the valve-core q is lifted from its seat o and the water passes through pipes l z and causes air to be drawn from the air-conduit. When the solenoid is
35 devitalized, the water is shut off and atmospheric air enters the air-pipe p . By the variations in pressure the hand-setting devices are operated. The power thus obtained is sufficient not only to set the clocks, but also
40 to wind the clocks, and several hand-setters may be connected to one air-pipe when the clocks are in the same building.

- I will now describe the construction of the hand-setting mechanism used in combination
45 with the pneumatic operating device shown in Fig. 2, reference being had to Fig. 4. Referring to said figure, the letter A designates a casing divided into an upper and lower compartment by a very flexible leather diaphragm
50 B. The upper compartment is connected with the ejector (shown in Fig. 2) by the pipe p . The lower compartment is open to the atmosphere. The diaphragm B is connected by a rod S' with a lever H, which can turn about
55 the winding-post of the clock-movement C. On said lever is mounted an arm provided at its end with a pin s , which engages with the pivoted bifurcated hand-setting lever G. Said lever is adapted to engage with an arm
60 g , secured to the arbor of the minute-hand in the usual manner. On the lever H is also mounted a pawl K, adapted to engage with the ratchet-wheel K' , rigidly mounted on the winding-post of the movement. On the arbor
65 of the minute-hand is also mounted a cam a' , which, in connection with the contact-arm a ,

forms a circuit-closer for the electromagnet or solenoid m' , Fig. 2. The rod S' is subjected to the action of the spring F, tending to force it downwardly. The operation is now as follows:
70 When the circuit at a a' is closed, the valve q of the ejector is lifted and the air in the upper compartment of the casing A is partially exhausted. The rod S' is lifted, carrying with
75 it the lever H and the parts thereto appertaining, the same then being in the positions shown by full lines in Fig. 4. When the contact at a a' is broken, valve q , Fig. 2, falls and atmospheric air enters through pipes z
80 and p into the upper compartment of casing A and restores the equilibrium. By virtue of the spring F the rod S' is forced downwardly and the pin s carries the hand-setting lever G into engagement with the arm g and sets the hands to the correct time. On continued
85 motion of the rod S' the lever G is released and assumes its normal position, while the pawl K engages the ratchet-wheel K' and winds up the spring of the movement to such an extent as to bring it back to the
90 condition of the prior period of synchronization.

If the closing of the circuit at a a' is not to take place hourly, but at intervals of several
95 hours, notched disks, such as j j' , may be placed on the minute-arbor in position to be engaged by the contact-arm a , which disks permit said arm to fall only when it is opposite one of the notches therein.

I am aware that heretofore clock systems
100 have been adopted in which the secondary clocks were simultaneously synchronized and that such clocks were synchronized by self-contained circuit closers thrown into action before or upon the closing of the circuit
105 at the master-clock, and therefore I do not claim this as my invention.

What I claim as new is—

1. In a clock system, the combination with a master clock provided with a circuit closer,
110 of a series of secondary clocks provided with hand-setting devices and with circuit closers operated to close and break the circuit at predetermined intervals, and timed to throw the clocks successively at predetermined
115 intervals into the circuit of the master clock, a source of electricity, and electrical connections, substantially as described.

2. In a clock system, the combination with a master clock provided with a circuit closer,
120 of a series of secondary clocks provided with hand-setting devices and with circuit closers operated to close and break the circuit at predetermined intervals, and timed to throw the clocks successively at predetermined
125 intervals into the circuit of the master clock, a registering or recording device in the circuit of the master clock, a source of electricity, and electrical connections, substantially as described.

3. The combination with a secondary clock,
130 of a pneumatic synchronizing mechanism

comprising a circuit closer operated by the
secondary clock, a solenoid arranged in the
circuit of the circuit closer, an air pipe *p*, a
supply pipe *l* for liquid under pressure, a
5 discharge pipe *z*, a core actuated by the so-
lensoid and provided with a valved end con-
trolling the water supply, a casing contain-
ing an air chamber placed in connection with
the air pipe *p* and closed by a diaphragm, a
10 hand-setter, and an operative connection be-

tween the hand-setter and the diaphragm,
substantially as described.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

ADOLF FRANKE.

Witnesses:

LUDWIG GLASER,
GUSTAV HÜLSMANN.