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(*Under International Convention.*)

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COMPLETE SPECIFICATION.

Improvements in the Operation of Electrical Clock Installations.

We, the Firm H. Aron, Elektricitätszählerfabrik G.m.b.H., of 39, Wilmersdorferstrasse, Charlottenburg, Germany, Manufacturers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in the working of electrical clock installations consisting of master and sub clocks, and like mechanisms.

The sub clocks are driven by the master clock by the making of a contact in the master clock, which transmits its current impulse through the sub clocks.

Such systems have the disadvantage that in case there is a fault in the contact making, or a breakage in the line, or mechanical defects in the master, or if there be different voltages existing at various points in the installation, all the sub clocks, or some of same do not work correctly.

According to our present invention these disadvantages are overcome by giving two or more impulses instead of one, tending to actuate the sub clocks, the master clocks being provided with contact arrangements giving impulses alternatively in opposite directions.

Under such a scheme the sub clocks will answer only to currents which are successively in the opposite direction, and hence though two or more impulses may follow in the same direction the progression of the sub clocks can only be influenced by any one of the said impulses.

The impulses, of course, if not simultaneous, must follow so quickly that they all occur within the period of progression, that is, with minute contacts within one minute, with half-minute contacts within half a minute, and with quarter minute contacts within a quarter minute.

The additional impulses, therefore, have the effect that those sub clocks which do not answer to the first impulse will be influenced, with certainty, by the second or any other impulse. This play is repeated in every period of progression.

For the purpose of this invention, it is immaterial whether the sub clocks are connected in series or in parallel, or in parallel-series.

It may be advisable to arrange that the secondary or further impulses enter the lines feeding the sub clocks as far away as possible from the principal master clock, giving the first impulse, the said lines for feeding the sub clocks being

[*Price* 8*d.*]

designed in an electrical straight "line" or "ring" system. By this means faults in the lines and differences in potentials along the line will be safeguarded against. For similar reasons the secondary and further masters may tap a separate or common source of supply of current to that of the principal master.

To translate these ideas into practical working, two or more master clocks with reversible contact arrangements will be installed at any convenient place in the installation, and these will send impulses of the same direction at the same time, or rapidly after each other along the distribution lines.

To obtain this result, it is preferable to use master clocks, each of which are periodically synchronised from an external source, or which are interlocked with each other.

Instead of using several self-contained master clocks, or movements it is also possible to use one self-contained master clock, and to replace the auxiliary master clocks partly or wholly by clock-works or contact devices, depending on the principal master clock, by relays, which are actuated by the principal master clock, by one or more of the secondary master clocks, or by the principal clock and one or more of the secondary master clocks.

These relays are so installed that they will give impulses immediately after the master clock or clocks, and always in the same direction as that of the master.

The relays are preferably so designed that they in their turn can only transmit their successive impulses when receiving impulses successively in the opposite direction.

If it is also intended to prevent breakdown due to mechanical defects in the master clock, it is better to supply at least two self-contained master clocks; one to act as a principal master, and the other to act as a secondary or auxiliary master. In this case, if one master clock fails, the other will maintain the progression of the sub clocks.

The synchronising of the various master clocks can be arranged by any well known method of synchronising relay, which according to requirements can be arranged to act at any period (hourly or daily) either from one or more standard pendulums, or from any public observatory, as is well known in practice. These synchronising relays receiving their impulses in the above described manner, will set the primary, secondary and auxiliary master clocks exactly at normal time by means of an instantaneous action.

According to this invention, it is obvious that interruptions in the main distribution lines when the clocks are connected up in parallel or parallel-series, will not prevent the correct working of the sub clocks. Also a drop in voltage along the line or lines will not be detrimental to the working of the sub clocks.

Consequently, and furthermore, by this invention it is possible to increase the number of sub clocks on any one distribution scheme to an extent which was heretofore impossible.

Moreover, it is obvious that this system is particularly applicable to a duplicated service of current supply, for an automatic throwover switch, as in previous practice is no longer necessary; but one service of mains would be led to the primary master, and a second service to the secondary master.

The enclosed diagram of connection shows as an example of carrying out the invention a scheme of distribution in parallel and parallel-series, and divided into two sections, which may be a considerable distance apart. This diagram shows one of the applications of our invention for a scheme of distribution to sub clocks.

It is obvious that various alternatives to the plan shown can be adopted, and it is also obvious that the scheme is capable of indefinite expansion, and that in place of two sections the number of sections can be increased indefinitely, always provided that to each section there be two governing apparatus, either one of which may be a master or a relay, or both may be masters or relays.

Where relays are inserted in place of masters, the system is preferably so designed that each relay receives an impulse from a separate master.

Improvements in the Operation of Electrical Clock Installations.

In the enclosed diagram of connections

A is the principal master.

C is the secondary master, which is shown to be interlocked with the primary master A by means of the regulating line RL. All the return currents in this system are shown along one line F, for which of course earth may be substituted.

The contacts K and K^1 in the master clocks A and C, are actuated every minute, half-minute or quarter minute as the case may be, in such a manner that the segment makes half a revolution.

An impulse is sent by the master clock A and by the auxiliary master clock C through the line, and hereby the connection must be made in such a manner, that these impulses have the same direction.

If the two master clocks A and C agree in their time, the two impulses will be given at one and the same time.

To ensure this, as above explained, the secondary master C is interlocked with the principal master A by the line RL, the secondary master C being fitted with synchronising relay S.R., which is actuated every hour or 2 hours by the principal master A, for which purpose a separate contact H.C. is periodically closed by A, and an impulse is transmitted through RL.

B^1 and B^2 are relays, which as above explained, are capable of an indefinite expansion. 1, 2, 3 & 4 are common or separate sources of supply. D^1 and D^2 are connecting lines from the two sections of the system H and H^1.

It follows that if one of the master clocks A or C stops, or there is a defect in the contact, that the other master clock will continue to drive the sub clocks.

Assuming a defect in secondary master clock C; master clock A will drive the sub clocks in section H direct, and through connecting line D^2 and polarized relay (P.R.) in B^2, will continue to drive the section H^1 of sub clocks, by means of contact K^2, as above explained, and in any extension of sections, the same principle will apply.

Taking another alternative, assume an interruption has taken place at X, the master clock A will continue to drive all the sub clocks in section H, excepting L and M. Master clock C will continue to drive all the sub clocks in section H^1, and through connecting line D^1 will actuate P.R. in B^1; hence through contact K^2 will continue to drive L & M.

Similarly assuming an interruption of the service of current supply at No. 1, if No. 4 be a separate source of supply, or a duplex main from a separate feeder in the case of lighting or power service, secondary master C will continue to drive the sub clock.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. An improved arrangement for working electrical clocks installations containing master and sub clocks, in which for the actuation of the sub clocks designed to be actuated by successive impulses in opposite directions, two or more impulses of the same direction are given within one period.

2. An arrangement for working electrical clock installations as claimed in Claim 1, in which two or more master clocks with reversible contact arrangement are provided, these master clocks being either interlocked or each master clock receiving an external impulse from any other source, and sending at the same time, or within a short interval of each other, impulses of the same direction into the clock installation.

3. An arrangement as claimed in Claim 2, in which the secondary master clocks are replaced partly or wholly by relays actuated by the master clocks, the relays being so designed and connected up that impulses of the same direction as those given direct by the master clock or clocks are sent into the line.

4. An arrangement as claimed in Claim 3, in which any number of separate sections are each governed by two governing apparatus, either master or relay.

Improvements in the Operation of Electrical Clock Installations.

5. The improved arrangements for the operation of electrical clock installations, substantially as described and illustrated in the accompanying drawings.

Dated this 29th day of March, 1911.

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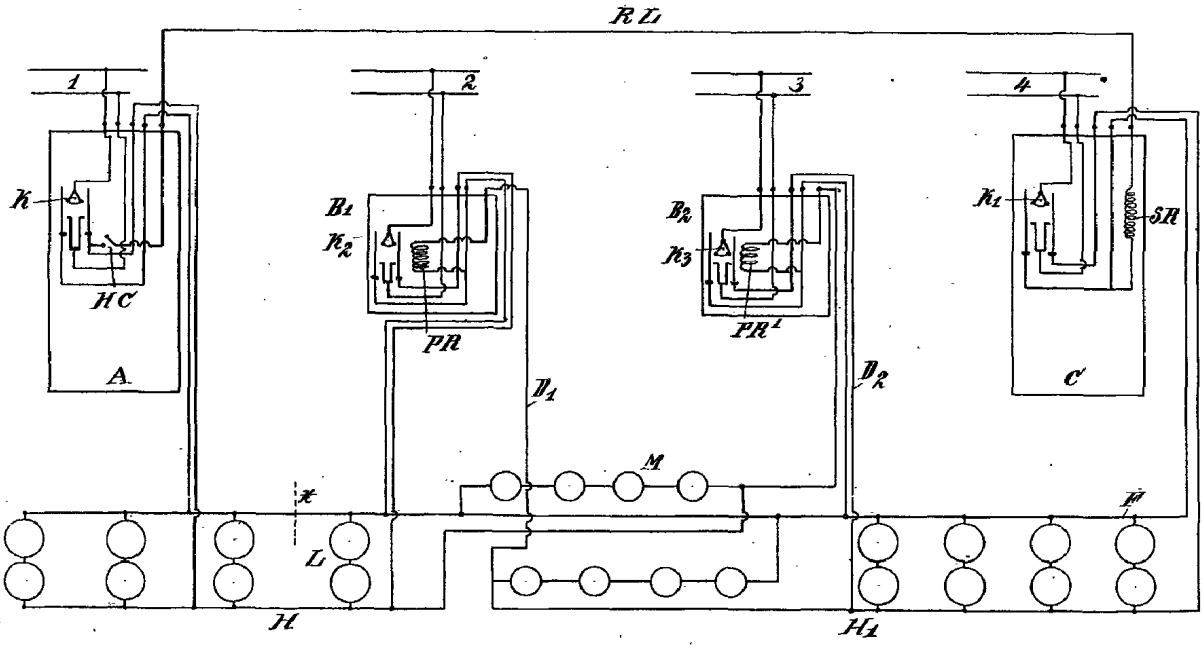
THE COMPLETE SPECIFICATION OF H. ARON ELEKTRICITATS ZAHLERFABRIK GES. *(1 SHEET)*

[This Drawing is a reproduction of the Original on a reduced scale.]



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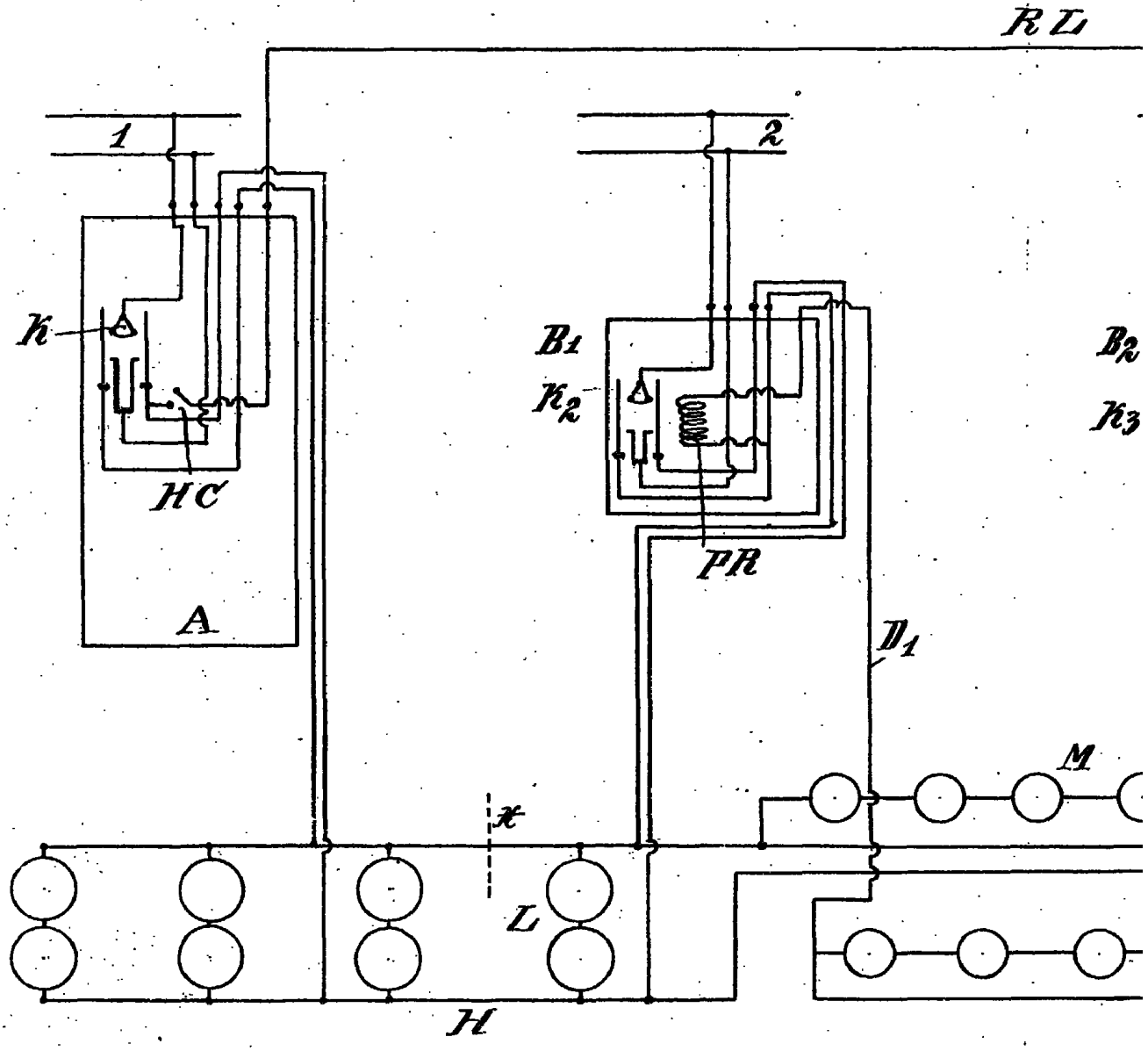

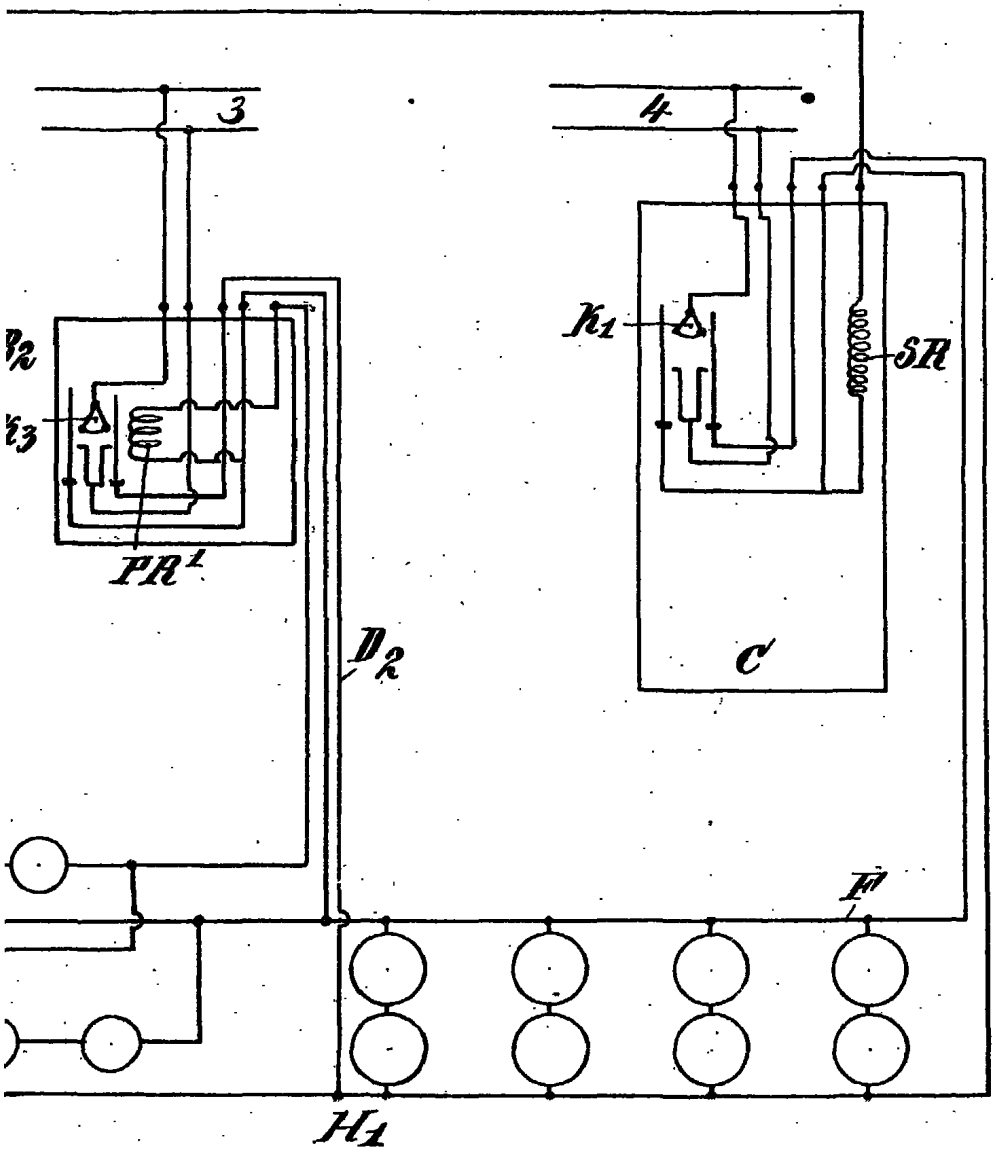

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