E. BELIN.

WIRELESS TIME SIGNALING.

APPLICATION FILED OCT. 24, 1914.

1,260,303.

Patented Mar. 26, 1918

2 SHEETS—SHEET 1.

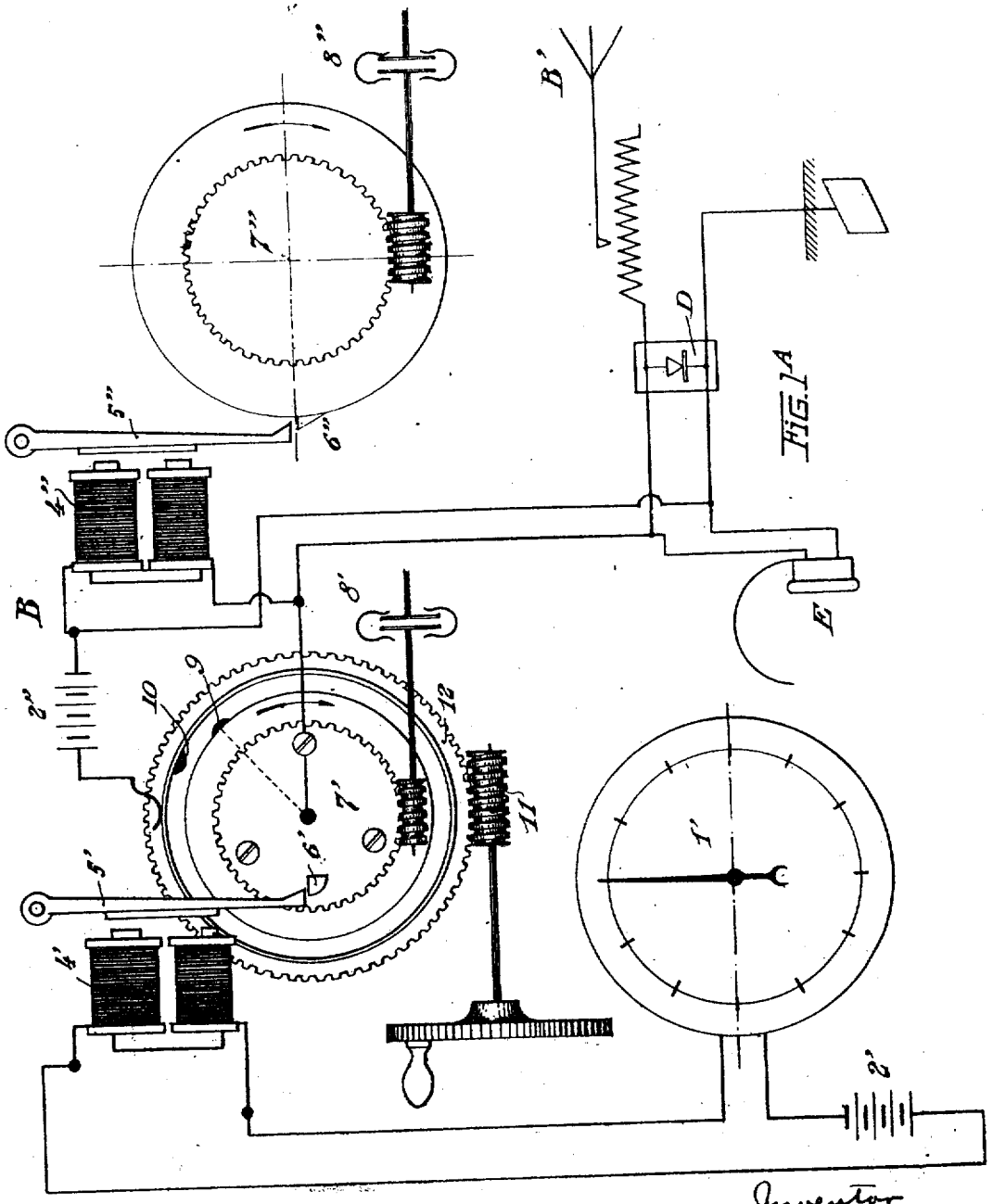


FIG. 1A

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2 SHEETS—SHEET 2.

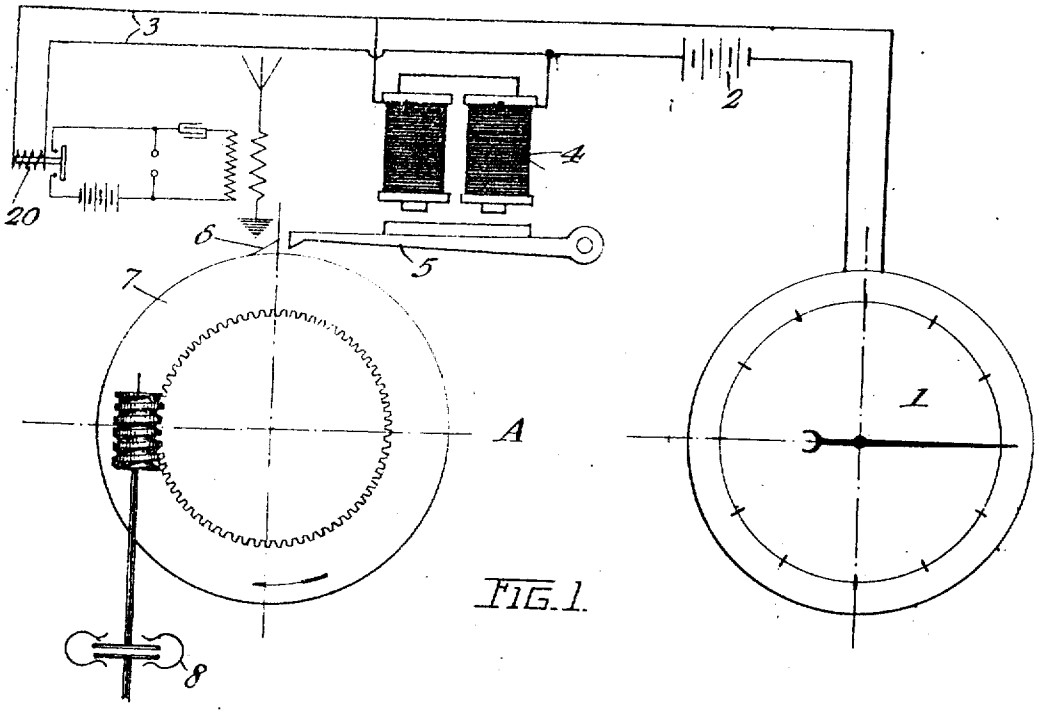


FIG. 1.

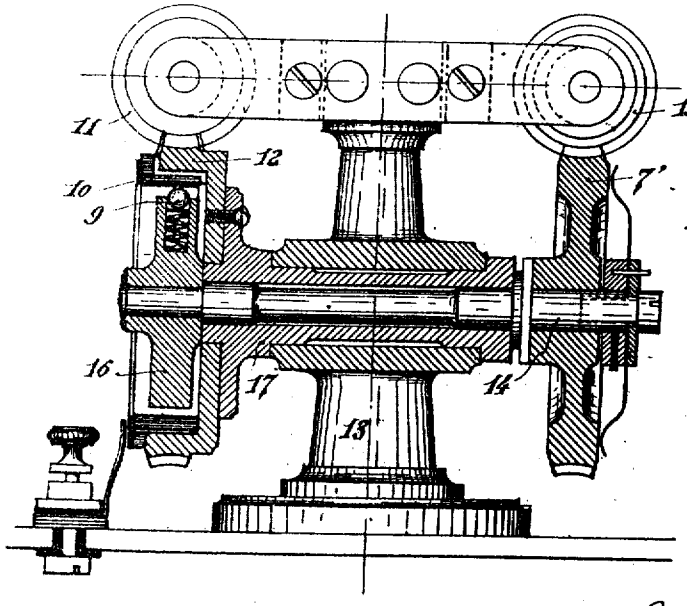


FIG. 2.

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UNITED STATES PATENT OFFICE.

EDOUARD BELIN, OF PARIS, FRANCE.

WIRELESS TIME-SIGNALING.

1,260,303. Specification of Letters Patent. Patented Mar. 26, 1918.

Application filed October 24, 1914. Serial No. 868,463.

To all whom it may concern:

Be it known that I, EDOUARD BELIN, citizen of the Republic of France, residing at Paris, in the Republic of France, have invented certain new and useful Improvements in Wireless Time-Signaling, of which the following is a specification.

The present invention relates to an arrangement for bringing apparatus situated at one or more stations in synchronism with that of a main station by either telegraphy or wireless telegraphy. It is necessary that these apparatus should keep absolutely in step, should run at the same speed and should pass through the same initial point simultaneously. These apparatus may perform a number of different functions, for example that of synchronous clocks, or of transmitting and receiving drums for electrical signals whether luminous or otherwise, the transmitting and reception of telegraphic messages, photographs and the like. Each of the stations may be furnished with a similar member having an exact periodic movement such as those of clocks and chronometers, the important feature being the time of the periodic movement.

It will be understood that the accuracy of the construction depends on counting upon an absolute isochronism between the two moving members, but these will hardly ever be in synchronism, that is to say have a simultaneous passage through a fixed point.

According to the present invention the arrangement for bringing the elements of one or more substations having similar periodic movements into synchronism with that of the main station comprises apparatus at each station for correcting each of said elements after intervals of predetermined extent, an auxiliary apparatus being provided at each substation consisting of an element having a similar periodic movement to the elements to be synchronized and a member the position of which may be adjusted so as to coöperate at any desired moment with said auxiliary element, whereby a corrective movement may be imparted to each of the substation elements simultaneously with the correction of the main station element by its apparatus.

Various methods of solving this problem of double coincidence can be readily perceived. An arrangement will be described which is more particularly applicable to the case of synchronizing two rotating drums by wireless telegraphy. It will be understood that more than one drum may be controlled, that is to say that it is possible to control a number of stations by the emitting of waves from a single station, it being understood of course that all these stations are capable of detecting the waves transmitted from this station.

The invention will be better understood by referring to the accompanying drawings, in which:

Figure 1 shows diagrammatic representation of the apparatus and electrical connections, while

Fig. 1ª is a view similar to Fig. 1 of the apparatus located at the receiving station, and

Fig. 2 shows a sectional view of the auxiliary adjusting apparatus.

At the regulating station A a clock or chronometer 1 periodically closes a contact in the circuit of the battery 2. This circuit passes into the relay 20 so as to cause the emission of waves by wireless telegraphy by means of the wires 3 and forms the regulating signal; at the same time this current passes through the electro-magnet 4 attracting the armature 5 which on being displaced releases a stop 6 on the main drum 7 which in turn is driven by a motor through the friction clutch 8 and runs at a speed rather greater than that corresponding to the period of the chronometer 1. Therefore between two consecutive closings of the circuit by the chronometer the drum 7 makes one turn.

At the receiving station, see Fig. 1ª, a chronometer or clock 1′ is provided which is identical and isochronous with the chronometer 1 of station A. Its operation is also similar to that of the station A in that it releases at similar intervals by means of the electro-magnet 4′, its armature 5′ and stop 6′, a drum 7′ driven by a motor through the friction clutch 8′. This is not the driving drum. The drum 7′ must control, and bring into synchronism with it, a drum 7″ driven through the friction clutch 8″ by means of a system comprising the electro-magnet 4″, the armature 5″ and the stop 6″, but the moment at which it can release the stop 6″ can be varied and regulated so as to coincide with the moment when the main electro-magnet 4 is operated.

For this purpose the drum 7′ is provided with a contact 9 which at each revolution

strikes against a contact 10 closing the circuit of the battery 2'' through the electromagnet 4''. In parallel with this circuit is arranged the receiver E in such manner that the closing of the contact can be detected. By listening it is then possible to hear both the signal emitted by the main battery 2 and the signal by the controlling battery 2'. This in practice will hardly ever be in coincidence. All that is necessary then is to move the contact 10 by displacing it, for example manually by means of the screw 11 and the wheel 12 around the axis of rotation of the drum 7' in such manner as to obtain an exact coincidence. At this moment the synochronism of the drum 7' will be identical with the drum 7 which were formerly only in isochronism. The synchronism will therefore remain as long as isochronism exists between the two chronometers or the clocks 1 and 1'.

In Fig. 2 is shown a section showing the method of operation of the parts 7', 8', 9, 10, 11 and 12. A support 13 carries the shaft 14 of the drum 7' driven by means of the screw or pinion 15 through the friction clutch 8'. This shaft 14 is provided at its other end with a disk 16 in which is embedded the contact 9 shown here in the form of a ball spring pressed outwardly. The shaft 14 serves as an axis and as a support to the hollow shaft 17 of the wheel 12 which carries the contact 10. It is possible to displace by hand the wheel 12 by means of the screw 11 and consequently regulate the instant at which contact is made between 9 and 10. The electric circuit is connected on one hand to the shaft 14 and on the other hand to the wheel 12. It will be understood that it will never be necessary to regulate the coincidence of the signals detected in the receiver E for a duration greater than that of a half period of the clock, because the wheel 12 can turn in either one direction or the other and consequently this regulation can be made very accurately in a very short time.

As has been said at the commencement, the drums 7 and 7'' can be employed for very different purposes and may be connected either by wire or without which in itself is independent of the solution of the synchronizing problem, for example the exact time may be received by means of a series of suitable rotations occurring once every second. The signals transmitted by the one may be received by the other with great accuracy. Also synchronism may be obtained for example for the transmission of messages, photographs or the like by wireless or line telegraphy, the synchronism in these latter cases being regularly regulated in a simple manner during the transmission of the other emissions.

Having now particularly described and ascertained the nature of my invention, I declare that what I claim is:

1. An arrangement for bringing elements at one or more substations having similar periodic movements into synchronism with that of the main station, comprising apparatus at each station for correcting each of said elements after intervals of predetermined extent, an auxiliary apparatus being provided at each substation consisting of an element having a similar periodic movement to the elements to be synchronized, and a member the position of which may be adjusted so as to coöperate at any desired moment with said auxiliary element, whereby a corrective movement may be imparted to each of the substation elements simultaneously with the correction of the main station element by said apparatus.

2. An arrangement for synchronizing apparatus having similar periodic movements and situated at one or more substations with that of a main station, comprising members having isochronous movements, provided at each of the stations, of which that of the main station corrects its own apparatus and transmits an electric signal simultaneously after uniform intervals, while that at the substation regulates its own apparatus through an auxiliary member having a similar movement and an adjustable member coacting therewith, a detector being provided to note both the time of receipt of the electric signal and the time of correction of the sub-station apparatus, thus enabling, by adjustment of the member co-acting with the auxiliary apparatus, the two corrections to be brought into exact coincidence, substantially as described.

3. An arrangement for bringing elements at one or more substations having similar periodic movements into synchronism with that of the main station, comprising apparatus at each station for correcting each of said elements after intervals of predetermined extent, an auxiliary apparatus being provided at each substation consisting of an element having a similar periodic movement to the element to be synchronized, and electro-magnetic means adapted to correct the motion of both the main and auxiliary apparatus aforesaid.

4. An arrangement for synchronizing apparatus having similar periodic movements and situated at one or more substations with that of a main station, comprising members having isochronous movements provided at each of the stations, of which that of the main station corrects its own apparatus and transmits an electric signal simultaneously after uniform intervals, while that at the substation regulates its own apparatus through an auxiliary member having a similar movement and an adjustable member coacting therewith, a detector being provided

to note both the time of receipt of the electric signal and the time of correction of the sub-station apparatus, thus enabling, by adjustment of the member co-acting with the auxiliary apparatus, the two corrections to be brought into exact coincidence, substantially as described, and a telephone receiver adapted to be affected both by the transmitted signal and the correcting current of the main station apparatus.

5. An arrangement for bringing elements at one or more substations having similar periodic movements into synchronism with that of the main station, comprising apparatus at each station for correcting each of said elements after intervals of predetermined extent, an auxiliary apparatus being provided at each substation consisting of an element having a similar periodic movement to the elements to be synchronized, and a member the position of which may be adjusted so as to coöperate at any desired moment with said auxiliary element, whereby a corrective movement may be imparted to each of the substation elements simultaneously with the correction of the main station element by said apparatus, the said auxiliary apparatus comprising a member rotatable at a speed corresponding to that of the main apparatus and provided with a contact adapted to close the circuit of the correcting apparatus.

6. An arrangement for bringing elements at one or more substations having similar periodic movements into synchronism with that of the main station, comprising apparatus at each station for correcting each of said elements after intervals of predetermined extent, an auxiliary apparatus being provided at each substation consisting of an element having a similar periodic movement to the elements to be synchronized, and a member the position of which may be adjusted so as to coöperate at any desired moment with said auxiliary element, whereby a corrective movement may be imparted to each of the substation elements simultaneously with the correction of the main station element by said apparatus, and wireless telegraphic means whereby the main station may signal to the substations.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses, this sixth day of October, 1914.

EDOUARD BELIN.

Witnesses:

G. F. WADLEY,

DE WITT C. POOLE, Jr.