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NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

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Fellow Horologists:

This journal issue will complete the series on Time Distribution by means of the "ATO" Regulators and Receiving Clocks. In addition, we will feature a brief article on the esthetics of the Secticon clocks. Also, we will start a series covering the Fred Frick Master, Secondary, & Program clock installation and service. The series will also cover the fascinating history of the company from its origin by McCaskey, through the Frick ownership, with the following management by Landis, and finally the Cincinnati Time Recording group.

The annual Mart cleanup has been completed, with older material deleted. Any member wishing the continuation of an ad which has been removed should request another insertion, to the attention of Dr. George Feinstein whose address appears on the Mart page.

For those who are still delinquent in dues, we recommend the immediate remittance to the attention of the Secretary-Treasurer, Harvey Schmidt. **Still only $10,** a genuine bargain, unchanged for 30 years! Heed this reminder and don't miss a single journal issue. A reminder is in order that material for the journal is always welcome... original material as well as technical and historical reprints.

The facilities for chapter meetings at recent regionals have not permitted our usual get-togethers, but we plan a very special and interesting meeting at the Eastern States Regional scheduled for August 16/17 in Syracuse, NY. If you plan on being there, don't miss this event.

Good reading ahead, enjoy this issue.

Martin Swetsky, FNAWCC,......President	)	
Harvey Schmidt, FNAWCC,.....Secretary-Treasurer	)	Co-editors
Dr. George Feinstein, FNAWCC..Chapter Historian	)	

HARVEY SCHMIDT, FNAWCC, Secretary-Treasurer, 75-80 179th ST. FLUSHING NY 11366

Continued from December, 2001 issue.

According to the arrangement shown on fig. 12, the cable C2 is connected to cable 3 by splices. In this case, it is necessary to solder the joints of the cable with resin and the wires must then be insulated by means of a rubber tape or Chattertons tape. In very damp districts, we advise protecting the joint with a lead band soldered like joints in a gas pipe, so as to form a tight lead coating all round the insulated wires. This kind of work is frequently done by electricians.

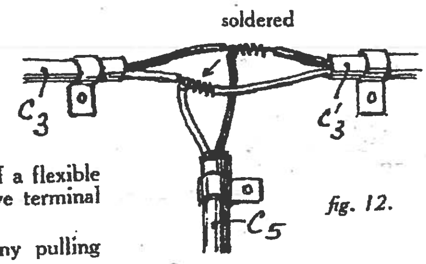


fig. 12.

6° **CONNECTING A RECEIVING CLOCK to be placed on a MANTLE-PIECE.**—Particular care is recommended to avoid damaging the wire or causing a short circuit in moving the clock when dusting. The lead covered cable should be preferably connected with a wall plug, with which the clock should be connected by means of a flexible wire, as in the case of portable lamps. The connections should be made so that the positive terminal of the clock corresponds to the black wire of the lead covered cable.

The flexible wire should be fixed on the clock in such a way as to overcome any pulling strain on the terminals that would disconnect them.

II.—FOR LARGE INSTALLATIONS OF THE "ATO" SYSTEM

In the large installations for time distribution, consisting of a large number of receiving clocks, the safety of their working is increased by proceeding as follows :

The regulator controls only a few special receiving clocks, so-called " relay-clocks ". These are provided with contacts for the distribution of time, each of which controls a group of receivers indirectly synchronised by the regulator.

Such an arrangement allows a reduction of the current passing through the switch, which the main regulator must periodically make and break. Moreover, each relay clock can be made to work by its own means if necessary as a safety master-clock, thus limitating the damages which may be caused by accidents in some part of the installation Finally the relay-clocks being normally synchronous, and not needing such high precision as the regulator, can be provided with a specially strong contact for time distribution. The adopted arrangements are such that the contact can be cleaned without interrupting the working of the installation. The use of relay-clocks, consisting in ordinary " Ato " clocks, does not show any complications, and hardly increases the cost of installation, so that we strongly recommend to use relay-clocks when the installation consists of more than five receivers.

The relay-clock takes the place of one of the receiving clocks used in the installation, and marks the time like an ordinary clock.

Under 30 receivers only one relay-clock is required, as shown on sketch fig. 13. In very large installations there is advantage in using several relay-clocks.

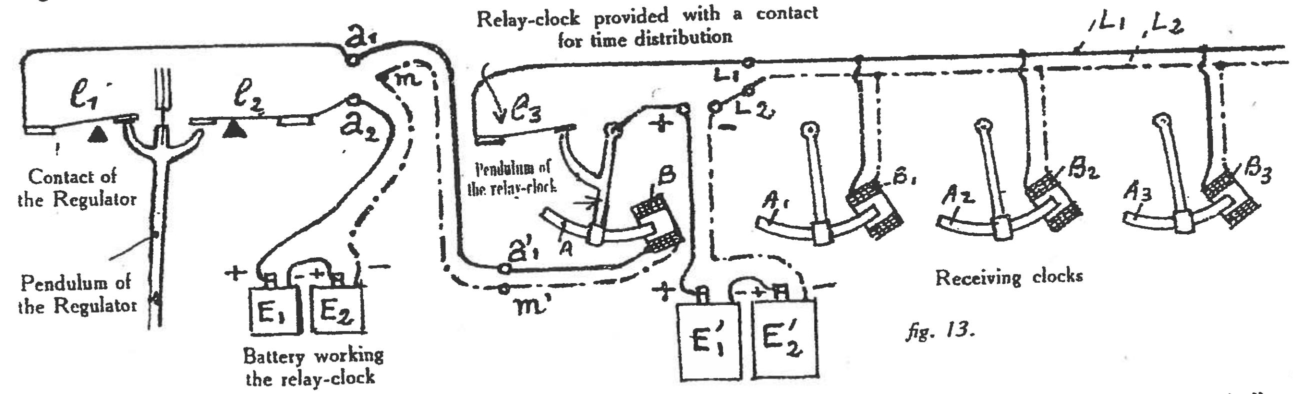


fig. 13.

The fixing of the apparatus should be carried out in the same way as for small installations. Fig. 14 shows diagramatically the easiest way of fixing.

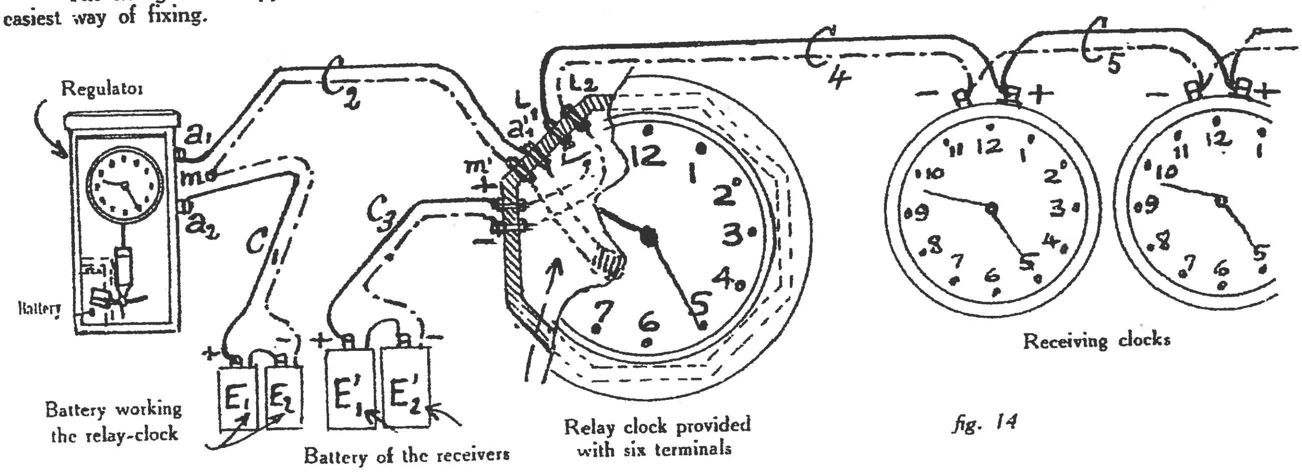


fig. 14

The relay-clock PS is provided with 6 terminals, L1, L2, a'1, m'+ and —, and is connected with the regulator in the same way as the first receiver shown on fig. 9. Cable C2 connects the terminals a1 and *m* of the regulator with the terminals *a'*1 and *m'* of the relay-clock. Cable C1 connects the terminals *m* and *a*2 of the regulator with the terminals of the battery E1 E2 working the relay-clock.

This relay-clock controls the receivers; for this purpose a cable C3 connects its positive and negative terminals with the terminals of the battery E'1 E'2, and the terminals L1 and L2 are connected by means of cable C4 with the receiving clocks, proceeding as described for small installations, —the relay-clock taking the place of the regulator.

III.—RECOMMENDATIONS CONCERNING TIME DISTRIBUTION PLANTS

The good working order of the installation depends on an easy supervision of the connections. Consequently, visible conductors secured along the angles of the ceilings and walls are to be chosen, and, where the wires are out of sight, special care should be taken.

For the splicing of the wires, it is not sufficient to twist the ends, as oxidation is likely to occur after a time, thus preventing the passage of the current. The joints of the wires should be soldered with resin or terminals with strong tightening screws should be used.

The contact of two insulated wires should be prevented by means of cotton coverings. When two cotton covered wires meet it is necessary to protect them with an insulation tube or rubber tape, or Chattertons tape. Care should also be taken that the conductors are well insulated from the lead cover where the latter is cut.

The wires easily reached should be carefully fixed. In installations for factories it is recommended to protect them by means of rigid tubes or to use cables with an iron core (these can easily be found in the trade).

When the wires are to be displaced, as is the case when a receiving clock on a mantel-piece is to be connected with a fixed cable, flexible wires should always be used, that is to say a cable whose conductors are made of several very fine wires twisted together.

No pulling strain should be exerted on the joints of the wires. When laying down the wires, extra care should be taken, as rough installations are likely to bring disagreeable and costly trouble.

We advise our customers to stipulate in their contract that their guarantee does not cover the case in which troubles were to arise from mechanical damages, such as the rupture or short circuiting of a cable caused by neglect or carelessness.

IV.—INSTALLATIONS WITH COTTON COVERED WIRES USED FOR HOUSE-BELLS

To reduce the cost of installation, ordinary wires used for house bells can be employed. (Copper wire 9/10 or 7/10 insulated by means of one coating of gutta-percha and two of cotton covering.)

This type of wire is to be reserved for places that are not damp, and where no neglect is likely.

The wire should be laid down in the same way as for house-bells. We recommend to use our derivation pieces as shown in fig. 11.

V.—COST PRICE OF THE INSTALLATIONS

The lead coated wire with two conductors costs about 2 francs per metre.

Two wires of each 7/10 mm. insulated with gutta-percha and cotton covering cost about 1 franc per metre, but are more difficult to lay down.

Contractors charge as a rule, for laying down the branchings an average price of about 2 to 4 francs per metre, according to the importance and difficulty of the work. This price includes the boring of walls and other accessory works.

FINDING OUT OF THE CAUSES OF BAD WORKING IN A TIME DISTRIBUTION PLANT

SYNOPSIS OF ELECTRICAL PRINCIPLES.—An Installation for time distribution, as shown diagramatically on fig. 16, can be compared with the hydraulic arrangement shown on fig. 15.

The battery can be compared with the pump P. causing the water to rise to the level H in the reservoir *Va*. The pendulums of the receivers can be compared with the blades F1, F2, F3 joined on to O1, O2, O3, which move down periodically under the influence of the liquid columns D1, D2, D3 when tap R is opened, the latter playing the part of the electrical switch I in the time distribution.

In the hydraulic installation considered, two distinct factors act on the energy transmitted to the blades :—

1° The height of drop H or pressure which can be measured with a manometer M.

2° The volume of water per second of each liquid column.

The action of the liquid column is directly proportional to the height of drop H or the difference of level and to the volume of the liquid column.

For a given difference in level. the volumes of the liquid columns through each pipe D1, D2, D3, will be greater when these pipes are shorter and wider,

In electrical installation, the phenomena produced are the same. The energy received by the pendulums depends first on the voltage of the battery (also termed difference of potential). This voltage is equivalent to the drop H or pressure. It can be measured by a voltmeter V, playing the part of the manometer M.

The energy received by the pendulum depends also on another factor, equivalent to the volume of water flowing per second. This factor is the intensity of the current or amount of electricity passing through the cables per second. This volume is expressed in amperes or milliemperes.

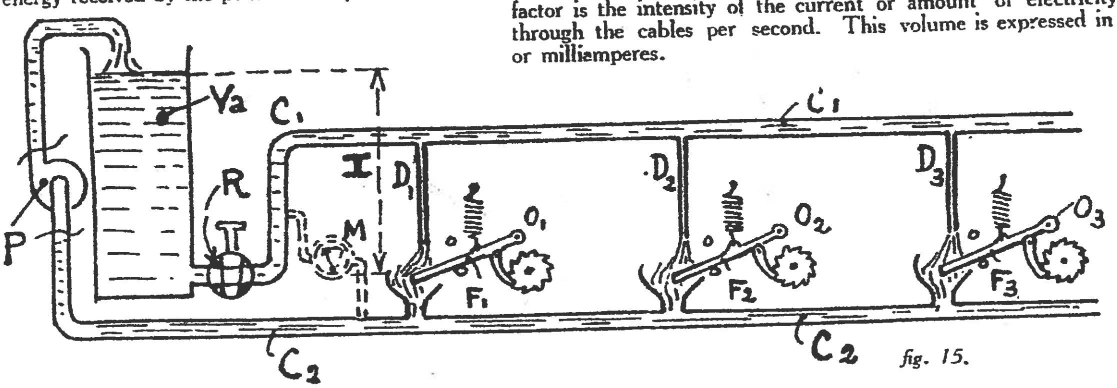


fig. 15.

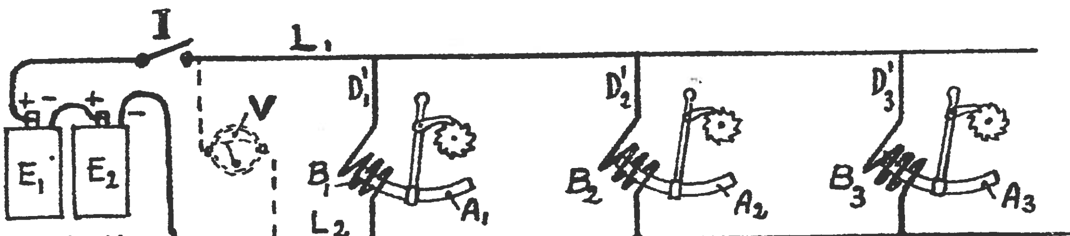


fig. 16.

For a given voltage, the intensity of the current flowing through each derivation is greater when the wires are shorter and of a larger section. This is the equivalent to the liquid currents in the pipes D1, D2, D3.

In the distribution of time of the "ATO" system, the working of each receiver requires only very little energy, the intensity of the current going through coils B being reduced to a minimum. For this purpose the coils are made of a very long and fine wire (5/100 diameter) and offer consequently great resistance to the flow of the current. Owing to this, the consumption of each receiver is very small (the maximum intensity used is under 1/1000 ampere).

When wires L1 and L2 are connected directly by means of a metal part, a short circuit is produced. This short-circuit is equivalent to the phenomena produced in the hydraulic installation shown on fig. 15, when the two pipes C1 and C2 communicate through a very wide opening. In this case the reservoir is rapidly exhausted and the difference in level H becoming too small, the blades de not receive any more energy. Similarly, when a short-circuit is produced by a metal part connecting the wires L1 and L2, the metal piece offers less resistance to the flow of the current than the coil B. This current of very high intensity (exceeding 10.000 times the consumption of a receiver) causes a very quick drop of the voltage and at the same time a permanent deterioration of the battery.

If the wires L1 and L2 are not properly insulated (for example if they are secured on a wooden support somewhat damp or impregnated with nitre) there is also a loss. This loss is perhaps less intense than in the case of a metallic short-circuit, but, after a time, it exhausts the battery and shortens its life.

FINDING OUT OF THE DEFECTS.—Take the case of an installation as shown on fig. 17. The bad working of the apparatus may be classified as follows:

1° **All the pendulums of the receptors oscillate, but the oscillations are weak.** — The fact that the pendulums are moving shows that there is no interruption or short-circuit. The amplitude of the oscillations being too weak, we may conclude that probably the voltage of the battery E1, E2 for distribution of the time is insufficient. This battery should be examined, and charged if necessary. If the battery is in good order, the fault may be due to the contact for distribution of the time being accidentally out of order, thus giving too short a contact (see end of our directions relating to this contact).

2° **Some of the receptors work; others are completely stopped.**—In this case, there must be an interruption of the cable leading to the receivers that are stopped. This cable must be verified, particularly at the splacing of the wires. (The finding out of the interruption may also be done as explained below (fig. 20).

3° **The regulator works with normal amplitude, but all the receptors are stopped.**—In this case the bad working may result from one of the following causes:

1° The battery E1 E2 for distribution of the time is completely discharged, or the cable C1 connecting this battery with the regulator is interrupted;

2° The cable C1 connecting the regulator with the first receptor is interrupted;

3° There is a short circuit on the line;

4° The contact for time distribution on the regulator is out of order.

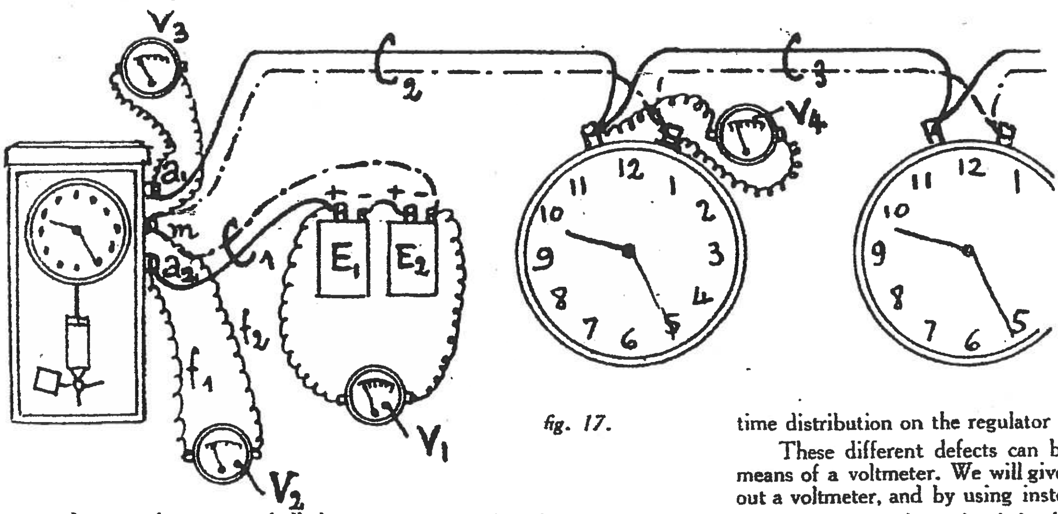


fig. 17.

These different defects can be detected very easily by means of a voltmeter. We will give a way of proceeding without a voltmeter, and by using instead an ordinary house-bell.

In case of stoppage of all the receptors, we advise to, firstly, make sure that there is no short circuit in the connections.

FINDING OUT A SHORT-CIRCUIT WITH A VOLTMETER.—A short circuit causing a rapid drop of the voltage may bring about a too rapid exhaustion of the battery.

To examine the battery a continuous current voltmeter may be used, capable of giving a marked deviation for 1 volt. By connecting the terminals of the voltmeter with the terminals of the battery, about 3 volts should be registered when the battery is new, and a little less later on. For the installation to work satisfactorily the voltage should be over 2 volts.

To measure the voltage it is not necessary to connect the voltameter with the actual terminals of the battery; it can be connected to any wire directly connected with the terminals of the battery.

For instance, the voltmeter V2 can be connected as shown on fig. 17. The wire *f2* connects the terminal *m* of the regulator with the negative pole of the voltmeter, the terminal *a2* of the regulator with the positive pole of the voltmeter. The latter should register a voltage of over 2 volts. If there is no deviation, we may conclude that the battery is exhausted or that the cable C1 has been accidentally cut.

If the voltmeter, when connected directly with the terminals of the battery shows a normal deviation, but no deviation when connected with the terminals *a2* and *m*, there must be a rupture of the cable C1. It sometimes happens that when twisting the wires they break, without damaging their covering; there results a discontinuity in the wire which it is rather difficult to find out; to that effect the wire must be felt carefully, especially at the joints and bends.

If the voltmeter connected with the terminals of the battery and the terminals al and *m* of the regulator shows the normal deviation, the defect must be found either in the contact of the time distribution or in the cable connecting the regulator with the receivers. There is certainly no short-circuit. We then proceed as follows the voltmeter should be connected with the terminals al and *m* of the regulator (position V3). For the regulator to work normally the needle of the voltmeter must move periodically every 1/2 second, at each closing of the contact of the time distribution.

If the needle does not move at all or only irregularly, it proves that the contact of the regulator is out of order (see further for description of this contact).

If nothing abnormal has been found in the movements, the voltmeter should be connected with the terminals of the first receiver (position V4) without breaking the connections with cable C2. The needle of the voltmeter should also deviate periodically every 1/2 second. If it does not, there must be an interruption in the cable between the regulator and the receiver. If the defect is due to a short-circuit, it can easily be located by testing separately each lead of cable. To that effect a new battery and a voltmeter are required. The ends of the lead of the cable to be tested are disconnected and fitted as shown on fig. 18. If the needle of the voltmeter deviates, there must be a short circuit.

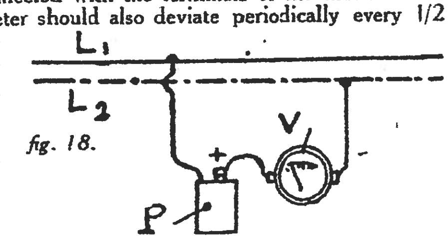


fig. 18.

In short, the finding out of any fault with a voltmeter can be done by successively connecting the voltmeter to the terminals of the battery, to the terminals *a2* and *m* of the regulator, to the terminals al and *m*, and finally to the terminals of the receivers.

VERIFICATIONS WITHOUT A VOLTMETER.—A good battery and an electric house-bell may be used. To make sure that there is no short-circuit in the branching L1 L2, the connections should be made as shown on fig. 19. If the bell rings there must be a short-circuit. If the bell does not ring, the defect must only be due to an interruption which can be easily located by carefully examining the connections, and by verifying that all the wires are well connected. It is wise to make sure beforehand that both the battery and the house-bell are in good working order; this should be tested by directly touching the wire f with the wire $f2$, when the bell should ring.

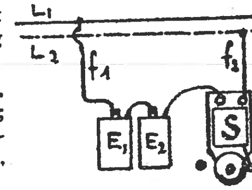


fig.19

If the tests prove that there is a short-circuit in the installation, the part of the cable where the fault lays ought to be found out easily; for this each lead of the cable will be tested separately by disconnecting their ends beforehand. To make sure that a wire is not interrupted, we shall proceed as shown on fig. 20

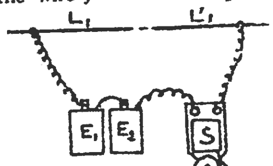


fig. 20.

SEPARATE VERIFICATION OF A RECEIVER.—To verify a receiver, a battery with two good elements should be used, whose terminals should be connected with those of the receiver. We shall then interrupt the circuit periodically, by hand, trying at the same time to provide for the rythm of one interruption every 1/2 second. The pendulum of the receiver should start oscillating under the influence of the successive current impulsions transmitted to the coil (see fig. 21).

SEPARATE EXAMINATION OF THE CONTACTS OF THE TIME DISTRIBUTION.—A good battery and receiving clock should be directly connected as shown on fig. 21. The pendulum of the receiving clock ought to beat with great amplitude. When disposing of a continuous current milliamperemeter, it may be used to ascertain the intensity of the current sent by the regulator. In connecting this instrument we must be careful not to proceed as in the case of a voltmeter. It has been said that this latter instrument should be directly connected with the parts between which the voltage or difference of potential is to be measured. On the contrary, in the case of a milliamperemeter the terminals of the latter should never be directly connected to those of the battery or to the wires which are directly connected to it. In fact milliamperemeters offer much less resistance than voltameters and are therefore run through by excessive intensity when connected with the terminals of the battery. The milliamperemeter A should be connected in series with a time receiver, so that the current runs at the same time through the instrument and the coil of the clock (see fig. 22).

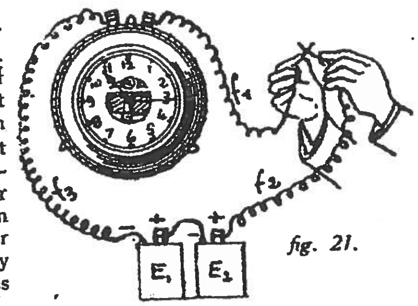


fig. 21.

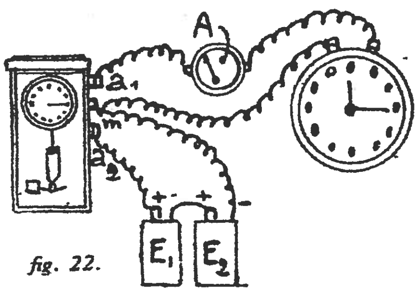


fig. 22.

The needle of the milliamperemeter should deviate every time the pendulum of the master clock becomes vertical, that is to say every 1/2 second.

DETAILS OF THE DIFFERENT PARTS OF AN "ATO" REGULATOR

To examine the mechanism, the hands should be taken out and the dial removed; for that purpose, the reed surrounding the dial will be taken out by simply turning it round; that reed being bayonet fitted will be removed without unscrewing anything. The small fixing screws of the dial are then exposed and can be easily removed. The counter dial presents a large opening through which the 'contact maintaining the oscillations and that of the time distribution may be seen.

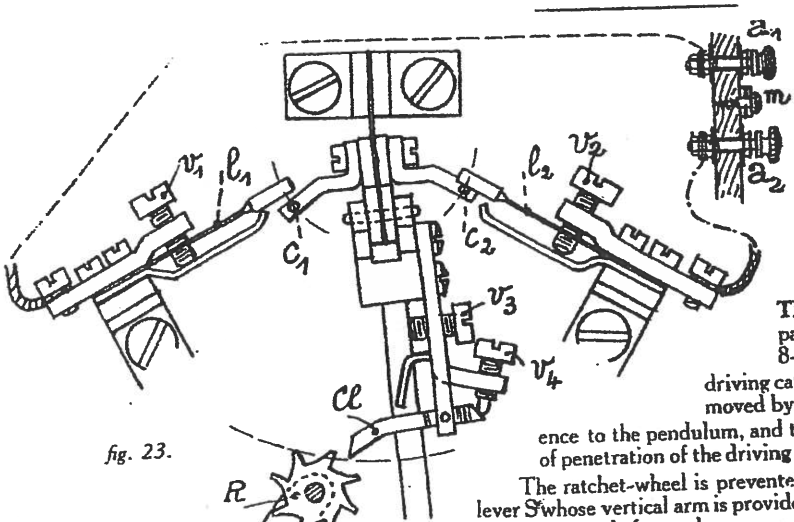


fig. 23.

CONTACT MAINTAINING THE OSCILLATIONS.—The first part of the mechanism is an 8-teeth ratchet-wheel driven by a driving catch (fig. 23), the axis of which can be moved by means of the screw V3 with reference to the pendulum, and the screw V4 is to regulate the depth of penetration of the driving catch into the toothing of the wheel.

The ratchet-wheel is prevented from going back by the bell-crank lever S whose vertical arm is provided with a pin C3 producing an electric contact at each forward movement of the teeth of the ratchet-wheel. It is this contact which transmits the current into the coil B and thus maintains the oscillations of the pendulum.

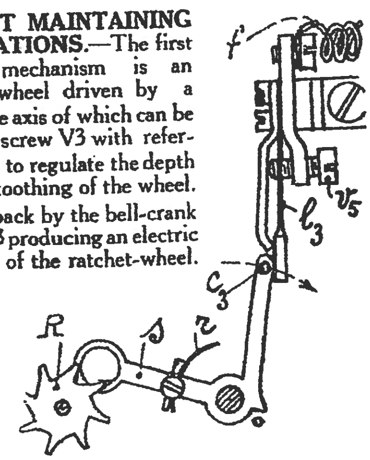


fig. 24.

To the bell-crank lever is fixed a spiral spring r, whose ferrule makes one with the frame work. The spiral spring r prevents the passage of the current through the oiled pivots. Moreover, when rotating the ferrule regulates the strength with which the bell-crank lever rests on the rachet-wheel.

The screw V5 allows to regulate the position of the contact spring with reference to the contact pin C3, making one with the vertical arm of the bell-crank lever. On the return of the pendulum the contact pin C3 should be slightly apart from the contact springs (about 3/10 mm.).

For the good working of the regulator, the following conditions must be realised :

1° There must not be any backward movement after each drive of the driving catch. For this, the screw V4 regulating the penetration must be so regulated that the catch leaves the driven tooth as soon as the ratchet-wheel has advanced by 1/8th of a turn.

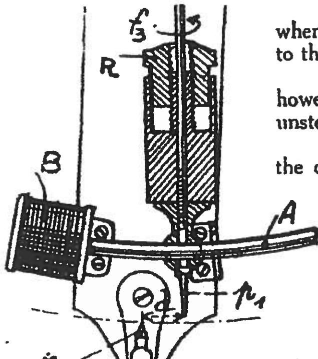


fig. 25.

2° The screw V3 must be so adjusted that each drive of the ratchet-wheel by the catch starts when the point of the pendulum P1 is at a distance =9 mm. on the right of the fixed point P2 corresponding to the vertical (see fig. 25).

3° The spiral must be so regulated that the bell-crank lever rests with a minimum pressure, sufficient however to keep the ratchet-wheel in place after each drive of the catch, and this in spite of the unsteadiness of the hands.

4° The screw V5 must be so adjusted that the contact pin of the bell-crank lever starts raising the contact springs after a drive of 3/10 mm. The electric contacts must be perfectly clean.

CONTACT OF TIME DISTRIBUTION

This is done as shown on fig. 23. When the pendulum is vertical, the springs *l*1 and *l*2 are both in contact with the pins C1 and C2. which are interconnected, and the current passes through them, When the pendulum in on the right of the vertical the pin C1 leaves the blade *l*1, and the current is interrupted. Similarly, when the pendulum is on the left of the vertical, the pin C2 leaves the blade *l*2.

The screws V1 and V2 regulating the position of the blades *l*1 and *l*2, regulate the duration of the contact. When working properly, pin C1 should start touching blade *l*1 when point P1. is at a distance of 8 mm. on the right of point *p*2, and pin C2, the blade *l*2 when the point *p*1 is at a distance also of 8 mm. on the left of point *p*2.

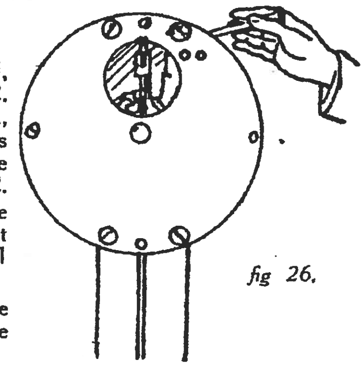


fig 26.

COMPLETE REMOVAL OF THE MECHANISM.—This is done by taking out the screws at the back of the cabinet. For our models to be fixed to a wall, the screwed back of the cabinet should previously be taken out.

REMOVAL OF THE COUNTER DIAL.—To the counter dial are fixed the mechanism of the hands and the spring contacts 13, maintaining the oscillations of the pendulum. These springs being connected by an electric wire with the fixed coil B, care should be taken to release the wire before removing the counter dial (For this, the screw driver should be placed as shown on fig. 26).

Fig. 1 Front view

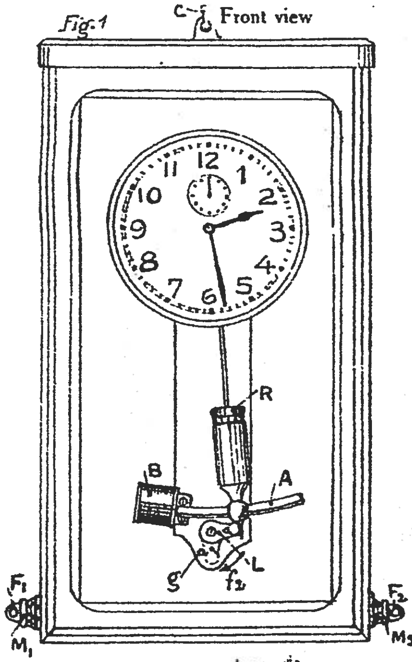


Fig. 2 Side view

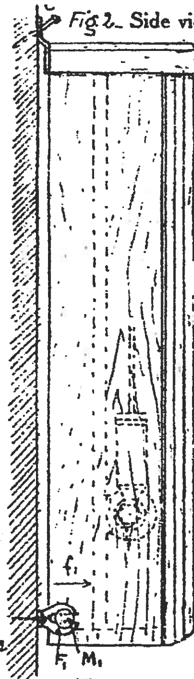


Fig. 3 Back view

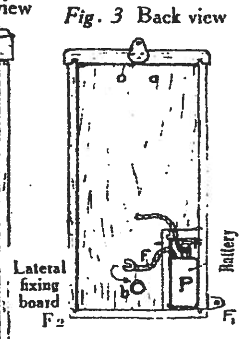


Fig. 4

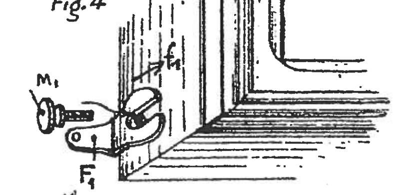


Fig. 5

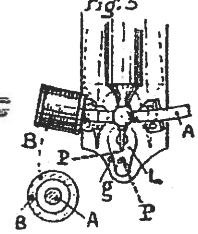
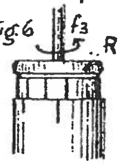


Fig. 6



DIRECTIONS for the INSTALLATION of an "ATO" REGULATOR

Connecting the Battery.—The Battery P should be connected as shown on fig. 3, which represents the back of the cabinet. The end of the wire F must be tightened under the terminals b.

Installation.—Fix a nail C in the wall, slightly inclined towards the top, to support the cabinet (fig. 2). The cabinet must be quite straight. For this, the pendulum should be freed by turning the stop lever in the direction f2 (see fig. 1), and this lever brought into contact with the stop pin g. The pendulum can then be used to straighten the cabinet. The point of the pendulum at rest should be placed exactly in front of the point of the lever L. To that effect, the lower part of the cabinet will be pushed towards or away from the wall, and then fixed in position by means of sliding fixing boards F1, maintained in position by screws M1 (see fig. 4). These fixing boards will be secured to the wall with nails.

The pendulum should then be made to beat, making sure that the magnet A passes right through the centre of the coil B and oscillates quite freely without friction or vibration.

Setting the Time.—This is done by turning the hands forwards or backwards ad libitum. If the pendulum is stopped, it should be started again.

Regulating.—This is made by turning part R in the direction F3 to make the clock go faster (see fig. 6). This raises part R. To make the clock go slower, the contrary should be done. One tenth of a turn indicated by the division marked on part R corrects a variation of about 3 second per diem.

NOVEMBER 1925

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is there an aestheticism of precision?

For all those engaged in selling goods where appearance is as important to the customer as technical qualities, we posed the above question to the designers of the new Secticon. They describe here how extensive research enabled them to define the most suitable forms for expressing the unique character of their creation.

The Editor.

The first three models of the Secticon series are the result of three years of work devoted to the solution of the following problem: to create forms expressing **a new standard of precision** never before achieved in quantity clock production. An additional requirement in regard to form was that effects had to be obtained meeting the following criteria:

— to be valid for as long as possible
— to combine mass production with high technical precision
— to respond to the taste of a vast clientele throughout the entire world.

Our work was based, in theory, on several elements common to all three models. In particular, we had in mind:

1. To obtain results with their own plastic validity, while at the same time respecting the object's function
2. To achieve a unity of form, not as the sum of the object's parts—base, frame, mechanism, face—but as an expression of the functions of the object considered as a whole
3. To create a unity of materials
4. To design a form calling attention to the clock face, this being the main point of interest
5. To attain a simplicity of means and ends (without, in this, resorting to rudimentary or puristic solutions), in other words employing a minimum of means to obtain the desired effect
6. To make a special study of the problems of the face (where only the dimensions vary from one model to another).

To these elements common to the three clocks other considerations had to be added, relating to each particular model and forming two separate categories. The first are physical in nature:

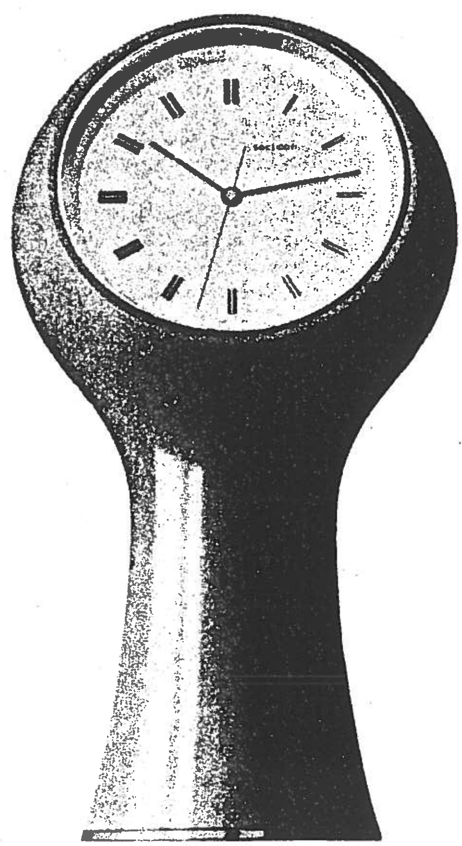
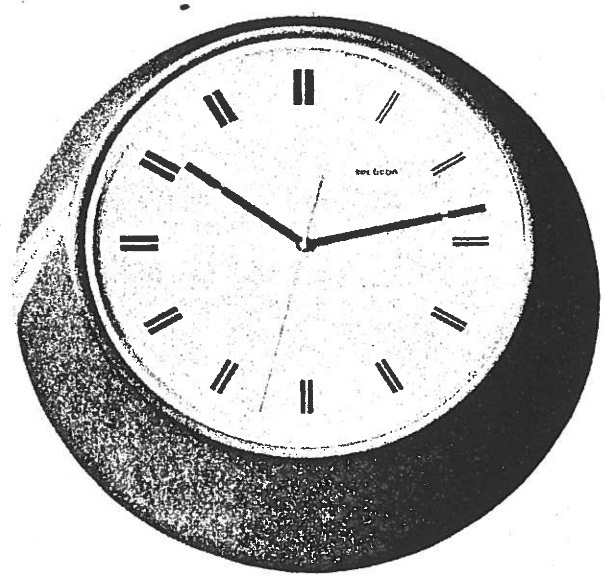


Table model T1

— the object's dimensions with regard to its use (example : the dimensions of the wall model which, under normal circumstances, is seen from a farther distance than the table model, differ in proportion)
— the object's dimensions with regard to the hand (to make handling easier)
— inclination of the clock face with regard to the eye of the on-looker, taking into consideration the various levels at which the objects may be found
— elimination of all exterior control buttons
— easy opening of the frame for starting and setting the clock and for changing the battery.

The other considerations are on the psychological plane :

Since the customary place for the T1 model is in the living-room, it was necessary to give it a shape having a certain "presence", by its dimensions (despite the reduced diameter of the face, the object should attract attention), and by the form itself (the object tending to become in the general setting an "individual" at which one glances with pleasure regardless of the need to know the exact time).
For the T2 model, conceived originally for a night table—a similar model with alarm is under study—our task was to facilitate manual contact or handling. Nor will the alarm model, we might add, display exterior control buttons, the alarm being stopped by simple hand pressure.
For the wall model, the destination had to be considered : places of business, offices, studios, workshops, halls. Thus, a simple form was called for. Moreover, since this model has to be suspended, like a picture on the wall, it has a tendency to become lost against the wall. Finally, the inclination of the face derives from considerations which are the reverse of those applying to the table model, for the human eye is usually lower than the clock face.
In regard to face design, we wanted to obtain a particular effect by means reduced to the absolute minimum. As solution, we decided on something midway between the two usual methods of indicating the hours (the first, the classic method, consists in showing the hours by means of numbers ; the other, more recent method employs simple lines). It seemed desirable to express time progression visually by a gradual thickening of the lines, in such a way as to differentiate them and to create an ensemble giving the effect of a spiral, emphasized by the off-center position of the Secticon name. This restored, on the face of the clock itself, a symmetry which we shall call dynamic.
As far as the colors of the clock frame and face are concerned, we for our part prefer the various solutions offered by a black face and light frame, but we have nonetheless developed an additional line with golden face and dark frame.



Wall model M1

CONCLUSION

From the foregoing, it may be seen that the creation of Secticon has been the subject of intensive study down to the smallest details, from beginning to end. Nothing has been overlooked, in order that the creativity of all those responsible for Secticon could blend in an organic whole.
This new product is liable to be considered as one of the most significant of our time, not only because of its superior quality but also because of the perfect clarity of conception of which it is the result.

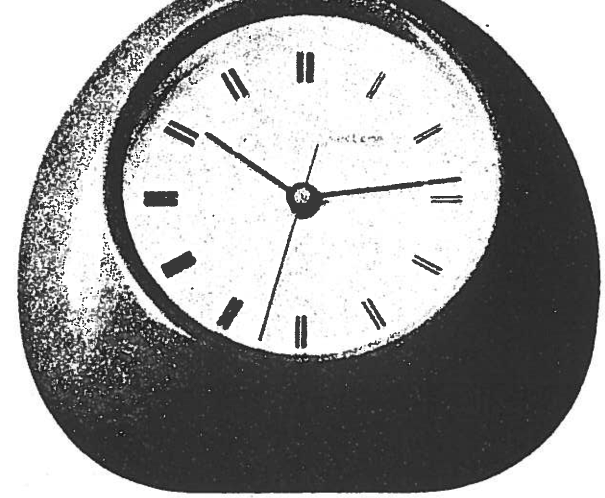


Table model T2

DIRECTIONS

for

INSTALLING and CARE OF

:Frick:

MASTER
SECONDARY
and
PROGRAM

Clocks

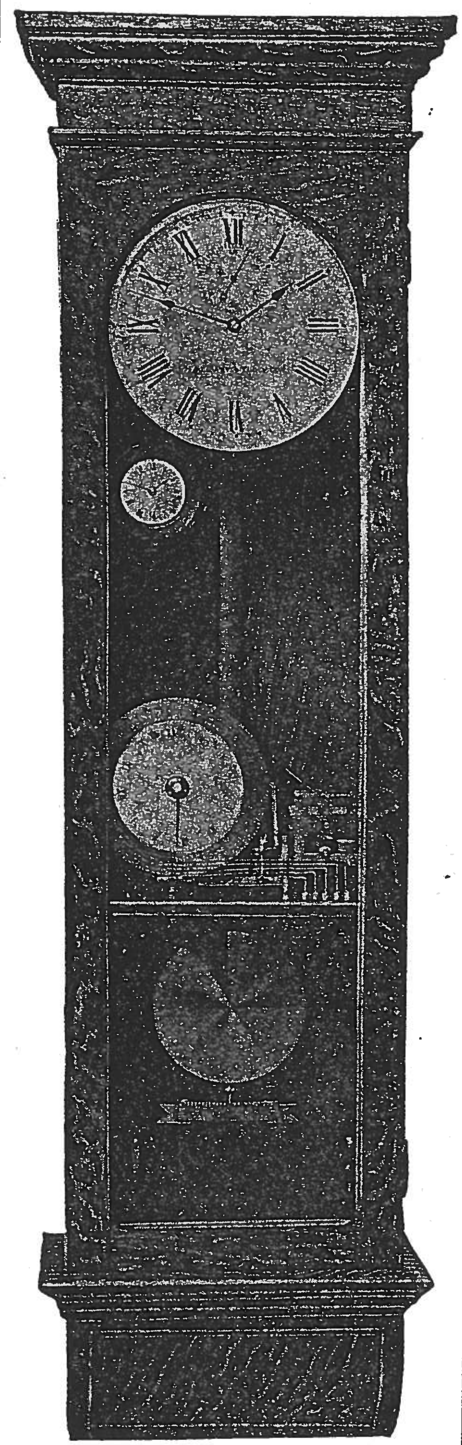
MANUFACTURED BY

FRED. FRICK CLOCK CO.

WAYNESBORO, PENNSYLVANIA, U. S. A.

Directions for Installing

AND CARE OF



Master Secondary
.. AND ..
Program Clocks

MANUFACTURED BY

Fred. Frick Clock Co.

Waynesboro, Franklin Co., Penna.

.... INDEX ....

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Unpacking and Hanging Master and Program Clocks

1. When opening the packing box be very careful not to injure the clock in any way. The lid of the packing box and strips which secure the clock in the box are fastened with wood screws, so that the clock can be removed with a screw driver.

2. Hang the clock on the wall where it is to be located, by the hanger at top of case. Use a good strong wood screw on which to hang the clock, putting the screw securely in the wall, with an upward slant. The clock will then settle against the wall solidly. If the wall is brick it may be necessary to key it with a wooden wedge, into which to drive the screw. Do not hang the clock on a shaky partition, as it will not keep correct time if the wall or partition is not solid and free from vibration.

3. After the clock is hung on the wall as above, remove the wood clamp used to secure pendulum ball in transit, using care not to injure connecting wire 12 or any other part of the mechanism. Also carefully remove the strings and wires used to protect the various parts in transit.

4. Plumb clock by pendulum, the lower point of which must stand directly in front of the O on the scale back of it.

5. After plumbing case, secure its lower end to the wall with screws provided for this purpose. This is important to prevent lower end of case from moving and throwing clock out of beat.

Setting Batteries.

For winding battery use four cells No. 3 Samson battery in series as shown in Fig. 13, charging the cells in accordance with printed instructions on jars and following hints:

1. Be sure that the sal-ammoniac is thoroughly dissolved before placing elements in jars. This is important.

2. If possible use soft water for charging cells, and be careful not to splash solution on jar above paraffine.

3. Before putting elements in jars see that any of the solution which was splashed on or above paraffine is carefully wiped off.

4. Before connecting wires carefully clean clamping surfaces of binding screws b and f, Fig. 13. See that binding screws c and nuts g are drawn up. The connecting wires h, should not be smaller than No. 16 B. & S. gauge with good insulation. No. 14 or No. 12 wire where a large number of cells are connected in one battery should be used.

5. After having set up batteries as above connect the line wires securely under binding screws. Before connecting wires be careful to have them clean and bright.

6. The above instructions apply to all batteries in a general way.

Caring For and Renewing Batteries.

1. Batteries should not be allowed to entirely run down before recharging, for if entirely exhausted the carbon will be thoroughly polarized and may require renewing. When batteries have run too long without recharging the carbons will have a heavy coating of crystals, the solution will be discolored and have a strong odor of ammonia.

2. It should be made a rule to recharge all cells once a year. In schools and colleges this should be done a week or two before the opening of the fall term, which will insure the batteries running through the school year without interruption. Keep a record in the master clock showing when batteries were set up or renewed. Every two or three months examine the cells and see if solution has evaporated. Keep solution up to lower edge of paraffine, by adding water from time to time, if necessary.

3. Every system in which a number of cells of battery are used should be provided with a battery gauge by means of which the strength of every cell can be accurately measured at any time and trouble avoided. We will furnish this gauge for $5.00 net, delivered to purchaser by mdse. mail. By testing each cell occasionally with this gauge you can ascertain condition of entire battery and avoid interruptions in working of system.

4. After the close of the school term it is advisable to empty all cells, carefully rinsing them with clean water and if carbons are covered with crystals scrape off same carefully. It is also a good plan to soak the carbons in clean water for a day and then thoroughly dry them in the sun, after which store them in a clean dry place until cells are recharged before

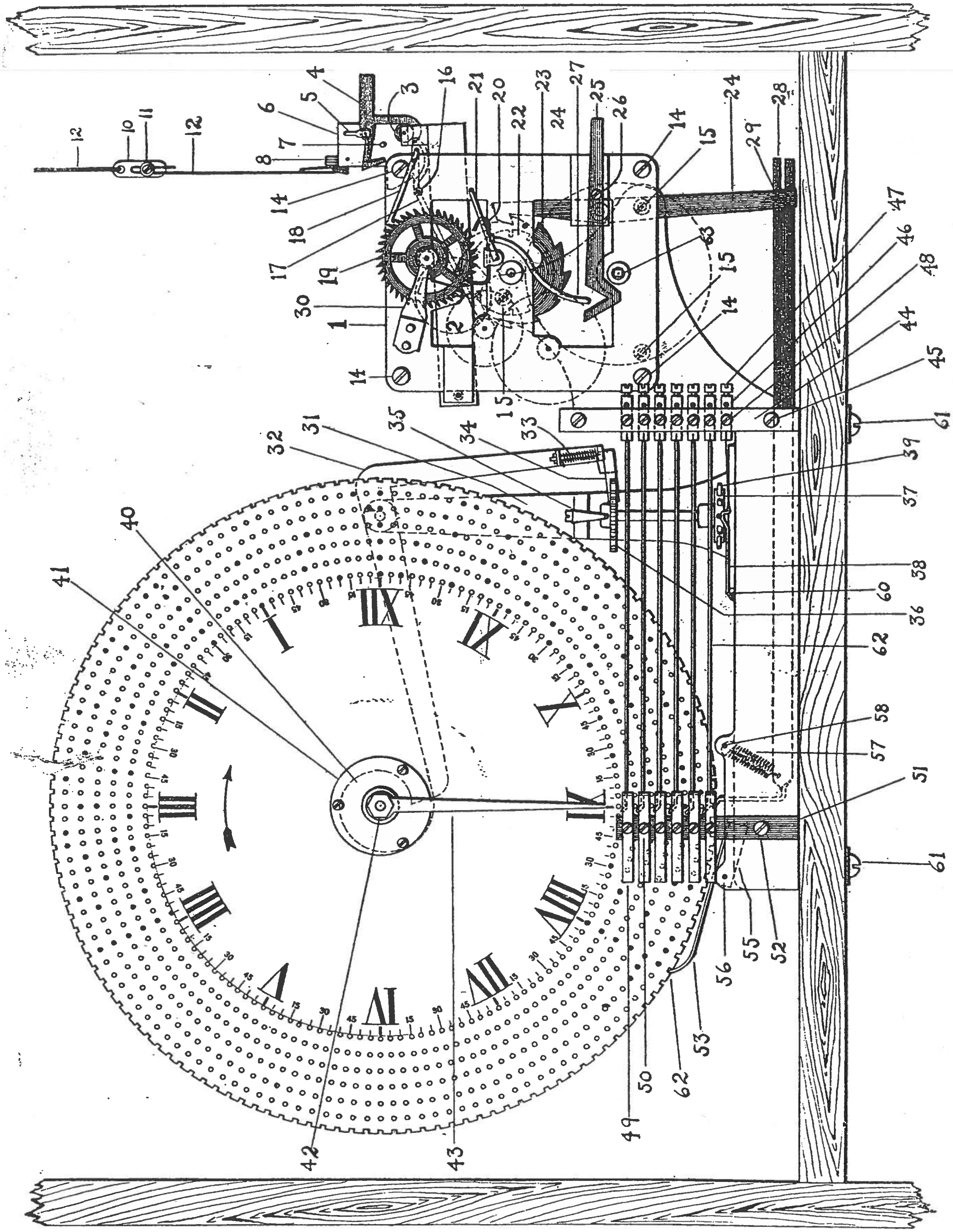

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Fig. 1

opening of next term. If zincs are much eaten, put in new ones when recharging. Batteries can be recharged without soaking and drying carbons as above, but carbons will last longer if soaked out and thoroughly dried before recharging. Recharge batteries as instructed on page 3.

5. It is better to allow master clock to run throughout the year and consequently the winding battery must not be disconnected at close of school year, but all other clock and bell battery should be, unless the bells or clocks are needed during vacation for summer term, etc.

Connecting Wires.

1. To binding plates on top of master or program clock marked "winding battery" connect the winding circuit—the two wires running to winding battery.

2. Connect secondary clock circuit to binding plates marked "Secondary Clocks."

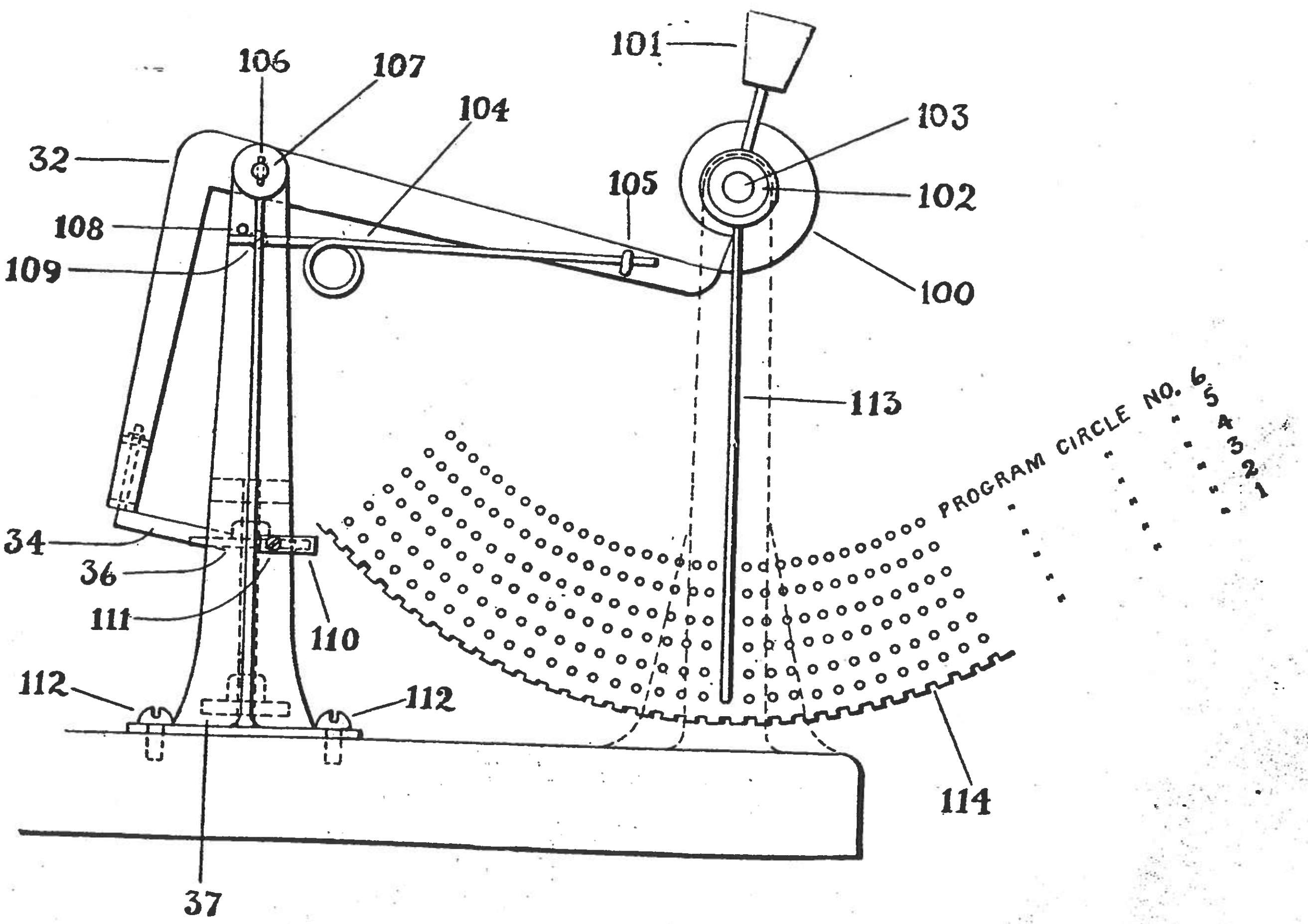

Fig. 2

3. Connect bell wires to binding plates marked "Bell Circuits", connecting bell battery wire to plate marked "Battery"; the wire operating bells on program No. 1. to plate No. 1; wire controlling bells on circuit No. 2 to plate No. 2 and so on. When but one bell circuit is used, but two bell binding plates on top of program clock are used and it does not matter to which plate battery wire is connected.

Referring to Fig. 11, 217 are Kartavert clamps which carry the vibrating contact arm 203, to which is fastened the brass spring 221, which carries at its outer end the platinum contact bar 210, which makes contact with the platinum contact bar 211 of revolving contact. The revolving contact is secured to escape arbor by screw 216. When contacts are in proper adjustment the contact points will not quite touch when pendulum has the **least possible swing that will permit clock to run,** but will make contact when swing of pendulum is increased one degree or less. The adjustment can be approximately made by turning vibrating and revolving contacts on their respective arbors and when adjustment is nearly right tighten up clamping screws 218 in vibrating contact and screw 216 in revolving contact, after which final adjustment can be made by means of adjusting screw 220. When making final adjustment turn on "Clock Switch" so that the secondaries will operate. This will enable you to tell exactly when contact is made, as it will operate pilot clock. The contact must not be made until a tooth of the escape wheel 173, Fig. 9, rests on the curved surface—locking surface—of pallet 172.

Setting and Regulating Master Clock.

1. Having set and connected batteries as per instructions, press "setting key" sixty (60) times, after which the clock will automatically wind itself once each minute, winding on the half minute. The "setting key" 207, Fig. 10, is located at left hand side of case, just below master clock dial. It is a good plan to press the "winding key" fifteen or twenty times, once each month or two, simply to make sure that the master is winding properly, and the battery is in working order. Should you press the "winding key" and not hear the winding armature click you will know winding battery is run down. Don't press "winding key" when second hand is at 60, as the secondary clocks are then operated and may be "scattered".

2. Set master clock by turning minute hand **forward slowly...Don't turn backward.**

3. The master clock is regulated in same manner as any ordinaryclock, by means of the adjusting nut under pendulum ball. To regulate pendulum, stop it when the second hand is one or two seconds **past** 60, then with left hand carefully support pendulum bob while with thumb and forefinger of right hand you turn adjustment nut, being careful not to twist pendulum. If the clock gains, lower pendulum bob; if it loses, raise it: Turning adjusting nut so that its front edge moves **from left to right,** raises pendulum bob and vice versa. One full turn of adjusting nut makes a difference of about ½ minute in twenty-four (24) hours. When variation is but a few seconds per day a small fraction of a turn of the nut will suffice.

4. Having adjusted pendulum set master clock hands to first minute **ahead of correct time** and wait until hands of master agree with correct time to the second, then start pendulum, being careful to avoid wabbling of pendulum, and be sure that it **swings to same point on the scale as before you stopped it.** The seconds beat pendulum should swing to 11 and the 80 beat to three. This is important where secondary clocks are operated, for if pendulum swings short the secondaries may be "scattered."

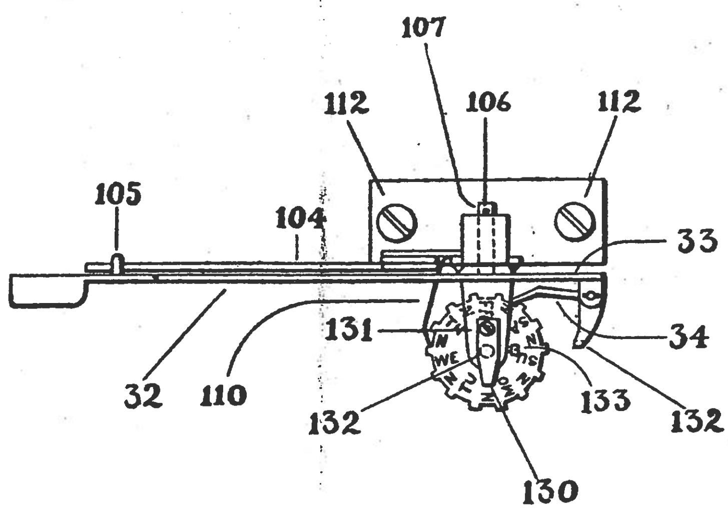

Fig. 3

To Hang and Connect Secondary Clocks.

1. Hang secondary clocks on screws driven securely into the wall in same manner as described for master clock, except that smaller screws may be used.

2. Connect wires to binding plates on top of cases, being sure that the wires are first clean and bright, and then securely held by binding screws. While it is not absolutely necessary that the secondaries hang plumb they should be carefully hung so as to look mechanical and neat.

To Set Secondary Clocks.

1. Open switch in master clock marked "clock switch", set pilot clock—the small clock just under left hand side of master clock dial—on time with master clock, by simply turning minute hand forward or backward, same as any ordinary clock.

2. Set all of the seconrady clocks to same time as pilot clock, by turning minute hand forward or backward same as ordinary clock, being careful to set minute hand on the minute dot.

3. Now return to master clock, close "clock switch" and press "setting key" a sufficient number of times to make pilot clock tally with master. Each time you press "setting key" pilot and secondary clocks are moved one minute ahead, but do not move "setting key" too fast or you may "scatter" the secondaries. "Setting key" sould be held down about a half second, which will give all of the secondaries time to operate. Should secondaries accidentally be set a minute or number of minutes ahead of master, simply open "clock switch" until master clock catches up with pilot clock.

4. Secondaries may also be set without operating "setting key" or opening "clock switch", by simply having your watch to agree with master **to the second** and then going to each secondary and setting same as any ordinary clock, bearing in mind that the secondaries move on the 60th second of each minute and that a few seconds before the close of each minute will seem to be about a minute slow.

5. Bear in mind that opening "clock switch" cuts out, or stops, the pilot clock and all secondaries, that each time you press down the "setting key" you move pilot and all secondary clocks one minute ahead.

6. After having started all clocks in accordance with above instructions, as a precaution, go to each secondary and see if it is on correct time, for owing to the fact that you have not had previous experience in handling these clocks you may have made a mistake. Before starting out to inspect clocks see that your watch is on time with master **to the second.**

7. For secondary clock circuit use either No. 16 or 14 B. & S. gauge damp proof office or weather proof wire. For concealed work No. 14 weather proof is the better. Carefully solder and tape all splices, and secure wires in place with either suitable cleats or knobs, but don't use staples, as wires may be injured in driving the staples.

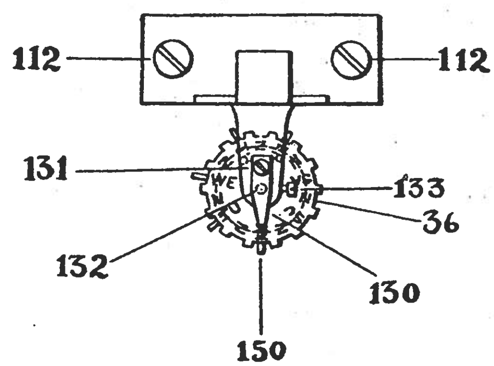

Fig. 4

Five Minute Interval Program Clock, Class A.

The five minute interval program clock gives signals on any or all periods divisible by five and is set as follows:

To Set the Periods in Five Minute Program Clock.

1. Each circle of holes in the program dial represents a program.

2. The **outer or largest circle** is No. 1, the next one No. 2 and so on. See Fig. 2.

3. Set program No. 1 in program circle No. 1, program No. 2 in program circle No. 2 and so on. For explanation of a program see catalogue page 7.

4. To set the periods turn the program dial **in direction indicated by arrow on dial**—never opposite way—by placing your fingers on **upper edge**

of dial and turning **from left to right** until the point at which contact pins are to be inserted stands at the **lower left hand side,** then with fingers of left hand carefully support edge of program dial while with pliers in right hand you press contacts securely home. It is important that the pins are pressed securely into the holes.

5. Now set program dial to the **last five minute period passed by master clock** by placing your fingers on **top edge** of dial and turning it **from left to right** until pointer stands at correct time. If you set the dial at 9.02 set to 9.00; if at 9.03 set to 9.05; if 9.32 set to 9.30 and so on.

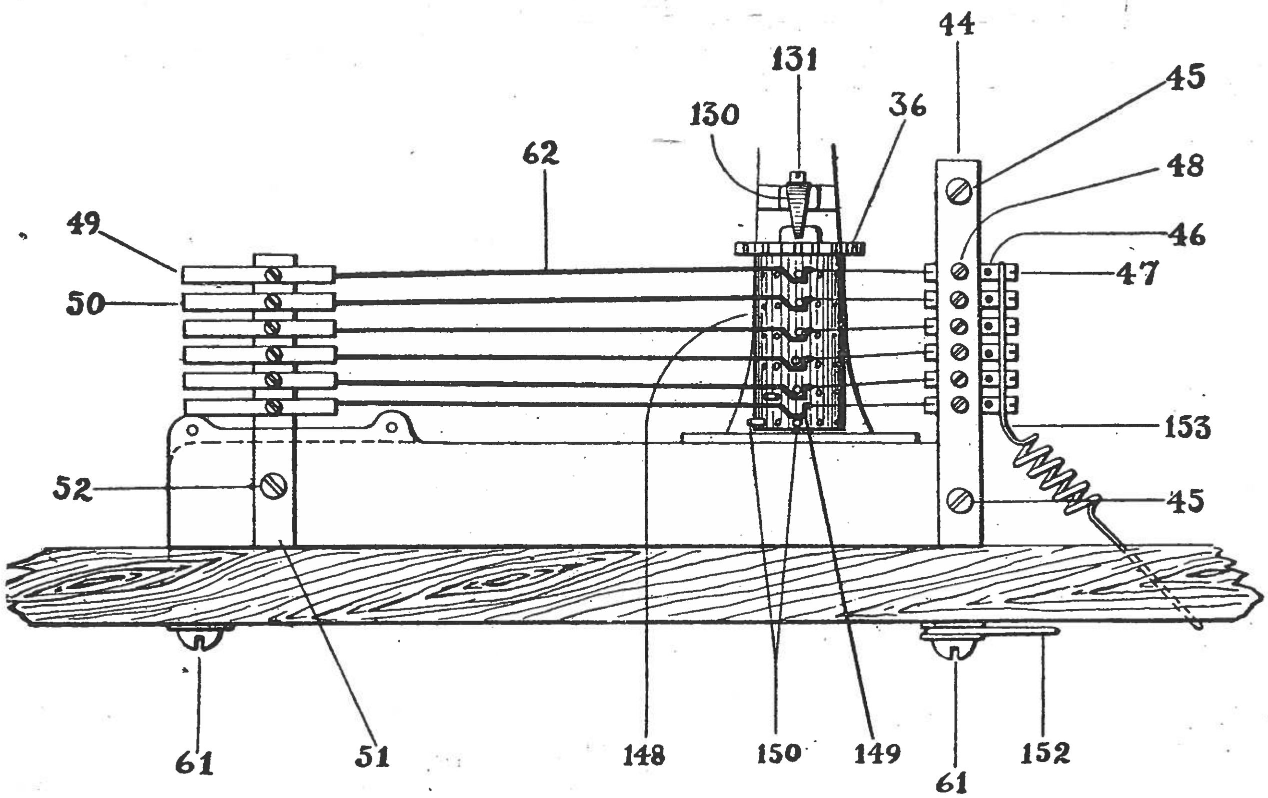

Fig. 5

The Automatic Cut-Out.

The automatic cut-out is used on Class A clock only and is shown in figures 1, 2 and 3, and is set as follows:

1. Place your finger against **front edge of indexed ratchet wheel and turn it from left to right** until the pointer 130 Fig. 3, stands at the index of the day or night on which you are setting it If you set it between 6 a. m. and 6 p. m. Monday, set to "Mo"; if after 6 p. m. Monday set to the "N" following "Mo" and so on.

2. When setting the automatic cut-out be sure that the spring dog 110, Figs. 2 and 3, is just back of a tooth as shown in Fig. 3. This is important.

3. The automatic cut-out flange 37, Figs. 1 and 2, is provided with 14 holes, seven for the seven days of the week and seven for the seven nights. By inserting the switch pins in the holes of this flange by the index on ratchet wheel the bells can be automatically put in and out of service on any desired days of the week. To illustrate, if the bells are to be rung on Monday, Tuesday, Wednesday, Thursday and Friday, the pins must be inserted in five holes directly under "Mo", "Tu", "We", "Th" and "Fr".

4. Wind motor of program mechanism once each week, always winding it on same day of the week. To wind it apply winding key to winding arbor 63, Fig. 1.

Five Minute Automatic Calendar Switch.

This switch is used on class B clocks and differs from the Automatic Cut-Out in the substitution of the insulator drum 148, Fig. 5, for the metal switch flange 37, Figs. 1 and 2. It is set as follows:

1. Place your finger against **front edge of indexed** ratchet wheel 36, Figs. 4 and 5, and turn it from **left to right** until the pointer 130, Figs. 4 and 5, stands at the index of the day or night on which you are setting it. If you set it between 6.00 a. m. and 6.00 p. m., set to "Mo"; if after 6.00 p. m. Monday, set to the "N" following "Mo" and so on.

2. When setting the automatic calendar-switch be sure that the spring dog 110, Figs. 2 and 3 is just back of a tooth as shown in Fig. 3. **This is important.**

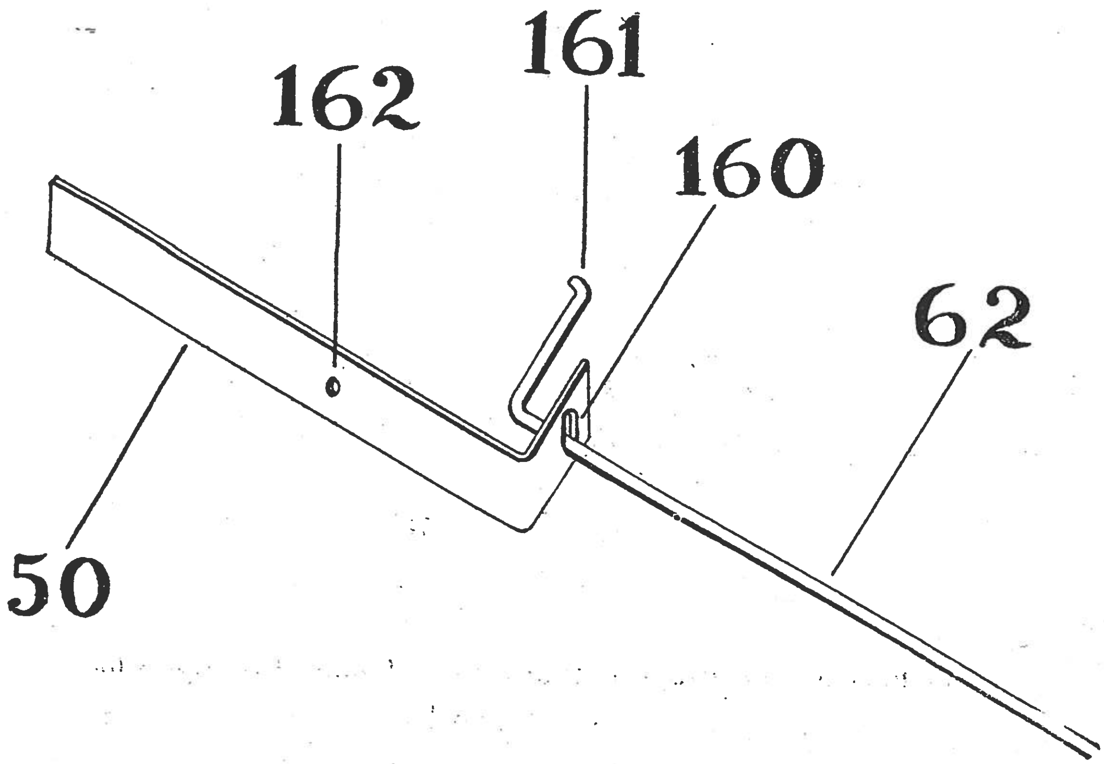

Fig. 6

3. By inserting the switch drum pins in the proper holes the different programs can be put in operation on any desired days or nights. Referring to Fig. 5 it will be noticed that for each commutator 62 there is provided a circle of 14 holes in switch drum 148. The lower commutator makes contact with contact pins in program circle No. 1—**the largest** circle, and if this program is to be in operation on say the five days of the week, Monday to Friday inclusive, simply place drum pins in the lower circle of holes in switch drum directly under "Mo", "Tu", "We", "Th", and "Fr". If program No. 2 is used on the five nights from Monday to Friday inclusive, place the drum pins in the next lower circle of holes in drum directly under the "Ns" following "Mo", "Tu", "We", "Th", and "Fr". If program No. 3 is to be in operation on Saturday simply place the switch pin in hole in **third circle** from bottom of drum directly under "Sa" and so on. Before inserting the drum pins turn drum as instructed above until the holes in which pins are to be placed stands in front, then press pins home, **using great care not to bend or injure in any way the commutators.** After having set the pins, set the switch as instructed above.

To Regulate Duration of Signals

The duration of signals is regulated by the flyers at the front and rear of motor movement. Three flyers are furnished with each clock. By using the two largest flyers the longest duration is secured; if the largest and smallest flyer is used a shorter duration is given; largest flyer only gives still a shorter ring and the smallest flyer the shortest duration, about 2 seconds. Care must be used when putting on and taking off flyers not to bend ends of the flyer shaft.

The escapement regulator shown in Fig. 1, consisting of escape wheel 19, verge 20, verge rod 27 and regulator 25 is no longer used, but will state for the benefit of users of the clocks having this adjustment, that raising outer end of regulator 25 gives a longer duration and lowering it gives shorter duration. Any duration between the limits can be secured. The duration of signals is regulated in same manner on both 5 and 2½ minute clocks.

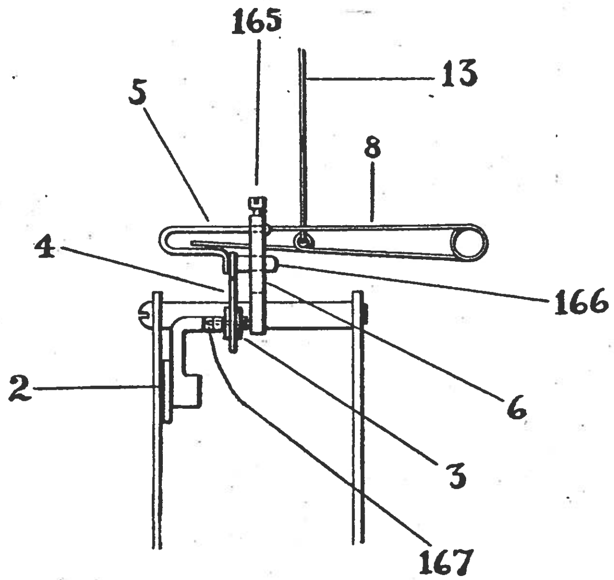

Fig. 7

To Set Periods and Program Dial of 2½ Minute Program Clock, Classes A and B.

The program dial revolves once each six hours, and in each circle there are 144 holes.

1. For each program two circles of holes are used, the outer circle of each pair being used for the A. M. and the inner for the P. M. signals.
2. The outer circle of figures on the program dial reads from 6.00 a. m. to noon and the inner from noon to 6.00 p. m.
3. To set the periods, place your finger on the upper edge of program dial and turn from **left to right**—never opposite way—until the point at which periods are to be set stands at **lower left hand side,** then with fingers of left hand support edge of dial while with plyers in right hand you press the contact pins securely home, inserting the pins by the figures on dial.
4. Now set the program dial to the **last 2½ minute period, passed** by the master clock, by placing your fingers on **upper edge** of dial and turning it from **left to right**—never opposite way. If you set the program dial at 9.02, set it to 9.00; if you set it at 9.04, to 9.02½; if at 9.23, to 9.22½; if at 9.31, to 9.30 and so on.

To Set the 2½ Minute Automatic Calendar Switch.

The automatic calendar switch is the same as shown in Figs. 3 and 5, except that the hard rubber switch drum is larger in diameter and each circle of holes has 28 holes instead of 14 as used on the five minute interval clock. It is set as follows:

1. Place finger on **Front edge of index ratchet wheel** which in the 2½ minute clock is at lower end of switch drum, 148, Fig. 5, instead of upper end, and turn from **left to right,** until the index of the day or evening on which you are setting it stands at the pointer. If you set it Monday between 6.00 a. m. and noon, set to "Mo", if between noon and 6.00 p. m. Monday set to the "PM" following this "Mo" and so on.

Hand Switches.

All program clocks are fitted with 'hand switches" by means of which the bells or clocks can be switched off at any time. These switches are located at the lower end of the clock case. The switch for bells is marked "bell switch" and the one for clocks "clock switch." Sometimes it is desirable to cut out the regular programs for a while as is the case during examination periods, etc., in which case simply open "bell switch" and ring the bells by push botton during the time the regular signals are not wanted. During the vacation periods open "bell switch", in order to save battery and unnecessary ringing of the bells. The secondary clocks should also be cut out during vacation, by opening "clock switch." When school opens be sure that all switches are closed.

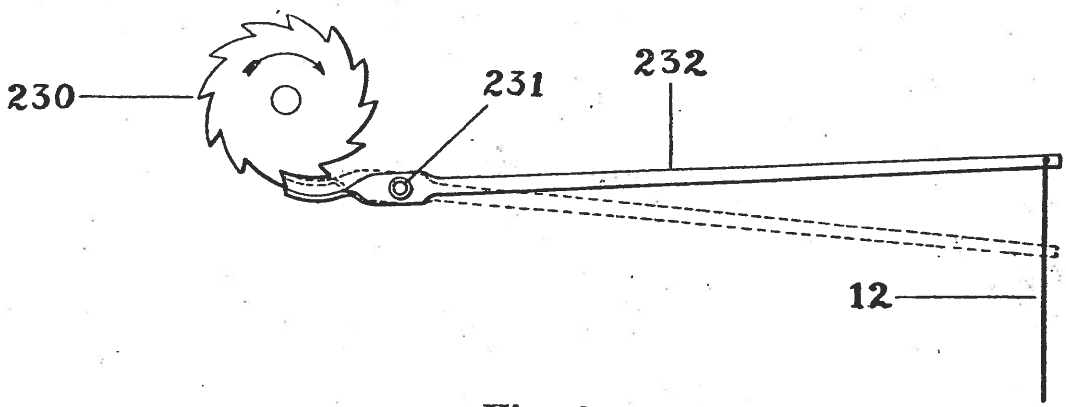

Fig. 8

Description of Master Clock

In the following description of master clock we will refer to Figs. 9, 10 and 11.

Once each minute a current is passed through the coils of the electro magnet 184 drawing armature 186 to poles of magnet, the armature 186 being fast to lever 197, which is mounted on shaft 188 and having at its upper end the pawl 193, imparts motion to winding ratchet wheel 175. The winding ratchet wheel 175 has sixty teeth and each time the current passes through the coils of magnets the driving spring 181 is wound one-sixtieth of a turn, the amount it unwinds in one minute. One end of winding spring 181 is hooked over the stud 182 on winding ratchet wheel 175, the other end being hooked over a similar stud in large gear wheel. The detent 176 carried on stud 179 is held in engagement with winding ratchet wheel 175 by means of spring 178. Winding pawl 193 is held in engagement with winding ratchet wheel 175 by the spring 191 which is secured to lever 197 by screw 192, which admits of adjusting tension on spring 191. Lever 197 is made in two parts, the lower part 189 being clamped to the upper part by clamping screw 190. This adjustment in connection with adjuster 196 permits of adjusting movement of pawl 193 so as to take one tooth of winding ratchet wheel 176 at each movement of armature 186. To make this adjustment loosen clamping screw 190, hold armature 186 against poles of magnet and move lever 197 until winding pawl 192 catches a tooth, then tighten clamping screw 190, loosen screw 195 and locate adjuster 196 so that winding pawl 193 moves back just one tooth. In brief, winding pawl 193 must be adjusted so as to take but one tooth of winding ratchet wheel 176 each time current is passed through coils of magnet.

Fig. 10 shows manner of connecting wires and battery. 200 is winding battery, the wires of which are connected to binding plates 201 on top of master clock; 207 is the "winding key" for winding driving spring 181, as per instructions on page 6. 180 is a small shunt of German silver wire, which practically eliminates sparking of clock contacts.

When self-winding master clocks are to operate secondary clocks they are fitted with two circuit closers as shown in Fig. 10, one operates the winding machanism and the other the secondaries. The secondary clock circuit closer operates when the second hand is at 60 and winding circuit closer when second hand is at 30. This circuit closer consists of a vibrating and a revolving contact.

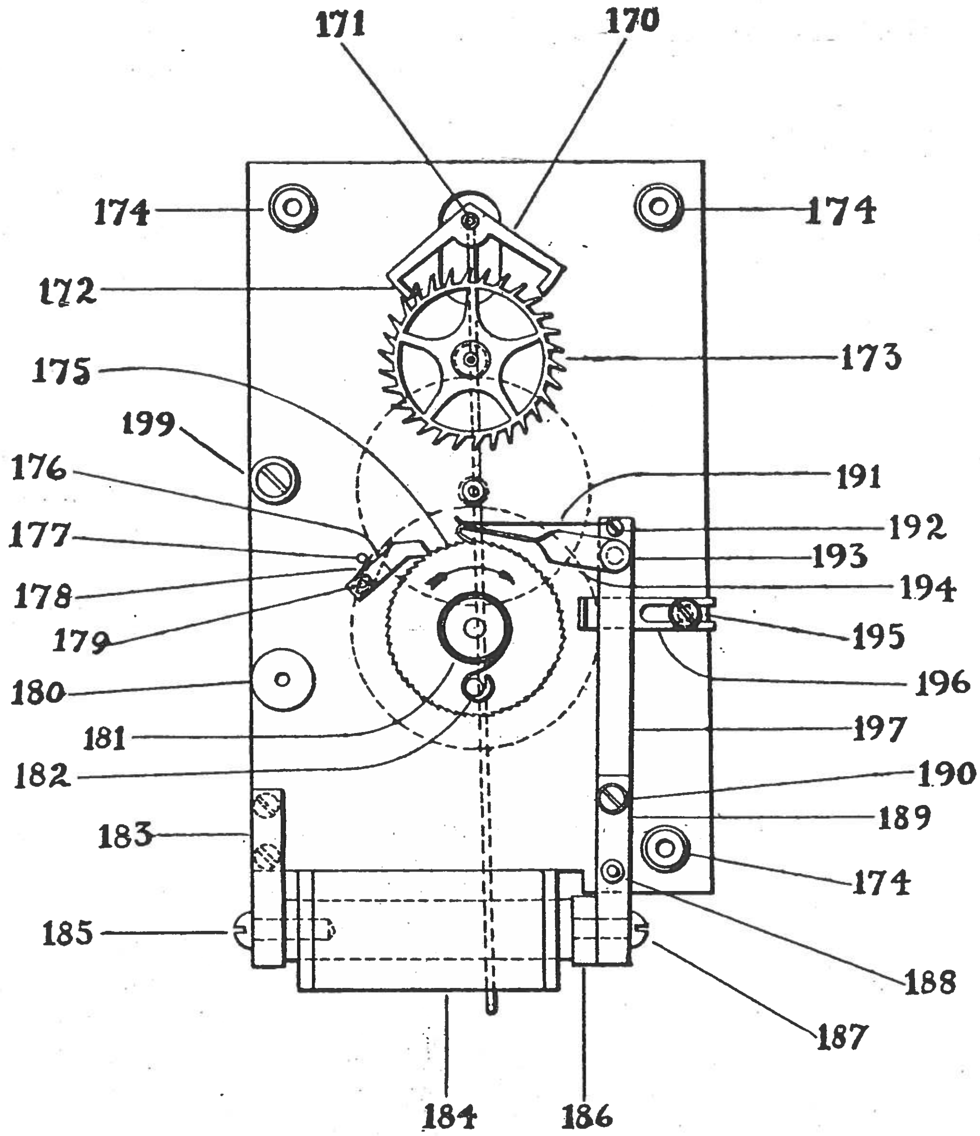

Fig. 9

The vibrating contact is clamped on pallet arbor 171, Fig. 9, and revolving contact on escape wheel arbor. Referring to Fig. 11, 217 are hard rubber clamps, which carry the vibrating contact arm 203 in the outer end of which is the contact screw 210, which makes contact with the platinum contact point 211 of revolving contact. Contact screw 211 is also tipped with platinum. The revolving contact is secured to escape wheel arbor by the screw 216. When contacts are in proper adjustment the contact points will not quite touch when pendulum has the **least possible swing that will permit clock to run,** but will make contact when swing of pendulum is increased one degree or less.

To be continued.

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ITR master clock probably for school bell system with mechanism for paper tape, but tape is missing. L.A. Seymour (206) 842-5835 or seymochla@aol.com.

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WEB SITES: **"Introduction To Electric Clocks"**, by Michel Viredaz, with animation by J. E. Bosschieter:
w ww.mypage.bluewin.ch/electric-clocks

THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78
NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXVIII #2, JUNE 2002

Fellow Horologists:

This journal issue will complete the series on Fred Frick Master, Secondary, & Program Clock Installation and Service, and also offer the fascinating background on the McCaskey-Frick-Landis & Cincinnati participants in the company's history.

Additionally, we have included the Tiffany Never-Wind patent for their Torsion Pendulum, and we are starting a new series covering Catalog #32 of the Standard Electric Time Co., from January, 1910.

While most of our chapter members usually pay their dues promptly, it seems a small segment ignores the dues notices until the final reminder, and the deletion of their name from the roster. This year we have over 30 unpaid members now, at mid-year, and a special notice has been sent to their attention. Perhaps we should offer a discount to early payers or add a surcharge for the reinstatement of a deleted name to the membership list. How about suggestions from the members... We do not wish to offend anyone but just want to avoid the extra work and expense caused by the habitual late payers. Remember, your officers are volunteers who have responsibilities aside from chapter duties, and just want to do their jobs as well as possible.

Our quote for this issue: "Any new venture goes through the following stages; Enthusiasm, Complications, Disillusionment, Search for the Guilty, Punishment of the Innocent, and Decoration of Those Who Did Nothing!" (Unknown)

Enjoy this issue....good reading ahead,.

Martin Swetsky, FNAWCC,......President)
Harvey Schmidt, FNAWCC,.....Secretary-Treasurer) Co-editors
Dr. George Feinstein, FNAWCC..Chapter Historian)

HARVEY SCHMIDT, FNAWCC, Secretary-Treasurer, 75-80 179th ST. FLUSHING NY 11366

A Brief History of the Relation of the McCaskey, Frick, Landis, & Cincinnati Co.

By Martin Swetsky

The McCaskey, Frick, Landis & Cincinnati saga began with the appointment of J.L. McCaskey as supervisor of the first high school in Waynesboro Pennsylvania in 1880. He designed crude program devices intended to ring school bells at predetermined times. He was awarded patents for his concepts in 1890 and 1891, but the system left a great deal to be desired, and he contacted Fred Frick, a local engineer for assistance in creating improvements.

Frick made various improvements and purchased McCaskey's patents and formed his own company in 1894, using modified spring-wound movements purchased from Howard and Seth Thomas, adding his own program device that he patented in 1895. This consisted of a disc with a multiple hole pattern into which pins were inserted to activate the program switches. This method allowed the system to accommodate a variety of programs by simply relocating the pins to new positions. Later Frick clocks used a self-winding mechanism with cast iron plates fitted with steel bushings, manufactured in his own plant, eliminating the need for purchasing the mechanisms from other makers.

In 1910, Frick sold his business to F.F. Landis who made many additional improvements including a mercury pendulum and a one minute interval program replacing the former five minute device. The Landis Program Clock Company went into receivership in 1930, and was managed on an interim basis by J.G. Mumma, a local banker from 1932 until 1937 when the company was sold to the Cincinnati Time Recording Company.

Many of the clocks movements contained the names of former owners of the company or former suppliers, with each successor using up the existing inventory, creating a measure of confusion as to the actual maker at that time. While sales of these clocks were concentrated in the Pennsylvania and Ohio areas, many of these clocks were discovered as far away as California, discounting the claim that they were limited to regional interest.

The power source originally recommended for the master clock was four #3 Samson cells in series delivering approximately 6 volts, with the slave clocks and program devices powered by separate cells for their functions.

A fascinating history of an organization that existed entirely on the ingenuity and genius of a handful of creative thinkers, each contributing to its progress in an area where no prior concept existed.

Continued from March, 2002 issue.

The adjustment can be approximately made by turning vibrating and revolving contacts on their respective arbors and when adjustment is nearly right tighten up clamping screws 218 in vibrating contact and screw 216 in revolving contact, after which final adjustment can be made with contact screw 210. When making final adjustment turn on "clock switch" so that the secondary will operate. This will enable you to tell exactly when contact is made, as it will operate pilot clock. The contact must not be made until a tooth of The escapement wheel 173, Fig. 9, rests on the curved surface—locking surface—of the pallet 172.

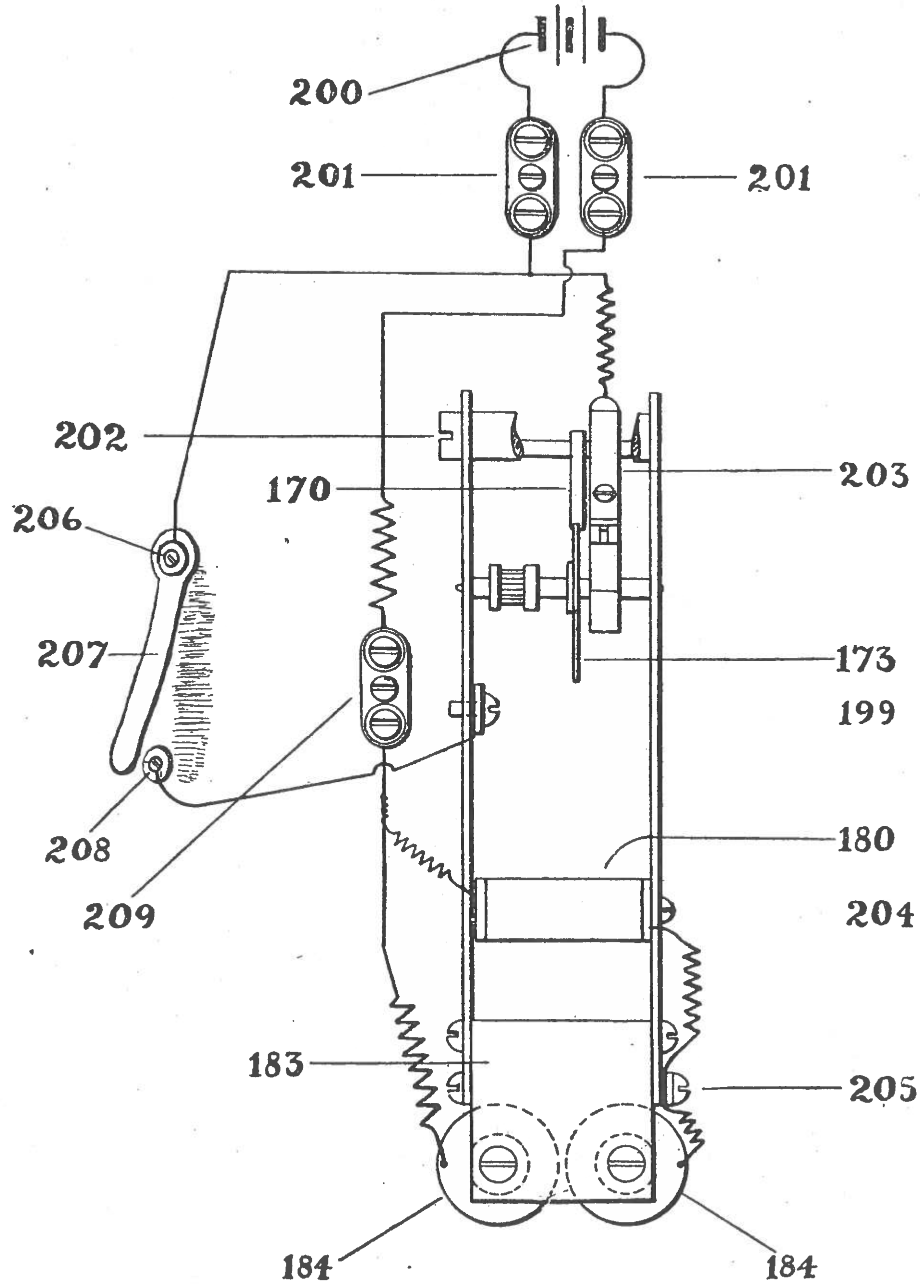


Fig. 10

Description of Secondary Clock.

The same movement is used for both pilot and secondary clocks. Therefore the same description applies to both.

Fig. 12 represents a secondary clock movement. Once each minute the master clock sends a current through the coils of secondary clock magnets 1 drawing armature 2 to poles 3, the armature being fast to lever 4 which is connected by link 5 to propelling plate 6 carrying propelling dog 7, moves counting wheel 8 one tooth each time the master clock closes the circuit. The counting wheel 8 has sixty teeth. Therefore at each movement it is moved one-sixtieth of a revolution or one minute. To lever 4 is fastened verge strip 9 carrying verge pallets 10 and 11, when armature 2 is drawn down to poles 3, lever 4 lifts verge strip 9 and disengages pallet 10 at the same time engaging pallet 11 which holds counting wheel 8 while propelling dog 7 is being moved back one tooth, when armature 2 is released lever 4 and propelling plate 6 drop back to their original position, by this movement propelling dog 7 moves counting wheel 8 forward one tooth while pallet 11 is disengaged and at the same time again engages pallet 10, thus allowing counting wheel 8 to move forward only one tooth and also preventing counting wheel from being turned backward. 12 is a back lash dog which holds the counting wheel firm while propelling dog is being moved back to the next tooth, thus preventing the hands of the clock from jumping while the circuit is being closed. The setting wheel 13, by which the clock is set, is held firmly in position by friction washer 14. Pole screws 15 hold magnets firm to base.

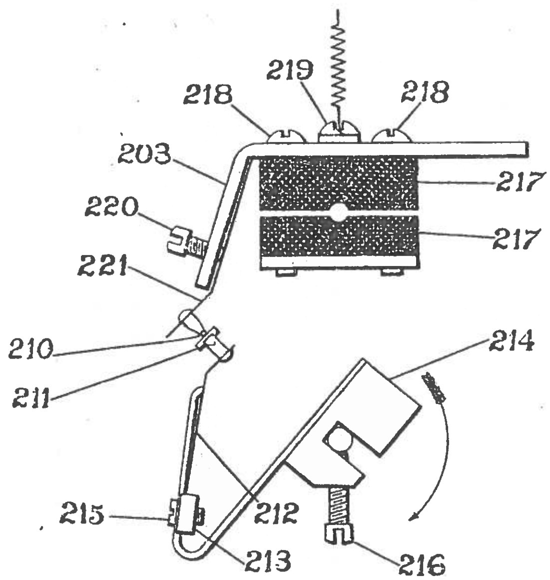


Fig. 11

Description of Program Mechanism.

The program machanism is connected to the master clock by the connecting wire 12, Figs. 1 and 8, which at its upper end is connected to the starting lever 232. Starting wheel 230, Fig. 8, is mounted on centre arbor of master clock and lifts starting lever 232 once each five minutes, allowing it to drop at the end of each five minute period. At its lower end connecting wire 12 is connected to starting spring 8, Figs. 1 and 7. When starting spring 232, Fig. 8, is raised to its highest position, starting spring 8 should be well above the inner end of starting dog 4, Figs. 1 and 7, and when starting spring drops it should strike in the corner of the L shaped bracket 6, Figs. 1 and 7. Starting spring should also have some tension against edge of bracket 6 so that it does not pass over starting dog 4, Figs. 1 and 7, without moving it. Starting spring 8 is held in bracket 6 by set screw 165, Fig. 7. By means of adjusting link 10 and clamping screw 11 length of connecting wire 12, Fig. 1. can be adjusted to give starting spring 8 proper lift. Each time starting spring 8 sweeps down along edge of bracket 6 it strikes starting dog 4, which allows drop arm 2, Fig. 1, to fall, which in turn strikes outer end of counting arm 17, lifting inner end of counting arm 17 out of notch in counting wheel 22 and lifts arm 18 out of stop wheel 19, thus putting in motion the motor movement, including driving wheel 23, which causes rocker arm 24 to turn on its pivot and move propelling rod 28 forward. It will be noticed that propelling rod 28 projects up through a slot in base under program dial and engages the notches in periphery of dial, thus imparting motion to dial. When driving wheel 23 has moved one tooth, or space, the inner end of counting arm 17 drops into a notch in counting wheel 22, stop arm 18 drops into the path of a tooth of wheel 19 and movement comes to rest. Just an instant before movement comes to rest the head of rocker arm—its uper end—passes a tooth on driving wheel 23 and permits receding spring 57 to return propelling rod 28 to its starting position. It will be also noticed that while driving wheel 23 is moving rocker arm 24 it is lifting drop arm 2 to its starting position and that starting dog 4 drops in under roller 3 just before movement comes to rest. A lug on the inside of drop arm 2 rests on driving wheel 23. By this means drop arm 2 is lifted to its starting position. Starting dog 4, Figs. 1 and 7, is held on stud 166, Fig. 7, by guard 5. It is important that the guard rests on end of stud and does not bind dog 5. 53, Fig. 1, is the backlash dog, which must drop into a notch just as movement of dial is completed. If it does not, dial may be moved backward when propelling rod recedes.

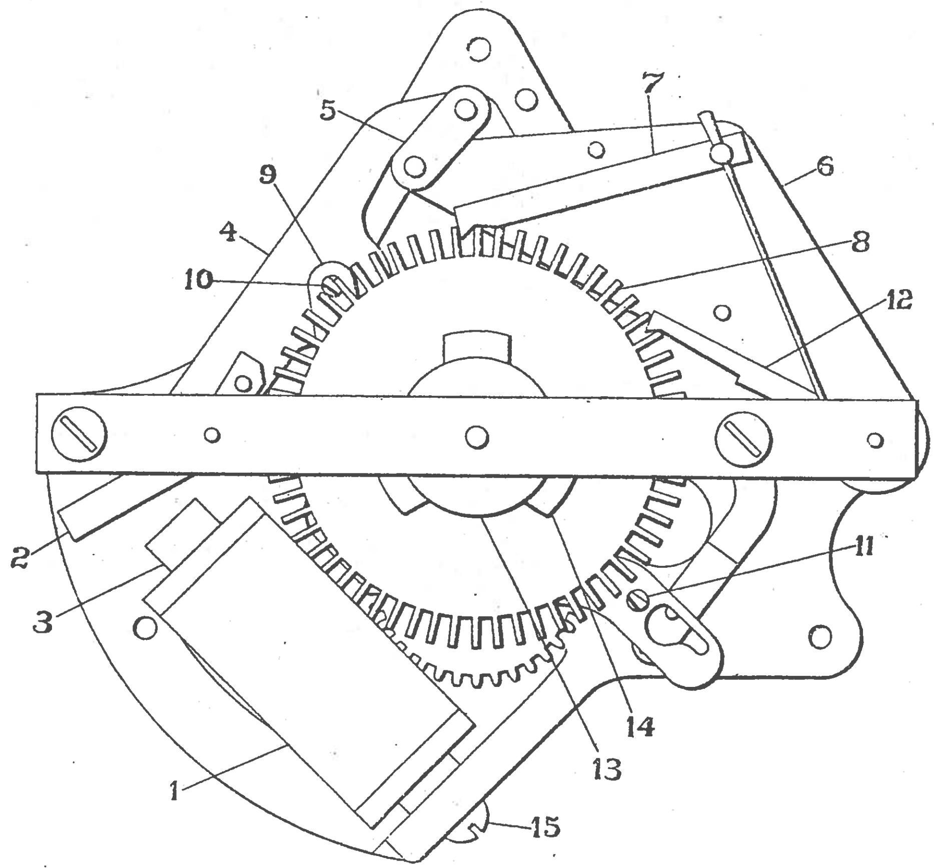


Fig. 12

Description of Commutators.

The commutators 62, Figs. 1, 5 and 6, make contact with contact pins in program dial. At one end they are held in the hard rubber column 44, Figs. 1 and 5, while the opposite ends are supported by adjusters 50, these adjusters being secured to the hard rubber post 51 by screws. On class A clocks, as shown in Fig. 1, all commutators muse rest against upper end of slot 160,

Fig. 6, under sufficient tension to make good contact with contact pins in dial, while on Class B. clocks, as shown in Fig. 5, only the commutators in actual service are held in upper part of slot 160 by pins 150 in switch drum 148, Fig. 5. It is plain that the commutators can be adjusted to make proper contact with pins in dial by means of the adjuster 50.

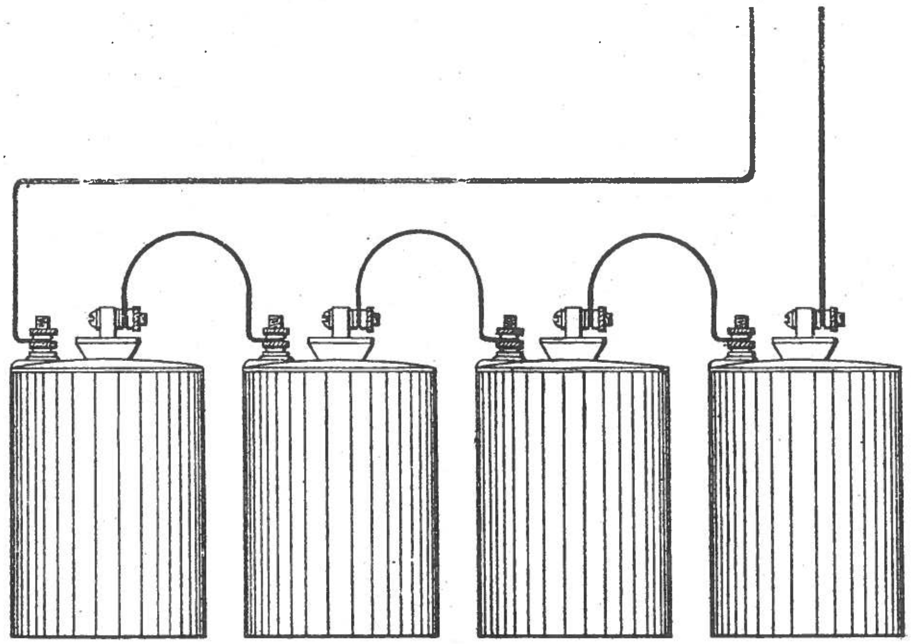


Fig. 13

Description of Automatic Cut-Out.

Aside from the insulator drum the automatic cut-out and calendar switch are the same.

The cam 100, Figs. 1 and 2, revolves once each twelve hours and operates switch arm 32, which carries at its lower end the pawl 34 which engages indexed ratchet wheel 36, Figs. 1, 2, 3, 4 and 5, turning ratchet 1-14th of a turn at each movement. Spring 104, Fig. 2, supplies the power to move switch arm 32. When switch arm 32 is released by cam 100 and pawl 34 turns indexed ratchet wheel one tooth the stop lug 132, Fig. 3, must move into path of a tooth of ratchet wheel 36 and prevent it from moving more than one tooth. The spring pawl 110 must also be in position shown in Fig. 3 on completion of movement.

No. 754,398. Patented March 8, 1904.

UNITED STATES PATENT OFFICE.

GEORGE STEELE TIFFANY, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO JAMES VAN INWAGEN, OF CHICAGO, ILLINOIS.

TORSIONAL PENDULUM FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 754,398, dated March 8, 1904.

Original application filed November 30, 1901, Serial No. 84,287. Divided and this application filed December 12, 1903. Serial No. 184,921. (No model.)

To all whom it may concern:

Be it known that I, GEORGE STEELE TIFFANY, a citizen of the United States of America, and a resident of the borough of Brooklyn, in the city of New York, in the county of Kings, in the State of New York, have invented certain new and useful Improvements in Torsional Pendulums for Clocks, of which the following is a specification.

This invention relates to torsional pendulums, which are especially useful in electric clocks because the period of each beat is much longer than the beat of the ordinary swinging pendulum and less current is required to impulse them, the current being used only during a minute fraction of each beat. These pendulums are also useful in spring-actuated clocks, tending to prolong the running thereof between the windings.

The objects of the invention are to provide a torsional pendulum easily and accurately adjustable to regulate the length of the beat and self-compensating to adapt itself to variations in temperature.

The invention consists principally in a compensating pendulum comprising a torsional pendulum-rod having a lateral extension provided with a stop, preferably adjustable on the extension, a weight of solid metal on said extension, and automatic means for holding said weight in contact with said stop, the weight and extension having different expansibilities under a varying temperature, which adapt them to act automatically by expansion and contraction to shorten the radial distance between the weight and the axis of the rod as the extension expands and to increase said radial distance as the extension contracts.

The invention consists, further, in certain structural features hereinafter explained.

Figure 1 of the accompanying drawings represents a side elevation of a torsional pendulum embodying one form of this invention, together with parts of an actuating mechanism therefor. Fig. 2 represents a transverse section thereof on line 2 2 of Fig. 1 looking downward. Fig. 3 represents, on an enlarged scale, a front elevation, partly in section, of the lower portion of the torsional pendulum.

The same reference-numbers indicate corresponding parts in all of the figures.

In my application, Serial No. 84,287, filed November 30, 1901, for a patent for an improvement in electric clocks I have shown the pendulum herein described embodied in the clock set forth therein, and this case is a division of said application. The drawings hereto annexed illustrate the connection of this pendulum with the actuating mechanism of the electric clock illustrated in said original application.

In the form of embodiment herein shown a torsional pendulum support or rod 220 is designed to be suspended from the pendulum-post, as 13, of the clock to which it is applied, and a pendulum-bob 230, whose arc of oscillation is horizontal, is secured to the lower end of said torsional rod. The pendulum-rod is preferably composed of a flat elastic metallic strip of wire or strands of wire or any other material and in any other shape adapted to receive and resist a torsional force. When the pendulum is designed for use on an electric clock, the pendulum-rod has means for completing an electric circuit through its main body or otherwise, and in such a case it may be provided with a contact-arm, as 221, secured at one end to said rod and projecting at the other end between contact-studs, as 151 and 152, supported, for example, on a plate, as 153, attached to an armature, as 150. As the pendulum-rod oscillates the arm 221 touches one or the other of said contacts, preferably by means of an upright stud 222, secured to the free end thereof.

The pendulum-bob 230, suspended from the pendulum-rod, comprises a horizontal coupling-bar 231, which constitutes lateral extensions in two directions of the pendulum-rod, stops 235 and 236 on said bar, weights 232 and 233 on said bar between said stops, and a spring-clip 234, suspended from the pendulum-rod and operative to hold the weights against the stops and permit them to expand toward each other. The weights are preferably spherical in form and provided with diametrical holes in which the opposite ends of the bar enter. These weights are preferably adjustable on the coupling-bar to regulate the torsional beat of the pendulum and to compensate for variations in the elasticity of the torsional support due to changes in temperature. Any suitable means of adjustment may be employed. The means shown consist of the stops 235 and 236 in the form of adjusting-screws which engage screw-threaded holes in the end of the bar, their heads serving as the stops for the weights. These adjusting-screws render the coupling-bar extensible. The spring-clip 234 is preferably in the form of an expanding fork, which may be considered as a downward or forked extension of the pendulum-rod, serving as a means of connecting the coupling-bar therewith. The coupling-bar extends through holes in the legs of the fork and the latter bear against the weights and hold them apart from each other in contact with the stops 235 and 236. Any suitable means for this purpose may be employed. The pendulum is regulated to increase the speed of its beats by adjusting the weights nearer together and to decrease the frequency of its oscillations by moving them farther apart. This adjustment is readily effected by means of said adjusting screws or stops. To avoid variations due to changes in temperature and to secure uniform action of the pendulum, the parts of the bob are so constructed as to compensate for such differences. The coupling-bar 231 is composed of a material which expands less for a given increase in temperature than the material of which the weights are composed. For instance, the coupling-bar may be composed of steel, which has a comparatively low expansibility, and the weights of an alloy of lead, which has a comparatively high coefficient of expansion. An increase of temperature will cause an expansion of the coupling-bar and weights, and the expansion of the coupling-bar will tend to move the weights apart; but the greater expansion of the weights operating against the stops will tend to decrease the distance between them and the radial distance of each from the axis of rotation of the pendulum-rod. The relative dimensions and expansions of these elements, respectively, are such that as the coupling-bar extends outwardly the weights expand inwardly the required extent to maintain the normal relation between the weights and bar, and as the parts contract on a lowering of temperature and the weights shrink in greater ratio than the coupling-bar the spring-clip holds the weights against the stops and the weights are thereby separated from each other or moved farther from the center of oscillation. The parts of the pendulum may be so proportioned as to compensate for variations in the length or stiffness of the torsional wire due to variations in temperature.

I claim as my invention—

1. A compensating pendulum comprising a pendent torsional rod having a lateral extension provided with a stop, a weight of solid metal on said extension, the weight and extension having different expansibilities adapting them to act automatically by expansion and contraction to vary the radial distance between the weight and the axis of the rod to compensate for the contraction and expansion of the extension, and automatic means for holding said weight in contact with said stop.

2. A compensating pendulum comprising a pendent torsional rod having a lateral extension provided with an adjustable stop, a weight of solid metal on said extension, the weight and extension having different expansibilities adapting them to act automatically by expansion and contraction to vary the radial distance between the weight and the axis of the rod to compensate for the contraction and expansion of the extension, and automatic means for holding said weight in contact with said stop.

3. A compensating pendulum comprising a pendent torsional rod, a coupling-bar connected with said rod and provided with adjustable stops, weights on said coupling-bar between said stops, and resilient means operative to hold said weights in contact with said stops and permit them to expand toward each other, the weights and bar being of different solid metals and the metal of the weights being more sensitive to the changes of temperature than the metal of the bar, and adapted by expansion and contraction to compensate for the expansion and contraction of the coupling-bar.

4. A compensating pendulum comprising a pendent torsional rod, a spring-clip attached thereto, a coupling-bar supported by said spring-clip, and weights adjustable on said coupling-bar between said clip and stops.

5. A compensating pendulum comprising a pendent torsional rod, a spring-clip attached thereto, a coupling-bar supported by said spring-clip and provided with stops at its opposite ends, and weights on said coupling-bar between said clip and stops.

6. A compensating pendulum comprising a pendent torsional rod, a spring-clip attached thereto, a coupling-bar supported by said spring-clip and provided with adjustable stops at its opposite ends, and weights adjustable on said coupling-bar between said clip and stops.

7. A compensating pendulum comprising a pendent torsional rod, a coupling-bar connected with said rod, weights adjustable on said coupling-bar between said clip and stops, and a spring means for holding said weights against said stops.

8. A compensating pendulum comprising a pendent torsional rod, a spring-clip attached thereto, a coupling-bar supported by said spring-clip and provided with stops, and weights on said coupling-bar between said clip and stops, the weights and bar being of different metals, the metal of the weights being more sensitive to changes of temperature than the metal of the bar, whereby the pendulum is self-compensating.

GEORGE STEELE TIFFANY.

Witnesses:

HENRY EDWARD DAWSON,

R. A. DE LA MATES.

No. 754,398. PATENTED MAR. 8, 1904.

G. S. TIFFANY.

TORSIONAL PENDULUM FOR CLOCKS.

APPLICATION FILED DEC. 12, 1903.

NO MODEL.

Fig. 1.

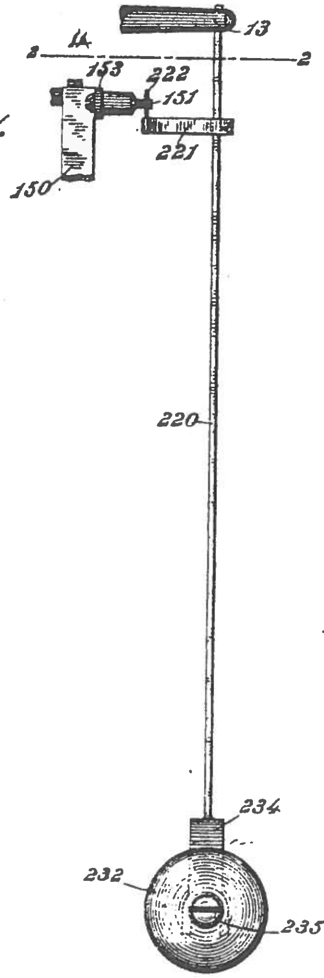


Fig. 2.

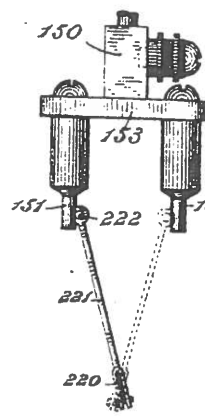
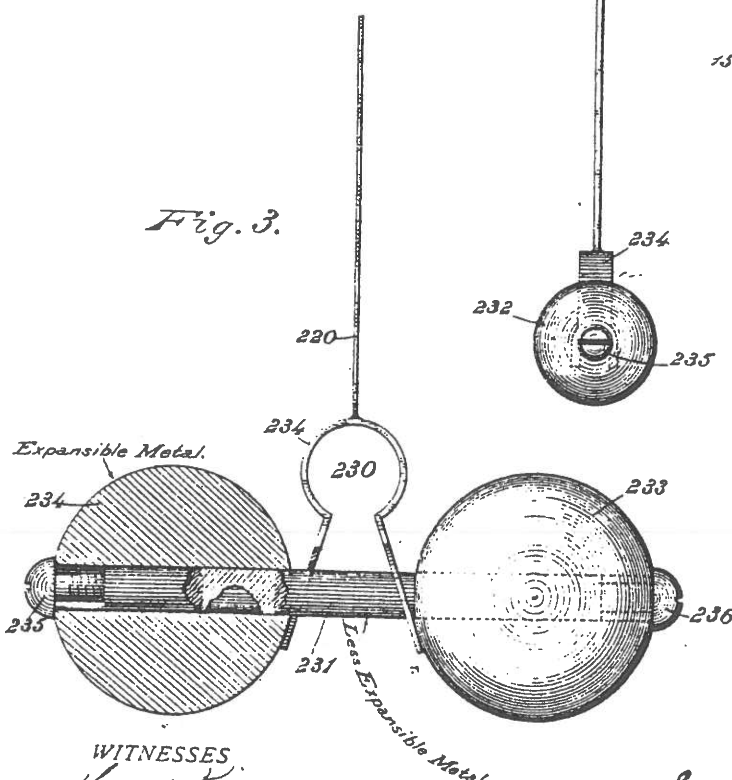


Fig. 3.



WITNESSES

INVENTOR

Attorney

THE NORRIS PETERS CO. WASHINGTON, D. C.

Standard Electric Time Systems

Catalogue No. 32. January, 1910

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THE STANDARD ELECTRIC TIME SYSTEMS

CONSIST ESSENTIALLY OF A

MASTER CLOCK OR REGULATOR

Electrically self winding, which operates or controls electrically

SECONDARY CLOCKS   TIME STAMPS

PROGRAM CLOCK SYSTEMS

WITH BELLS, GONGS, WHISTLE VALVES, ETC.

STREET CLOCKS   TOWER CLOCKS

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SYNCHRONIZERS

FOR OTHER TIME-KEEPING APPARATUS

AUTOMATIC TIME CONTROLLED DEVICES

AND VARIOUS KINDRED EQUIPMENT

THAT CAN BE ADVANTAGEOUSLY USED IN

SCHOOLS, UNIVERSITY BUILDINGS, HOTELS, CLUBS, PRIVATE BUILDINGS, INSTITUTIONS, STORES, RAILROAD STATIONS, PUBLIC BUILDINGS, FACTORIES, CENTRAL STATIONS, OFFICES, BANKS, ETC.

An Outline

The Standard System concentrates the control in a central Master Clock, which can be so made and compensated as to run with any desired degree of precision.

The Secondary apparatus, whether much or little, and located in one building or many, is electrically controlled by, and shares the precision of, the Master Clock.

The controlling and operating energy is electrical, being drawn from batteries; hence, only low voltage wires are usually necessary to connect the different elements in the system.

The Master Clock is wound electrically; therefore, the Clocks, Time Stamps, etc., in this system do not have to be wound by hand, and they never run down.

Perfect synchronism, or agreement, between all apparatus in the system results from this common control— the Master Clock — so that a cardinal difficulty with all winding clocks (lack of agreement) is overcome.

In principle, therefore, the Standard System makes possible a remarkable range of adaptability, operating simplicity and economy, together with accuracy and agreement, that can be obtained in no other way. Furthermore, the operation is automatic, so as to eliminate all care and forethought.

The Standard Master Clock Movement

The STANDARD Master Clock is made (1) to wind itself and (2) to control Secondary apparatus.

The Self-Winding Mechanism (Fig. 574. Page 7). Besides the lettered parts shown in this illustration, there is a helical spring mounted on a sleeve concentric with the main wheel arbor bearing the hands.

One end of this spring is attached to the main wheel *G* and the other to the ratchet winding wheel *H*.

P is an oscillating circuit closing arm carried by but insulated from the verge staff and vibrating with the pendulum.

N is a rotary circuit closing arm carried by the escapement arbor. It revolves once per minute.

Assuming, for example, a 60-beat clock. The path described by the end of *P* is tangent for the fraction of a second, *each* second to the circle described by the end of *N*. Therefore, on a certain second (the thirtieth) *P* and *N* will come in contact for the fraction of a second — just long enough to make a circuit to the winding magnet, *A*.

The winding magnet, being thus energized, draws up its armature, to which is attached the winding lever with a pawl, *E*, so arranged as to push forward the winding wheel, *H*, one notch.

Description continued on page 8.

List of Principal Operating Parts in Master Clock Movement

A,	Winding Magnet.
B,	Shunt — To Absorb discharge from *A*.
C,	Crutch Rod (for Mercurial Pendulum Rod).
D,	Winding Lever Staff.
E,	Winding Pawl.
G,	Center Wheel.
H,	Winding Wheel.
J,	Back Pawl.
L–L^1,	5-Seconds Contact Arms.
M & N,	Rotary Circuit Closer Arms.
O & P,	Oscillating Circuit Closer Arms.
R,	Insulating Circuit Closer Blocks.
Q Q,	Circuit Closer Balance.
S,	Beat Adjuster.
F,	Program Circuit Closer.
I,	Pin for Engaging L–L^1.
l, l, l, l,	Dial Posts.
T,	Eccentric Screw for Adjusting Interval of Contact between L–L^1 and *I*.
U,	Lock Nut for Same.
V,	Contact Brush.

All Pinions are solid, cut steel and polished.

Verge ear is pinned to plate after adjustment.

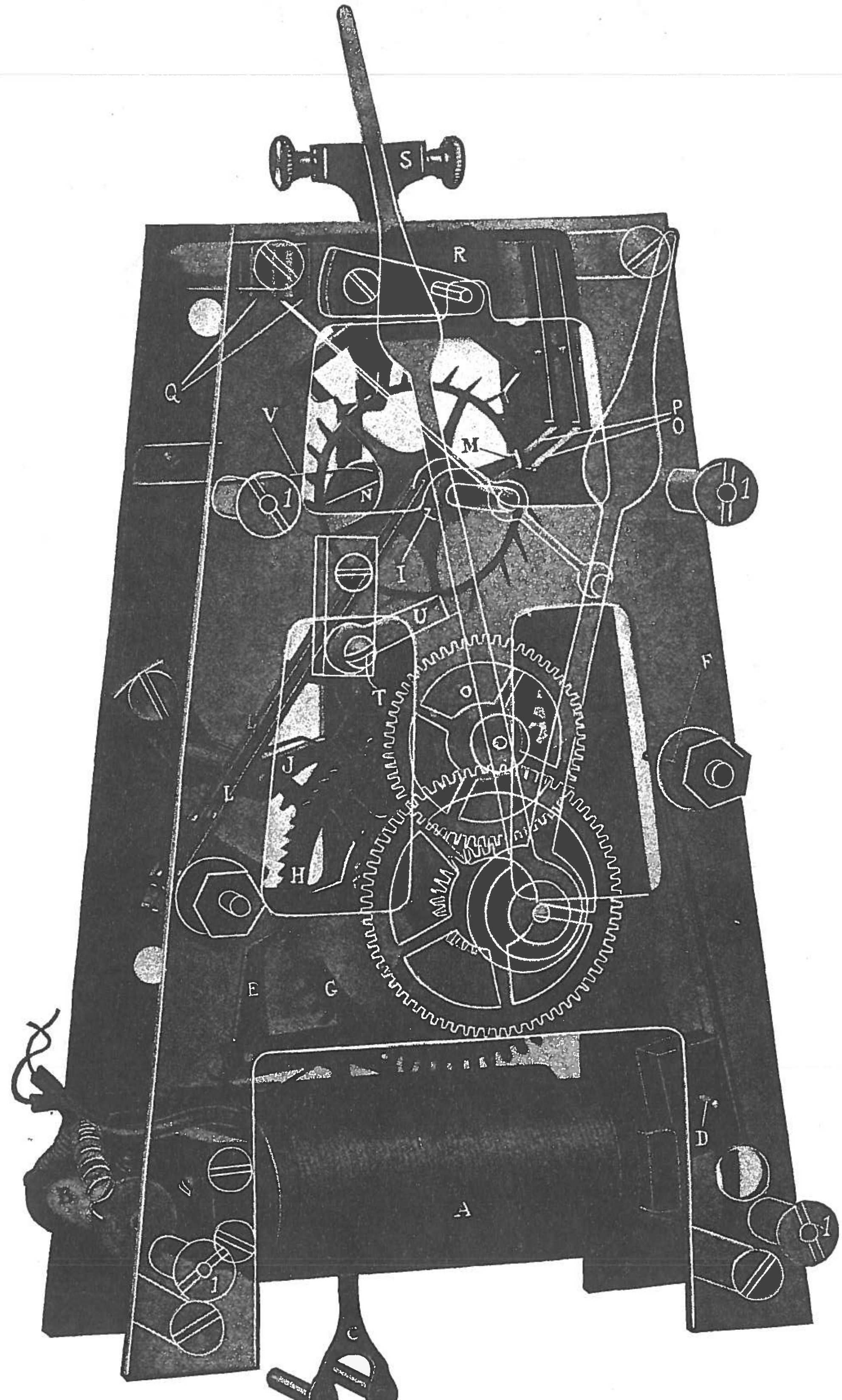

Fig. 574

STANDARD MASTER CLOCK MOVEMENT

For description see page 5

Continued from page 5

Minute Wind.— On the thirtieth second, therefore, the Master Clock automatically rewinds the spring the amount it unwound in driving the clock during the preceding minute. Through this simple minute-wind design the spring is kept practically at a uniform tension, which condition is most favorable to closest regulation.

A pin stop on the winding wheel prevents over-winding of the spring.

Contacts for Secondary Control.—The escapement arbor carries a second contact-arm, *M*, set 180° around from *N*, and in such a position that a second oscillating circuit closing arm, *O*, carried by, and insulated from, the verge staff will make a contact with it for a fraction of a second each minute on the sixtieth second. This "timing" contact makes the circuit (either direct or through relays) which operates the Secondary Clocks, Time Stamps, synchronizes other apparatus, or gives electrically the time impulse for any sort of service.

Master Clocks may also be designed for one-half minute time impulses when desirable for railroad work or other service when one minute impulses are not close enough.

Contact Design.— To attain the utmost success and reliability, the contacts must be sure, positive, and durable. The STANDARD design, a product of twenty-five years' experience, leaves little to be desired. *O* and *P* are flexible, so that when their ends come in contact with the ends of the rigid arms, *M* and *N*, there will be no shock or binding. The result is a rubbing action, insuring a self-cleaning friction contact. The action takes place at the end of the swing, so as to assist rather than retard the motive power.

All these contact surfaces are iridium-platinum tipped for durability. Provision is made for easy renewal if it should ever become necessary.

Cam Operated Contacts in Master Clock Movements, commonly known as bell-ringing attachment.— Besides the regular minute impulse time-contact circuit-closers described above, the Master Clock can also be equipped when desired with auxiliary circuit closers for fixed schedules of different durations over different periods of time. These are cam operated contacts wired in series with other regular contacts in the Master Clock. They can often be effectively employed when it is not necessary to vary the program; i.e., for unalterable schedules. For schedules that are liable to be changed use Program Clocks, see pages 53–56.

The following table gives some of the combinations of cam operated schedules.

WITH CONTACTS CLOSING ONCE PER MINUTE FOR SHORT DURATION (½ SEC.)		WITH CONTACTS CLOSING ONCE PER MINUTE FOR LONGER DURATION (1 TO 10 SECS.)		CAM OPERATED CONTACT WITH ANY FIXED SCHEDULE EXTENDING
List Numbers		**List Numbers**		
Without Relay	*With Relay*	*Without Relay*	*With Relay*	
215	218	221	224	*Over period of 1 hr.*
216	219	222	225	" " " *12 hrs.*
217	220	223	226	" " " *24 hrs.*

The *short duration* contact equipment can be built into any 60, 72, or 80 beat Master Clock movement when ordered by list number, as above, together with list number covering the clock with the other equipment desired. See pages 12, 15, 16, 19, 21 and 23.

The *long duration* contact equipment can be furnished upon order giving list number, on 60, 72, and 80 beat Master Clocks built to control Secondary time apparatus only; that is, it cannot be supplied when Program Clocks are used.

Fixed schedules over period of one hour can have minimum intervals of one minute between signals. For the 12 and 24 hour schedules the minimum time between consecutive signals is five minutes.

In asking for prices, schedule desired should be submitted.

Pendulums.— They are of the 60-beat type for best grade time keepers, but others for shorter beats are also supplied for certain service. For the closest work the mercurial compensating pendulum with metal rod and micrometer adjustment is furnished. With this micrometer the center of oscillation may be varied to correct for minute errors.

Heavy metal ball pendulums with hard-wood rods are furnished for less exacting service.

Oscillation of the pendulum rod is imparted to the verge staff through the crutch rod, *C*, and another micrometer adjustment, *S*, which permits an easy adjustment of the escapement to slight deviation from plumbness.

Cases for STANDARD Master Clocks are made in several different styles, architecturally, and usually of oak. Other kinds of wood may be employed for cases and finished to match the woodwork of the room in which the Master Clock is to be located. The time required for delivery and the cost are a little greater when other than standard wood and finishes are required. The Master Clock is substantial and magnificent in appearance, forming a handsome addition to the room in which it is located. Diameter of dial, usually 12″. The cases of STANDARD Master Clocks also usually contain the equipment for controlling the various circuits, such as Battery Gauge, Indicators or Pilot Dials (these to show the time indicated by the Secondary Clocks of the circuit into which they are connected), winding key, setting key (strap switches for momentarily closing circuits), circuit switches, series jacks, and plug for Battery Gauge, etc., as required for the particular system.

ALL IN ALL, the STANDARD Master Clock movement embodies numerous superior features. Equally important, it has been stripped of all unnecessary or delicate parts. In fact, the STANDARD Master Clock is a wonderfully simple device in comparison with other complex and delicate mechanisms for producing similar results. The number and variety of impulses it can give out to Secondary apparatus is surprising. The material of which it is constructed, the design and proportioning of parts, in fact every detail, has been worked out in the light of long experience by experts in this business. It is the heart of the system, and can be relied upon to perform its functions.

The exterior appearance is rich, simple, and durable.

To be continued.

WEB SITES: "Introduction To Electric Clocks", by Michel Viredaz, with animation by J. E. Bosschieter: w www.mypage.bluewin.ch/electric-clocks

FOR SALE: **SWCC** Western Union, 15-1/2" convex "glass". Actually it is plastic, but it beats a naked dial. $20.00 (I'll pay UPS up to $5.00) Paul M. Hopkins, 2717 Millwood Rd., Birmingham, AL 35243 (205) 967-1237

Replacement Field Coils for **SESSIONS** and **HAMMOND** synchronous clock movements.
Wining's Clock Service, 2910 Farmdale Rd., Akron, OH 44312 (330) 628-9655

BANGOR Electric Clock Parts, New Factory original parts too many to list separately. Call or e-mail with your needs. Elmer Crum, (727)868-0181, electrichorology@juno.com

"Synchronome Brisbane 1903-1991" The story of the Jackson family of electrical clock makers. An Historical Project by Chapter 104. A 32 page booklet about the operation of the Synchronome Elec. Co. of Australasia. $5.00 Norman Heckenberg, 30 Depper St., St. Lucia, Qld. 4067, Australia

Glass Domes for the **Tiffany Never Wind** and other early electrical & battery clocks. If I don't have it in stock I'll try to get it. E-mail www.glassdomes.com
Ben Bowen, Rt. 3 Box 134C, Monticello FL 32344, (850) 997-3797 phone & fax.

Electronic "master clock" for old slave dials: $50. "Governor" makes Eureka clocks keep quartz-accurate time with no change to the clock: $95. Voltage regulators: $35 to $55.
Bryan Mumford, 3933 Antone Road, Santa Barbara, CA 93110; (805) 687-5116; www.bmumford.com

ITR master clock probably for school bell system with mechanism for paper tape, but tape is missing. L.A. Seymour (206) 842-5835 or seymochla@aol.com.

Sangamo and **Hamilton Sangamo** movements, motors, platforms, and other parts. Send SASE for list. Harvey Schmidt, 75-80 179th Street, Flushing, NY 11366 or wwlathlot @AOL.com.

Several **Bulle** 4 glass marble top and bottom crystal regulators in large & clockette sizes. Also several **ATO** marble clocks, a couple of **Brillies**, one advertising Dunlop Tires and a **Bardon** table clock. Also new/old stock of **Bulle** suspension springs and reproduction **Self Winding** "A" movement commutator. Contact Steve Berger at (480) 483-3711 or clocks @timesavers.com.

New publication: 60-page booklet with facsimiles of instructions and drawings re: **FAVAG** clocks with Hipp-toggle, period 1930-1960 (all in French). $25 including postage. Order email viredazepal @bluewin.ch, or address Michel Viredaz, Raidillon 48, 1066 Epalinges, Switzerland. Send money in banknotes, no checks please.

Requests for reprints of previously published material should be directed to the Chapter Historian:
Dr. George Feinstein 75-19 195th Street Flushing, NY 11366

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Dennis Roberts, 812 Hartfield Dr., North Aurora, IL 60542 (630) 761-9286

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HERSCHEDE electrically wound clocks, movements, parts, catalogs, or manuals.
Patrick Loftus, 3399 Las Vegas Drive, Belmont MI 49306 ploftus05@aol.com.

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Henry R. Cramer, 509 Windward Way, Greer SC 29650. (864) 244-1802

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THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78

NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXVIII #3, SEPTEMBER 2002

Fellow Horologists:

In this journal issue #3 of this years presentation, we continue with the series on Catalog #32 of the Standard Electric Time Co., of January, 1910. We are also including a one page cut from the Grimshaw and Baxter Catalogue of October, 1906 describing the "Ever-Ready" Electrically Propelled Clock, provided by our chapter member A. D. Harris of Great Britain.

In addition, we'll start a new series covering the book, "Sangamo, a History of Fifty Years" by Robert C. Lanphier and Benjamin P. Thomas, provided by Tom Wining.

To round out the mix of technical and historical material we include an original article by Bill Arnold and Jerry Hartman titled "Electrifying the Self Winding Clock".

We appreciate the cooperation of those members who answered the call for material to be published, as evidenced by the variety of information listed above, and offer the gratitude of the entire membership.

Our quote for this issue is by Albert Einstein, and is as follows:

"If A = success in life,
then A = X + Y + Z,
where X is Work, Y is Play, and
Z is knowing when to keep your mouth shut!

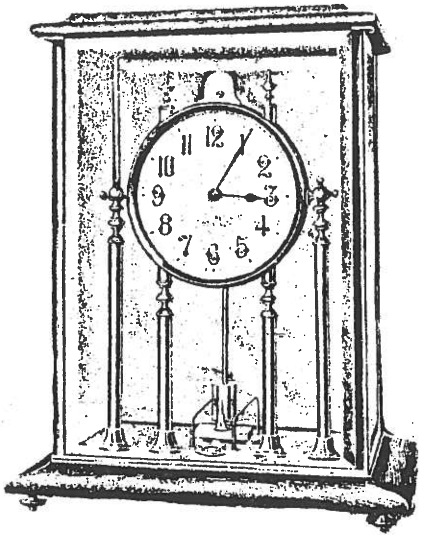
This issue promises to be especially interesting, enjoy it!
Good reading ahead......

Martin Swetsky, FNAWCC,......President)
Harvey Schmidt, FNAWCC,.....Secretary-Treasurer) Co-Editors
Dr. George Feinstein, FNAWCC..Chapter Historian)

HARVEY SCHMIDT, FNAWCC, Secretary-Treasurer, 75-80 179th ST. FLUSHING NY 11366

"EVER-READY" ELECTRICALLY PROPELLED CLOCK.

PATENTED IN ALL COUNTRIES.



No. 261.

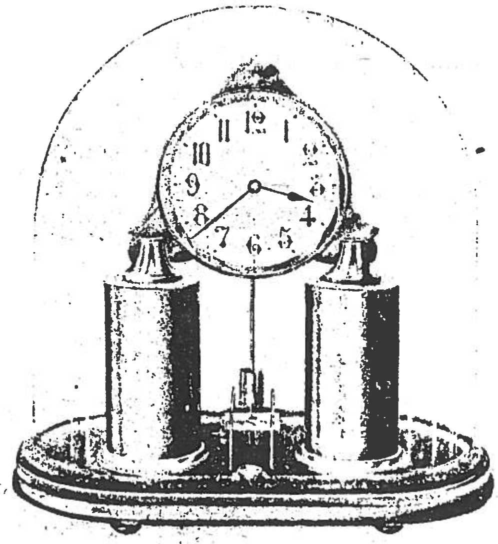
Base and Top : Solid Mahogany.
Front and Sides of Case : Bevelled edge Plate Glass.
Back : Bevelled edge Plate Glass Mirror.
Standards : Solid Brass, heavily Nickel-plated.
Height 14ins. Width 11½ins. Depth 8¼ins.

Price complete *as illustrated*, without Cells,

£7 7 0.

We recommend two "Ever-ready" E Cells at 5/- each.

As can be seen by the above illustration, the batteries which actuate this clock can be placed in a cupboard, behind the mirror, on a mantelpiece, or any other convenient spot. They are connected to the clock by neat, flexible silk cords. When renewing the battery it is therefore unnecessary to move the clock in any way. This is an exceptionally handsome and neat design.



No. 260.

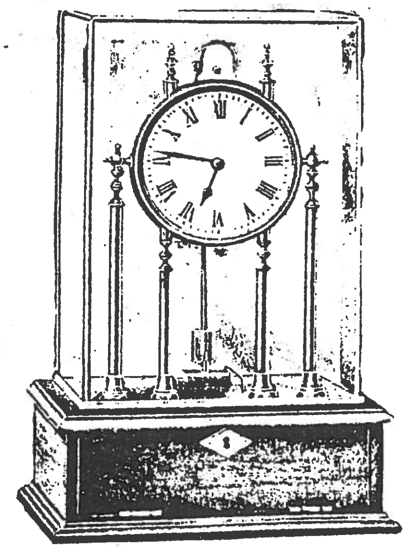
Frame : Highly polished and lacquered brass.
Height 14½ins. Width 14ins. Depth 8ins.
Complete with Glass Shade and Polished Stand.

£5 17 6.

Refills, 6/- each.

When new batteries are required they can be fitted with the greatest possible ease without the use of any tools.

Full particulars sent with each clock.



No. 262.

Base : Solid Mahogany, Oak, or Walnut.

Cover : Front and Sides – best Plate Glass, Bevel Edge. Back—Mirror of best Plate Glass.

Standards : Solid Brass, heavily Nickel-plated.

Height 17ins. Width 11ins. Depth 7½ins.

Complete *as illustrated*, **£10 6 0.**

Refills, 6/- each.

Pendulum : Constructed of special alloy, which is practically insensitive to temperature changes. Motion Work : Accurately machine cut on highest class precision tools.

Electric clocks from the

Grimshaw and Baxter Catalogue

29 – 37 Goswell Road, London, E.C.

October 1906

These clocks were manufactured by the Ever Ready Battery Company based on the Herbert Scott design from patents issued in 1893, 1894, and 1902. A series of articles by John Wilding FBHI, on the construction of a similar clock, using the Herbert Scott notched tooth principle, appeared in the Horological Journal between December 1977 and August 1978. These Journals are now out of print. However they have been republished in book form with full explanatory text and drawings. 'How to make a simple battery driven clock' is available from the British Horological Institute, U.K. at $35 plus shipping. It is advisable to contact the Institute in advance to determine the latest inclusive cost.

Continued from June, 2002 issue.

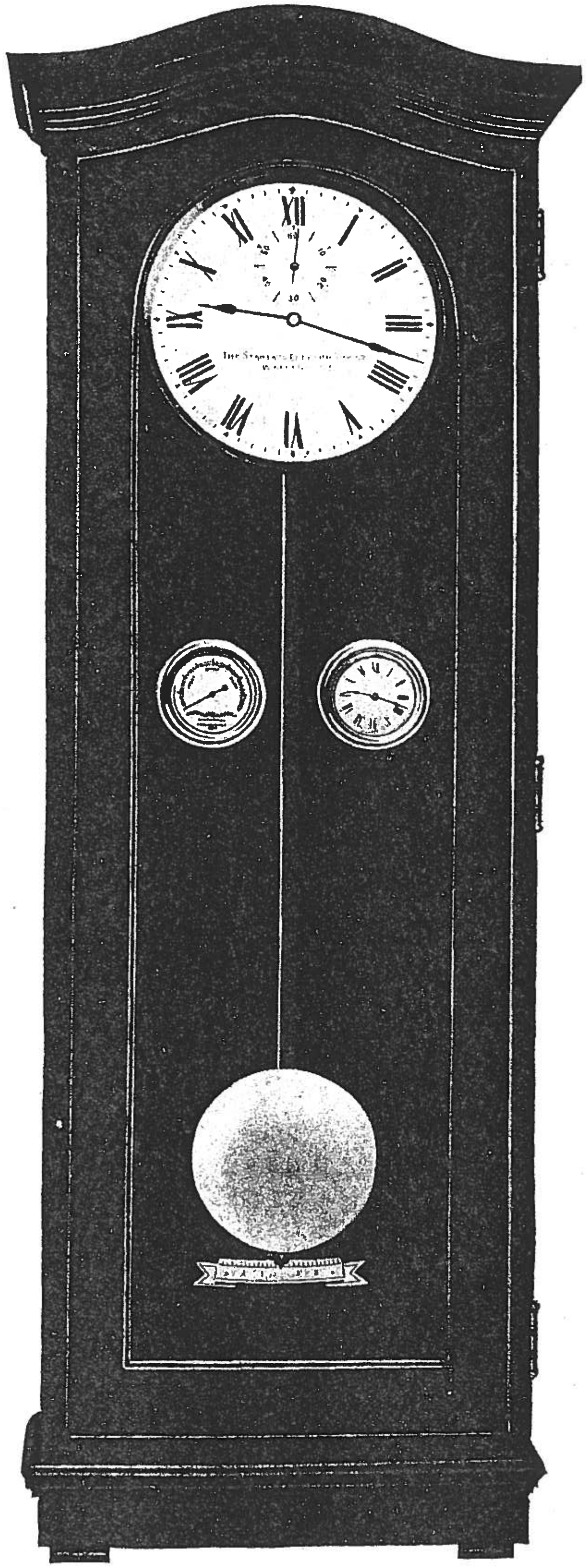


Fig. 634. List No. 1. Quartered Oak

MASTER CLOCK. 60 BEAT

Metal Ball Pendulum

EXTREME DIMENSIONS

Dial	*Height*	*Width*	*Depth*
12"	65"	22¾"	9¾"

60-Beat Master Clock

Fig. 634. Page 12. Roman Numerals

List Numbers for Different Wiring and Equipment in STANDARD Master Clock Case

List Number 397. For Clock arranged to run itself only

For Controlling Secondary Clocks Only

List Numbers		
With Gauge and Indicators	*Without Gauge and Indicators*	*Number of Circuits of Secondary Clocks*
1	6	One
2	7	Two
3	8	Three
4	9	Four
5	10	Five

For Controlling Signals Only

With Relays	*Without Relays*	
	20	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations
12	21	2-Circuit Program Clock in Master Clock case
13	22	4-Circuit Program Clock in Master Clock case

For Controlling Both Time and Signal Apparatus

With Gauge and Indicators	*Without Gauge and Indicators*	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations, and clock wired for:—
77	82	1-time circuit
78	83	2-time circuits
79	84	3-time circuits
80	85	4-time circuits
81	86	5-time circuits
With Program Relays	*Without Program Relays*	2-Circuit Program in case, without indicators and gauge, and clock wired for:—
45	25	1-time circuit
46	26	2-time circuits
14	27	3-time circuits
15	28	4-time circuits
16	31	5-time circuits
		2-Circuit Program in case, with indicators and gauge, and clock wired for:—
17	32	1-time circuit
18	49	2-time circuits

Continued on page 14

Continued from page 13

List Numbers		
With Program Relays	*Without Program Relays*	4-Circuit Program in case, without indicators and gauge, and clock wired for:—
19	50	1-time circuit
29	51	2-time circuits
30	52	3-time circuits
47	53	4-time circuits
48	54	5-time circuits
		4-Circuit Program in case, with indicators and gauge, and clock wired for:—
23	55	1-time circuit
24	56	2-time circuits

This STANDARD Master Clock can be equipped with either *Metal Ball* or *Mercurial* Compensating Pendulums. In ordering or writing for prices, state which is desired, as well as the list number. If clock is to control Time Stamps or other apparatus, specify number and operating voltage.

Cases are regularly furnished in oak of standard finishes. Other finishes or woods supplied to order.

60-Beat Master Clock

WITH TICKER ATTACHMENT

Fig. 577. Page 15

Can be furnished with Equipment covered by the following List Numbers on pages 13, 14, 17, and 18

1	31	97	119
2	50	101	120
6	51	102	126
7	52	103	127
8	53	104	128
9	54	105	129
10	77	106	130
20	78	109	140
21	82	110	141
22	83	111	142
25	84	112	143
26	85	116	144
27	86	117	396
28	96	118	397

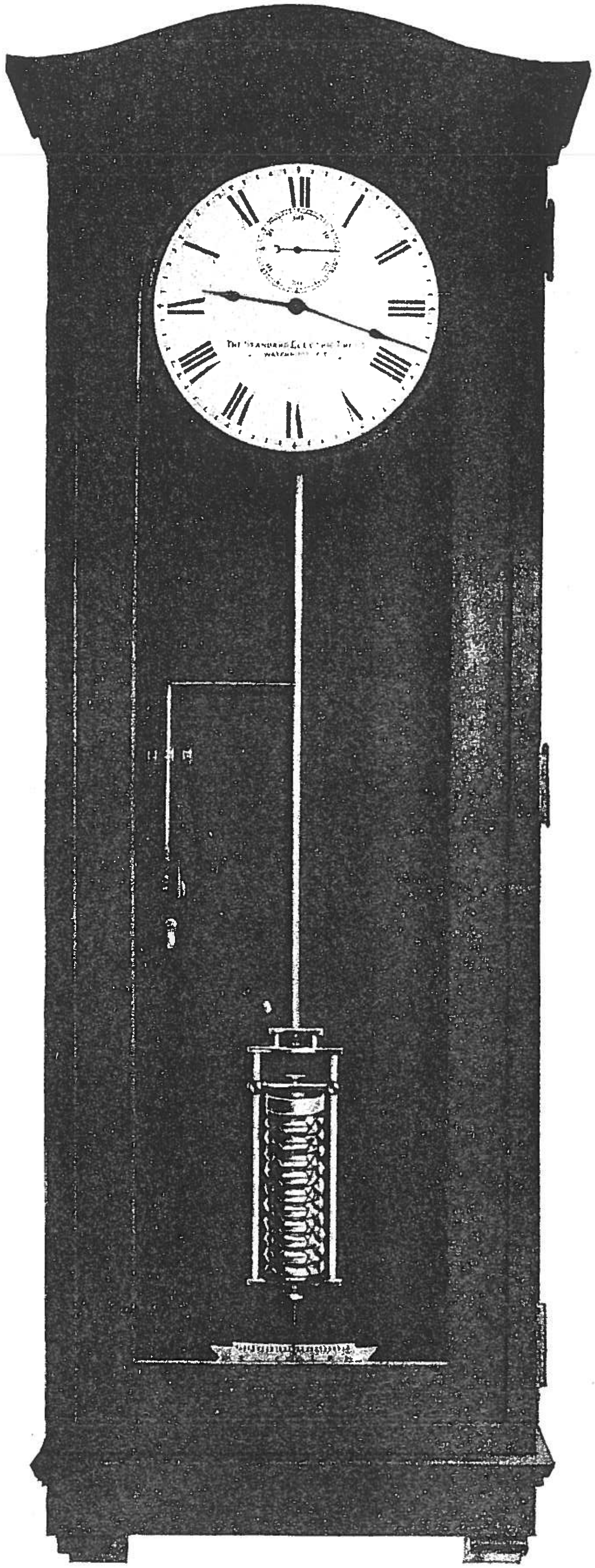


Fig. 577. Quartered Oak

MASTER CLOCK. 60 BEAT

With Seconds' Ticker. Mercurial Pendulum

Dimensions same as Fig. 634, page 12

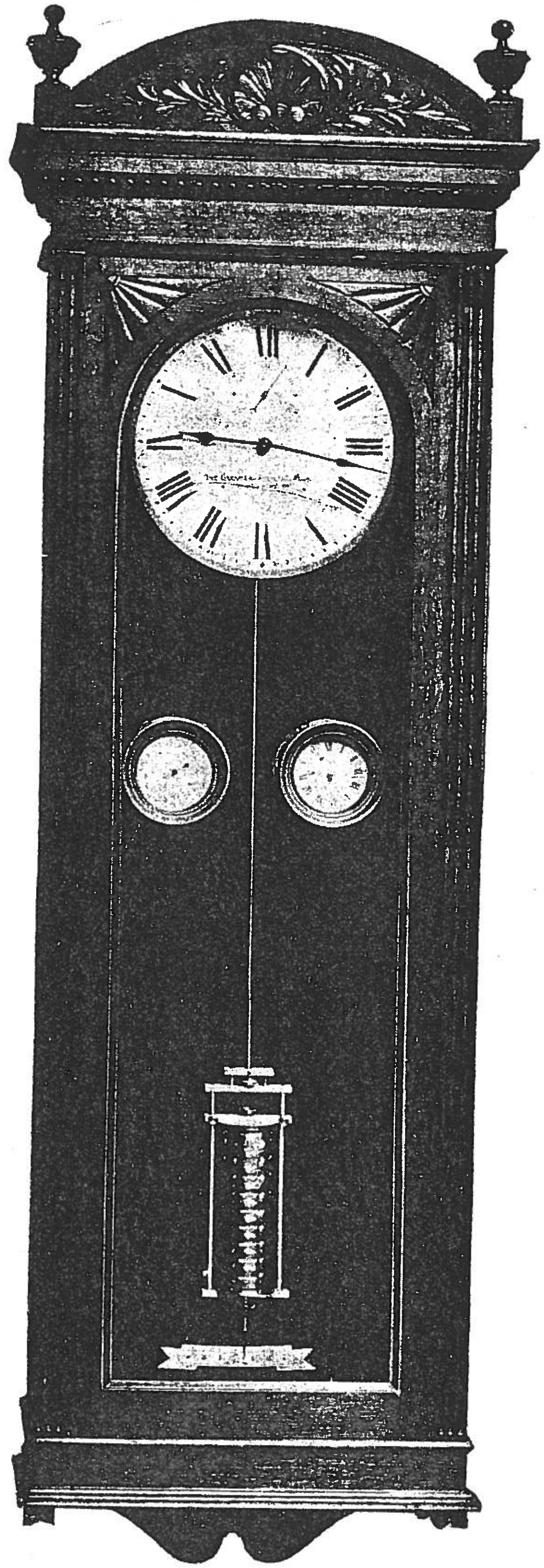


Fig. 12. List No. 96. Quartered Oak

MASTER CLOCK. 60 BEAT

With Mercurial Pendulum

EXTREME DIMENSIONS

Dial	*Height*	*Width*	*Depth*
12″	74″	25″	9⅜″

60-Beat Master Clock

Fig. 12. Page 16. Roman Numerals

List Numbers for Different Wiring and Equipment in STANDARD Master Clock Case

List Number 396. For Clock arranged to run itself only

For Controlling Secondary Clocks Only

List Numbers

With Gauge and Indicators	*Without Gauge and Indicators*	*Number of Circuits of Secondary Clocks*
96	**101**	One
97	**102**	Two
98	**103**	Three
99	**104**	Four
100	**105**	Five

For Controlling Signals Only

With Program Relays	*Without Program Relays*	
	106	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations
107	**109**	2-Circuit Program Clock in Master Clock case
108	**110**	4-Circuit Program Clock in Master Clock case

For Controlling Both Time and Signal Apparatus

With Gauge and Indicators	*Without Gauge and Indicators*	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations, and clock wired for:—
111	**116**	1-time circuit
112	**117**	2-time circuits
113	**118**	3-time circuits
114	**119**	4-time circuits
115	**120**	5-time circuits

With Program Relays	*Without Program Relays*	2-Circuit Program in case, without indicators and gauge, and clock wired for:—
121	**126**	1-time circuit
122	**127**	2-time circuits
123	**128**	3-time circuits
124	**129**	4-time circuits
125	**130**	5-time circuits

Continued on page 18

Continued from page 17

List Numbers *With Program Relays*	*Without Program Relays*	
		2-Circuit Program in case, with indicator and gauge, and clock wired for:—
131	133	1-time circuit
132	134	2-time circuits
		4-Circuit Program in case, without indicators and gauge, and clock wired for:—
135	140	1-time circuit
136	141	2-time circuits
137	142	3-time circuits
138	143	4-time circuits
139	144	5-time circuits
		4-Circuit Program in case, with indicators and gauge, and clock wired for:—
145	147	1-time circuit
146	148	2-time circuits

This STANDARD Master Clock can be equipped with either *Metal Ball* or *Mercurial* Compensating Pendulums. In ordering or writing for prices, state which is desired, as well as the list number. If clock is to control Time Stamps or other apparatus, specify number and operating voltage.

Cases are regularly furnished in oak of standard finishes. Other finishes or woods supplied to order.

60-Beat Master Clock

Hall Type. Fig. 14. Page 19. Arabic Numerals

List Numbers for Different Wiring and Equipment in STANDARD Master Clock Case

List Number 395. For Clock arranged to run itself only

For Controlling Secondary Clocks Only

List Numbers *With Gauge and Indicators*	*Without Gauge and Indicators*	*Number of Circuits of Secondary Clocks*
92	87	One
93	88	Two
94	89	Three
	90	Four
	91	Five

Continued on page 20

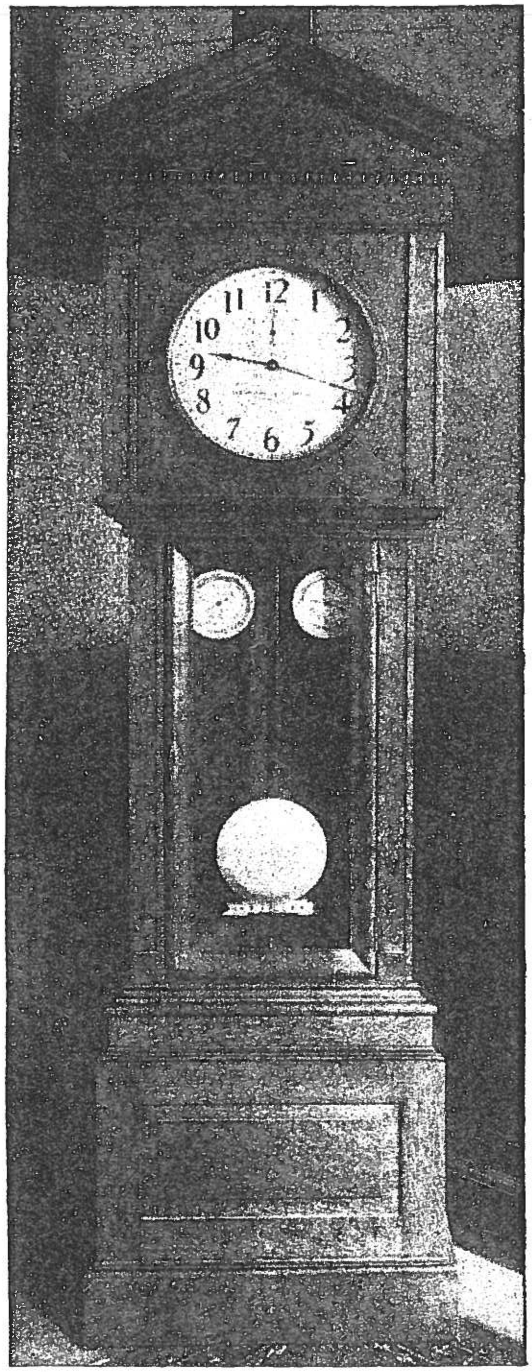


Fig. 14

Hall Type, Wood Case, Self-Winding

List No. 92

MASTER CLOCK. 60 BEAT

Metal Ball Pendulum

EXTREME DIMENSIONS

Dial	*Height*	*Width*	*Depth*
14″	95½″	34½″	15″

To be continued.

A METHOD OF ELECTRIFYING THE SELF WINDING CLOCK

The narrative that follows is a collaboration of two people: Bill Arnold having a strong automotive technical knowledge and Jerry Harman an electric clock collector and a Chapter member. Jerry will provide the background of obtaining a Self Winding Clock and Bill will state his background and a method for providing current to the winding motor.

Jerry:
During 2001, the Journal published in four issues "INSTRUCTION MANUAL FOR SYNCHRONIZED SELF WINDING SYSTEM WITH FC CONTOL BOX'. I was intrigued by reading the manual and looked forward to having an opportunity to have a clock. In September 2001, I was fortunate to purchase two slave clocks at an auction. The next step was to find a method to make them functional. This is where Bill comes into the picture. He will complete this article.

Bill:
My first introduction to self winding clocks was working on old automotive clocks in antique cars. They are mechanical clocks with electric winders, electromechanical analog clocks, most can be repaired. They have a set of points that wind the main spring when they make contact.

Most of the American car clocks in the 50's and 60's were designed in this manner. They are polarity sensitive and will not work if you reverse the leads. For instance, the old 6-volt Fords used a positive ground this means the case must be hooked to the positive terminal of the battery in order for the electric winder to operate in the right direction.

This is a simple principle and as long as the clock is regulated, the electric winder winds the main spring before the clock runs down. In fact, the first of the home clocks were designed this way. Now we have low current quartz clocks.

Slave clocks can be used independently of the master units. This is basically how most of them are operated today. In order to do this, one must either design a power supply or devise some way of using modern batteries to wind the clock. After all, these are nothing but mechanical clocks.

The batteries that were used during the time the company was operational are not now readily available. The clocks used a number 6 dry cell that were also used in the old style crank up telephone. I'm not saying that they are impossible to find but they might be expensive. It occurred to me that the solution to this would be to devise some method of powering up the clock using what is available today rather than find something that was used originally.

I really didn't know how much current it took to wind the clock. I knew that it operated on two No. 6 batteries that were 1.5 volts each. These were hooked in series and added up to 3 volts total. I knew flashlight or "D" cells would work but also realized that they probably wouldn't last long because the winder mechanism would draw too much current. This meant that if one were to use "D" cells, they must be hooked up to equal 3 volts and yet provide the current needed to operate the winder.

By checking with some of my collector friends, it was determined that the proper amount of batteries needed to do the job was eight. By using battery holders designed for two "D" cells, I could get the proper voltage and current. Four of these in parallel with each other would supply four times the current that a single pair would provide. This should meet or exceed the original battery requirements. If my calculations are correct, the batteries should power the clock for a year. The No. 6 batteries were changed at one-year intervals.

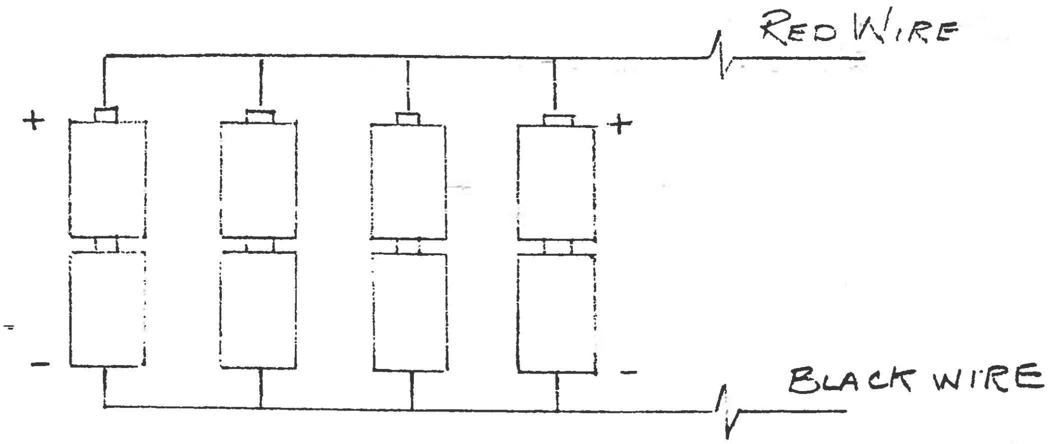
These battery holders can be permanently fastened to the case. I positioned them around the clock movement and used pop rivets to secure them. I then made a wiring harness to fasten them together in the series parallel configuration as described, see Figures 1 and 2. What I would suggest is to solder the larger 14 GA wires as close to the terminals of the battery holders as possible so that the connection will be short. If you use solder-less connections, you may end up with some resistive joints. There is no substitute for a good mechanical connection properly soldered. It is essential to have good connections and the proper gage of wire. I used 14 GA wire to interconnect the batteries. The reason for this is if the wire is too small, it just will not carry the current. Also the Positive side of the battery must be hooked to the Green wire as shown in Figure 1. You must have the polarity correct in order for the winder to function. I also used shrink tubing over the connections to insulate and protect them. This is put over the bare wire connections and heated to form a shield. When heated, the tubing conforms to the contour of the joint. I tied the wires together with nylon wire ties to make them look neat and keep them out of the way.

If you like, a switch can be installed to disconnect the batteries. After all if any of the sets are left hooked up, the clock will wind itself until the batteries run down. One battery from each set must be removed in order to break the electrical connection.

What I have described seems to work quite well. The batteries are readily available and should be a permanent solution to not finding No. 6 batteries. It is safe and you don't have to worry about a power supply overheating in case you got one that was too small. Time will tell if they will last a year or more but if they don't, there can always be more added in parallel later.

Note: A comment about the Mel Kaye article in the April 2002 issue of the NAWCC BULLETIN. The article "Those Wonderful Automobile Clocks" was wonderfully written, very informational, and a joy to read. In the section entitled "The Evolution"; Mr. Kaye describes the electric automobile clocks or the electromechanical analog clocks and their demise. Bill may be good or just lucky but three of his 1950's cars have clocks that are still operating. Assuming the clock movement is operational and the coil sound, the clock can be disassembled and the contract points can simply be filed to remove the oxidation and the "dead" clock comes alive. My '55 clock is still ticking!

FIGURE 1



PARTS LIST

DESCRIPTION	QUANTITY
TWO CELL D BATTERY HOLDERS	4
14 GAGE RED WIRE	AS NEEDED
14 GAGE BLACK WIRE	AS NEEDED
1/8 in POP RIVETS	AS NEEDED
SOLDER	AS NEEDED
HEAT SHRINK TUBING	AS NEEDED
WIRE TIES	AS NEEDED
D BATTERIES	8

14

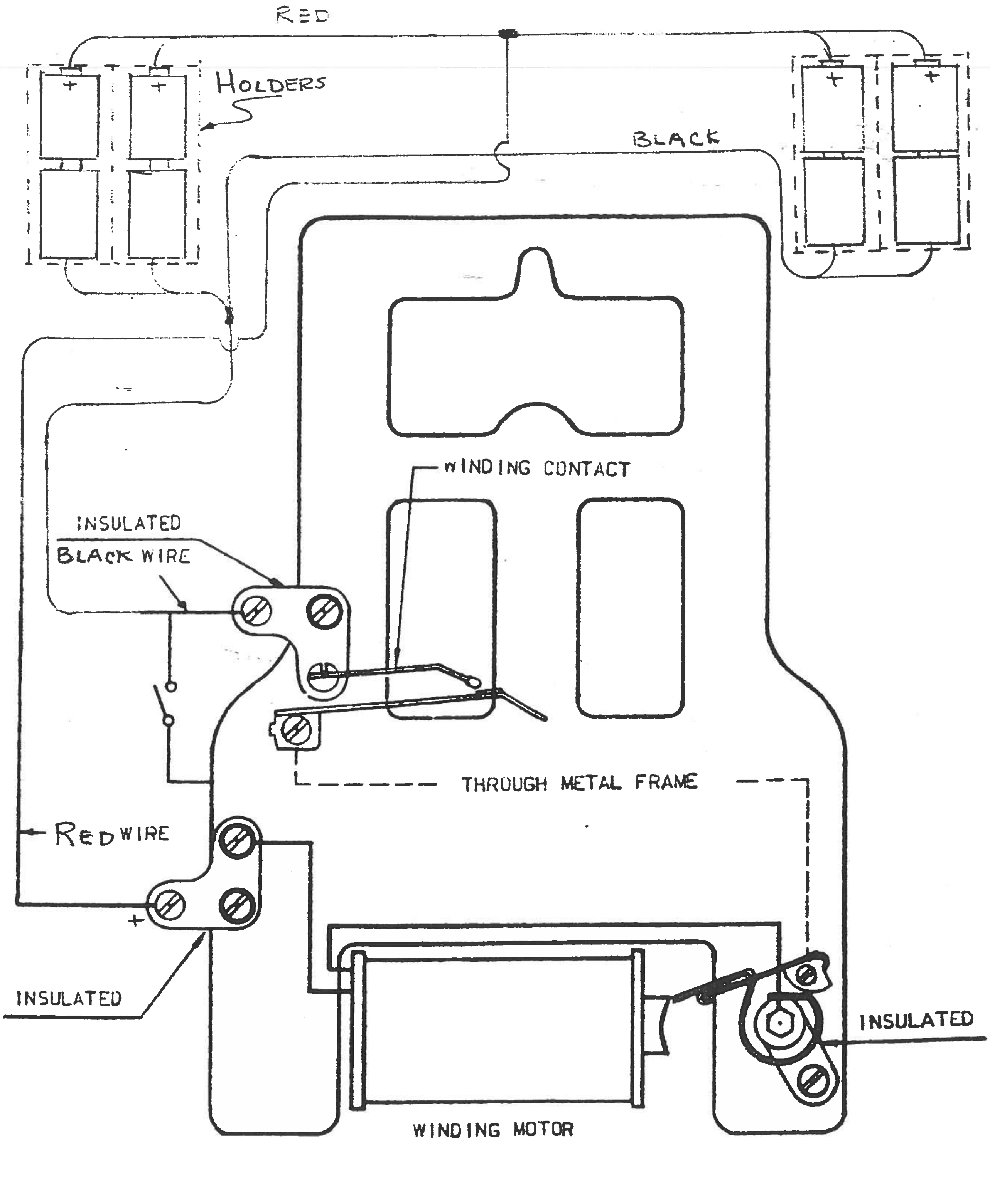
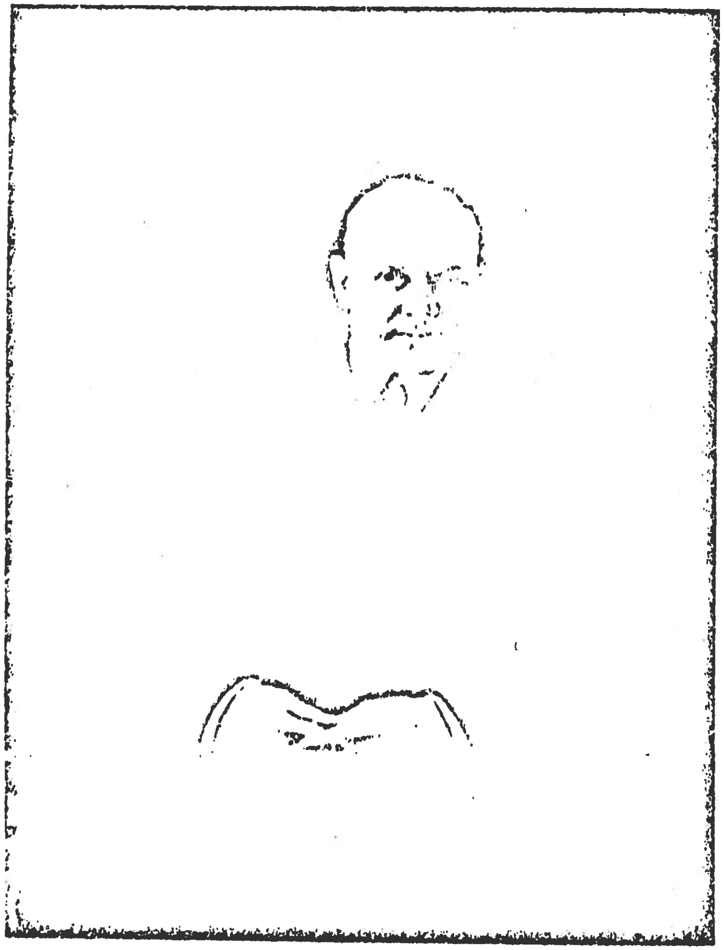

RED
HOLDERS
BLACK
WINDING CONTACT
INSULATED
BLACK WIRE
THROUGH METAL FRAME
RED WIRE
+
INSULATED
INSULATED
WINDING MOTOR

FIGURE 2



JACOB BUNN
1864–1926

SANGAMO

A HISTORY OF FIFTY YEARS

FORTY YEARS OF SANGAMO

by

ROBERT C. LANPHIER

SANGAMO IN PEACE AND WAR

by

BENJAMIN P. THOMAS

PRIVATELY PRINTED

CHICAGO · 1949

PRINTED BY
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CHICAGO
AND CRAWFORDSVILLE, INDIANA

Preface

LIKE most other successful American business enterprises, the Sangamo Electric Company had humble beginnings, and through the perseverance and judgment of management, mutual loyalty and understanding on the part of employer and workers, the development of technical knowledge and the courage to venture, it progressed to an established position in its field. Its story is one of long-term success, not unmixed with vicissitudes.

The story is presented here in two parts by two different authors. Part One, "Forty Years of Sangamo," was written by Robert C. Lanphier, who was co-founder of the company with Jacob Bunn and succeeded him as president. Mr. Lanphier's story is an intimate, personal narrative covering the period from 1896 to 1936. It is reproduced exactly as it was originally written and published in the latter year, and this should be remembered in reading it. For example, when Mr. Lanphier states that the Ashida Engineering Company is still Sangamo's agent in Japan, the reader must bear in mind that this was written thirteen years ago. Other statements in the first part of the book are valid only as of the date when Mr. Lanphier wrote.

Part Two, "Sangamo in Peace and War," covers the period from 1936 to 1949, and is written by Benjamin P. Thomas, a long-time resident of Springfield and a distinguished historian and author. Since Mr. Thomas has no connection with the company, his narrative is less personal than Mr. Lanphier's, but he has had free access to company records and has also profited from numerous conversations with those most intimately acquainted with company affairs.

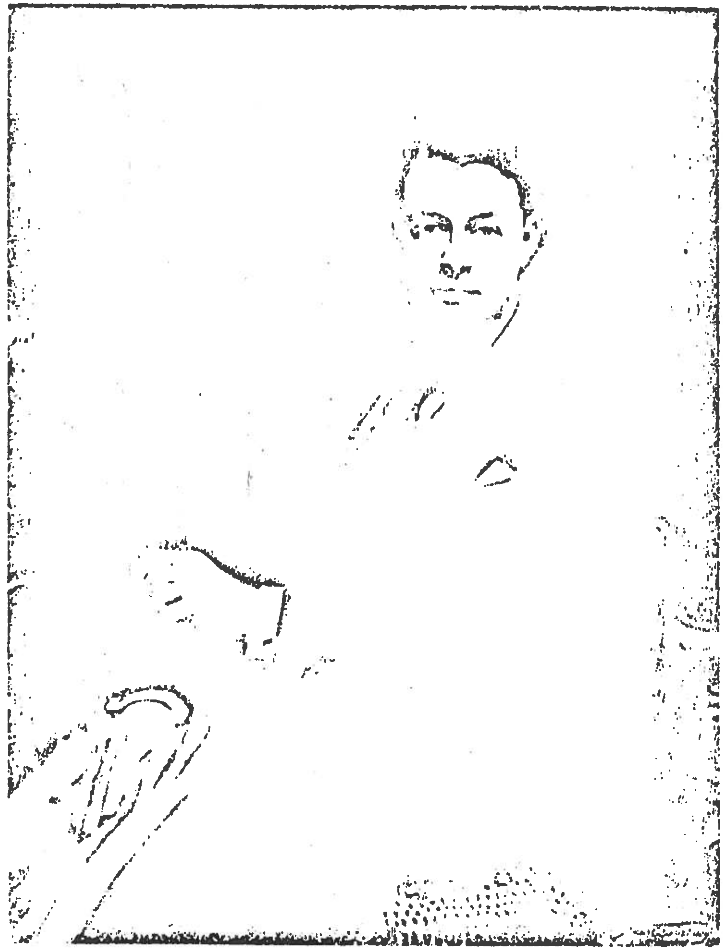
Sangamo hopes this little book—a memento of its Fiftieth Anniversary—will be of interest to those associated with the company and to its other friends.

PART ONE

FORTY YEARS OF SANGAMO

BY

ROBERT C. LANPHIER



ROBERT CARR LANPHIER
1878–1939

I
FORTY YEARS OF SANGAMO

SANGAMO happened this way:—In 1892 the Illinois Watch Company was sued by Waltham Watch Company on the pendant set of a watch, and Tom Sheridan, as Master Mechanic of the Illinois Co., acted as principal expert for the company during this litigation.

As a result, Mr. Sheridan decided to leave and study patent law, and soon became one of the best known patent lawyers in Chicago. There, in 1895, he had as a client a Mr. Ludwig Gutmann, a German electrical engineer whose early training had been with some of the great pioneers in the electrical art, Dr. von Siemens in Berlin, Gaulard and Gibbs in France, and Blathy of Buda-Pesth. Mr. Gutmann came to the United States in 1887 and was associated with the Westinghouse Company in various engineering capacities, principally in the development of street railway motors, until early in 1895, when he went to Chicago, and shortly thereafter, to Peoria, where he became superintendent of the Royal Electric Company, manufacturers of transformers.

Prior to leaving Westinghouse, and harking back to his association with Blathy, one of the first persons to conceive of the induction watthour meter, Mr. Gutmann had also conceived the idea of such a meter, embodying several novel ideas in the, then, very primitive meter art.

It was in connection with patent applications covering these ideas that Mr. Gutmann went to Mr. Sheridan, and when he told the latter that he wanted to find a manufacturer to make his meter, Sheridan, through his former association with Illinois Watch Company, immediately thought of them, as an electric meter required a recording train, which he felt the Watch Company's equipment was suitable to produce. Furthermore, at that time, the watch business was just beginning to recover from the depression of 1893-4, so the Illinois Company had much vacant space and idle machinery, which Mr. Sheridan thought might well be utilized in the manufacture of Gutmann's meter.

Mr. Bunn's first meeting with Mr. Gutmann.

SO Sheridan told Mr. Jacob Bunn, Jr., then Vice President of the Watch Company, about Gutmann, early in 1896, and after a meeting with Gutmann, Mr. Bunn told his father, Mr. Jacob Bunn, Sr., about this invention, and suggested that the Illinois Watch Company consider making electric meters. However, the idea did not appeal to Mr. Bunn, Sr., so Mr. Jacob Bunn, Jr., decided to "back" Gutmann on his own account, sufficiently, at least, to find out whether there was anything to his ideas.

Mr. Bunn therefore arranged with the Watch Company to make the mechanical parts for the models Mr. Gutmann wished to build, while Mr. Gutmann himself wound the coils, and assembled and tested the two models, at Peoria.

These were completed in the summer or early fall of 1896, and, as Mr. Gutmann did not have adequate testing facilities at Peoria, he sent these models to his friend, Prof. R. B. Owen, Professor of Electrical Engineering at the University of Nebraska, for complete tests and for his opinion as to the commercial possibilities of such a meter.

At that time meters were not in extensive use, especially on alternating current circuits, and, outside of the Thomson commutator meter, which was then used on A.C. as well as D.C., all alternating current meters made in the United States up to 1895 were amperehour meters.

That year the Diamond Meter Co. brought out an induction watthour meter, not correct on inductive loads, but it was not until 1896 that the first true induction watthour meter was brought out by Westinghouse, embodying the Shallenberger invention of compensation to make the meter correct on inductive load.

Thus, when Prof. Owen tested Mr. Gutmann's models, there was practically no standard of good performance in induction meters to compare with, so his report simply stated that there were possibilities in the meter, when further developed and refined.

As Mr. Gutmann had neither the time nor the facilities to work out the necessary improvements, and as there was no one of electrical training associated with the Illinois Watch Co., Mr. Bunn decided to let the matter rest, for, as he told me the next year, he had spent "a couple of hundred dollars" on these models and experiments, and did not feel like throwing away more money on Mr. Gutmann's invention unless he could see some definite plan under which to develop the idea.

So the models were put away in a box in the drafting room at the Watch Company, and there they stayed through the Spring and early Summer of 1897, and there the matter might have ended except for one of those chances which often occur in this life.

Mr. Bunn first tells me of his meter venture — July 4, 1897.

THE writer had graduated from Yale, in electrical engineering, in June, 1897, and came home to Springfield for a short vacation before going to Schenectady, to enter the student course of the General Electric Company, then just starting, having no thought of any electrical occupation in Springfield.

The evening of July fourth he was at a dinner where he saw Mr. Jacob Bunn, Jr., who asked about his electrical studies, and what he intended to do, then remarked, "Oh, by the way, I got interested last year, through Tom Sheridan, in some kind of electric meter invention of a man named Gutmann, who lives over in Peoria, and had a couple of models made, which are in a box out at the factory. I don't know anything about these electrical devices, so maybe, if you've learned anything at Yale, you could tell me whether there's anything to this meter." With the rashness of youth, I said I should like to see the models and Prof. Owen's report, so Mr. Bunn, with a smile, asked me to come out to the Watch Factory the next day, which I did, and we dug the box out, to find a jumbled mass of castings, coils, brass cylinders, and odds and ends.

Even with my very slight acquaintance with watt-hour meters, for little was then taught about them to electrical students, I recognized the purpose of some of the parts, and tried my best to make Mr. Bunn feel I knew "what it was all about." He very kindly suggested that I think some more about the meter during my absence on a short trip, and that he would ask Mr. Gutmann to come over to Springfield and talk to us early in August.

In the meantime, I wrote to my dear friend and teacher at Yale, Prof. Henry Bumstead, later Yale's greatest physicist, asking him to tell me where I could "read-up" on meters, and he gave me such references as he could, which were few and far between in those days.

Mr. Gutman "cross-questions" m — August 1

SO, primed as best I could, I met Mr. Gutmann early in August at Mr. Bunn's office, and never before nor since have I gone through such a catechism, to test my meager electrical knowledge. However, the upshot was that Mr. Gutmann told Mr.

Bunn he thought "that boy" could do some experimenting with his models, "if watched carefully" as to mistakes, and Mr. Bunn then talked to me about temporarily dropping my plan of going to Schenectady, and of spending "a couple of months" trying to find out whether it would be worth while to go on with Mr. Gutmann's invention.

This appealed to me, so after completing some other work I was doing for the Weather Bureau, I went out to the Watch Factory on September 13, 1897, was given a small space in which to work, and introduced to Otis White, then one of the principal tool makers in the Watch Factory machine shop, and with whom Mr. Bunn had arranged to do the fine mechanical work that I might require in the course of my experiments.

At that time the watch factory was lighted by gas made in their own plant, and had no electricity, power for the machinery being obtained from one large Corliss engine, so that I had to seek elsewhere for a place to do any experimenting. Mr. Bunn soon arranged with the old Springfield Electric Light Company, then having a power station at Seventh and Adams Sts., for me to have the use of their arc light testing rack, provided with a bank of lamps for load. That still left the question of instruments, but, after some digging around at the electric light plant, I found an old ammeter, considerably used up, which we succeeded in repairing somewhat, and with this elaborate equipment all my tests for the next few months were carried out.

As my experiments required frequent mechanical changes at the watch factory, I made a box in which to carry the rather large and heavy meter model, which I lugged back and forth on a bicycle, sometimes four or five times a day, good exercise, if not engineering experience.

Reports required by Mr. Gutmann on experiment work.

MR. GUTMANN insisted, from the start, that I should write him in detail every evening, of my experiments and results for the day, to which he replied at length two or three times a week, and came over to Springfield, first, at intervals of a few weeks, but later, every two or three months. This report procedure was kept up for over a year, and as my letters were all in long hand, with many diagrams, they filled three big copy books, which, unfortunately, were accidentally burned up when cleaning an accumulation out of the Watch Company office a few years later.

By the latter part of November, after many, many, changes had been made in the model as I found it, especially in the adoption of spiral instead of vertical slots in the cylinder (in the belief that infringement of the Tesla patents would thus be avoided), Mr. Gutmann and I agreed that the meter was sufficiently improved to justify recommending to Mr. Bunn that a final design be made, and a small lot of meters made to such design, before considering definite plans for commercial manufacture.

So I prepared a report, which is still in our "archives," detailing my experiments, which was given to Mr. Bunn late in November, '97, and at his request, I then made in December, a perspective color drawing of the proposed meter, to show him about "what it was going to look like," which old drawing greatly faded, was resurrected in our drafting room about twenty five years later, and now hangs in my office.

After discussing the situation with Mr. Gutmann, Mr. Bunn decided to see the matter through further, at least to the extent of building some new models, so from December, '97, to March '98, Otis White and I worked on these in the Watch Company machine shop, Otis doing all the fine work, while I did the more elementary machine work, wound the coils, and assembled the models, in the meantime gaining invaluable help from Otis in the knowledge of jigs, dies and other tools.

Experimental tests at University of Illinois — Spring of 1898.

WHEN the models were completed, we had no facilities in Springfield with which to make the tests on them that Mr. Gutmann wanted, so Mr. John W. Bunn, then, as for many years, Treasurer of the University of Illinois, arranged for me to use the facilities of the old electrical engineering laboratory there.

I went to Urbana in April, remaining several weeks to carry out the necessary tests and experiments, and have never forgotten the courtesies and helpful advice extended to me then by Prof. Carman, Professor of Physics.

On my return home, I prepared a report to Mr. Bunn and Mr. Gutmann, and the results indicated were such that they decided to go ahead with the manufacture of meters, but before doing so, Mr. Gutmann wanted to submit one of the models to friends in the Western Electric Company, which was therefore done in May, '98. We waited weeks for their report, and when finally received in July, were a bit discouraged by their caution regarding the danger of infringing certain patents.

However, after Mr. Gutmann had discussed the matter with his patent attorney, he told Mr. Bunn he felt there was little danger, and so far as these patents were concerned, this proved true, as they were never invoked against us.

Mr. Bunn's decision to manufacture meters — September, 1898.

SO, in September, 1898, Mr. Bunn decided to prepare for manufacture of Mr. Gutmann's meter, and arranged with the Watch Company for use of a few machinists, in addition to Otis White, who now began to devote all his time to the meter work.

During the next three months, most of the tools were made, some machines bought, the old main spring building of the Watch Factory (the small building still standing at the west end of our No. 1 Building) was rented in November, and I spent that month and December fixing it up to manufacture and test meters, while Otis looked after the tools and machinery.

To be continued.

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ITR master clock probably for school bell system with mechanism for paper tape, but tape is missing. L.A. Seymour (206) 842-5835 or seymochla@aol.com.

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w www.mypage.bluewin.ch/electric-clocks

THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78

NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXVIII #4, DECEMBER 2002

Fellow Horologists:

This is the last journal issue of the year, and as a result it includes the usual dues and Mart ad reminders. Dues, is still only $10, is due at years end, and Mart ad updates and deletions will take place with the next issue. If you would like your ad continued, you must advise Mart manager, Dr. George Feinstein. Likewise new ads and updates should be submitted ASAP. This issue continues the "Sangamo, a History of Fifty Years" by Robert C. Lanphier and Benjamin P. Thomas. Also continued is the Catalog #32 of the Standard Electric Time Co., of January, 1910.

We received two interesting letters, commenting on the article "Electrifying the Self Winding Clock" printed in the last issue, which we are including herein. These are by Paul Hopkins and Robert H. A. Miles, and provide some interesting and not readily available information on DC circuits, use of batteries, and set-up of Self-Winding clocks. A very enlightening follow up offering varying points of view on the subject. Commentaries about previously published articles are always welcome, with dissenting opinions and criticisms encouraging discussion and enlightenment.

We recently received an e-mail featuring a short story we considered worthwhile and are reprinting it here. Take note and see how it applies. This is a story about four people named Everybody, Somebody, Anybody, and Nobody. There was an important job to be done, and Everybody was sure that Somebody would do it. Anybody could have done it, but Nobody did it. Somebody got angry with that because it was Everybody's job. Everybody thought Anybody could do it but Nobody realized that Everybody wouldn't do it. It ended up that Everybody blamed Somebody when Nobody did what Anybody could have done.

Get involved, volunteer, submit articles, and generally support your organization.

Good reading ahead, enjoy this issue.

Martin Swetsky, FNAWCC,......President)
Harvey Schmidt, FNAWCC,.....Secretary-Treasurer) Co-Editors
Dr. George Feinstein, FNAWCC..Chapter Historian)

HARVEY SCHMIDT, FNAWCC, Secretary-Treasurer, 75-80 179th ST. FLUSHING NY 11366

Comments on "A Method of Electrifying the Self Winding Clock"

The article "A Method of Electrifying the Self Winding Clock" prompts me to write to correct one incorrect statement, to relate some pertinent history, and to offer some of my opinions.

The correction applies to the statement, "you must have the polarity correct in order for the winder to operate." It appears that Figure 2 is taken from a Self Winding Clock Co. Spec. Sheet for a Type "F" movement utilizing the oscillating armature. This movement will operate with either polarity if the arc suppressing resistor is still in place. If the resistor has been replaced with a diode, polarity must be observed, or if the clock has a "zip" motor, polarity must be observed, otherwise, polarity does not affect the operation of the winder.

However, battery polarity could possibly have a long term effect on the coils. In 1947 I went to work for Alabama Power Co. in an area of work involving oil circuit breakers used to de-energize transmission lines. Typically, these circuit breakers are operated by means of 130 Volt DC batteries. One of the first things I was told was that corrosion, leading to coil failure, had been found in circuit breakers in which the coils were permanently connected to positive, and were operated by applying negative to the other coil terminal. In utility parlance this is called "tripping with negative." However, no problems had occurred with the opposite polarity, "tripping with positive." Alabama Power had been "tripping with negative", and was in the process of changing to "tripping with positive" at that time. In my years of utility work "tripping with positive" was the standard for DC circuits. Following that convention would reverse the polarity shown in Figure 2. Also, my copy of Self Winding Clock Co. Spec. Sheet A-4, dated May, 1945, has negative connected to the bottom terminal, so for the above reasons, I connect negative to the bottom terminal. However, I suspect that the 3 volts used in the clock greatly reduces the possibility of coil damage. But why take a chance, particularly with todays cars following that convention.

Now a word on batteries. When I obtained my first Western Union Clocks about 25 years ago I used 2 D-cells, and obtained battery life of approximately a year. Then I decided to try the 4 cell series/parallel connection. What I got was a leaking cell! I wrote to Duracell asking about the wisdom of paralleling D-cells. The answer was that they do not recommend it. As I recall, small differences in cell voltage cause a circulating current, which has a bad effect on both cells – high current drain from one cell, and current reversal in the other cell. I now use 2 cells, and accept shorter life.

Of course, battery life is going to depend on the efficiency of the winding mechanism. Proper adjustment of the coils, the bumper springs, and the self-interrupting contacts, will maximize the operation of the mechanism, reducing winding time, and helping battery life. However, I think that the effect of the amount of pre-assembly winding that is given to the main-spring is over looked. I have experimented and found that 1 turn of the spring is adequate, but I do put on 2 turns when I assemble the clock. My spec. sheet says to put on "the desired number of turns." (Not much help.) And the most recent clock, which I worked on, had 15 turns. I know that clock was slow to wind, and hard on battery life. It is possible that the clocks mentioned in the preceding article might have some of the just mentioned problems.

In summary, I recommend that the negative be connected to the lower terminal of the clock, that the arc suppressing resistor be intact, that all of the adjustments (including spring pre-wind) be checked, and that any D-cells connected in parallel be watched closely.

Paul Hopkins
2717 Millwood Road
Birmingham, AL 35243
Tel. No. (205) 967-1237

Powering the Self winding Clock

Some years ago at general antique fair I saw a Self Winding Clock laying dial-less on the wet grass and took mercy on it and purchased it. It was one that had for many years (since about 1910) been in service on our London Underground. Strangely this railway had been financed by an American and therefore employed a Self Winding system. The restored clock was hung in my dining room and so had to be powered by internal batteries. I used just two Alkaline D cells and to my surprise the batteries ran for an extremely long time- years rather than months. I was therefore very mystified the article in the September Journal suggesting that no fewer than eight batteries of this type were needed. Clearly this is based on a gross misconception of current requirements. The replacement of the original No 6 batteries every year was obviously a matter of routine maintenance rather than necessity and could it be that this was the basis for the suggested overkill of eight D cells.

I therefore decided to make some measurements. The clock winds for about 30 seconds every hour. The measured current is 140mA. It should be noted that because of the inductance of the windings and back emf it is necessary to measure the current rather than calculate it from the coil resistance. Thus the power consumption per hour is only 0.00117 amp hrs. This gives a total of 10.2 amp hrs per year. An alkaline D cell can give 16 amp hrs and possibly more under periodic use, giving a battery life of over eighteen months. Thus my finding that just two D cells in series are quite adequate was quite valid.

Similarly the use of thick 14 gauge wire and soldered joints is quite unnecessary. Even one ohm resistance in the connections would be quite acceptable causing only a 5% drop in current. In my case I managed to retain the original early wiring which is about 22 SWG- more than adequate for 140mA. Also although the clock had red and black leads in practice the battery polarity has no effect on the operation or current consumption since the "motor" has no permanent magnets.

R. H. Miles.

Continued from September, 2002 issue.

Our first contact with Electric Appliance Company — October, 1898.

ONE day in October, while Otis and I were working in the Watch Factory machine shop, a man came in asking for "the fellow who is working on an electric meter," and when he found us, introduced himself as Levi Millard, salesman for the Electric Appliance Company, of Chicago, and said they had heard a meter was being developed in Springfield, and that they wanted the sales agency for it, if it was good. Of course I assured him it was, then took him up to Mr. Bunn, and thus began a close association that lasted as long as the Electric Appliance Company continued in business, nearly thirty years.

Early in December, Mr. Bunn and Mr. Gutmann decided to organize a small company to manufacture meters, Mr. Bunn supplying the necessary money, and Mr. Gutmann putting in his patents and pending applications. At the same time, we took on our first employe, Jim Edwards, still with us, I am glad to say, as our Senior Foreman.

How the name SANGAMO was adopted.

THERE was considerable discussion about a name for the little company, Mr. Gutmann suggesting some rather imposing ones, but Mr. Bunn finally decided on "Sangamo," because of its local interest, and the fact that it would be distinctive, should the infant company survive and grow. We have been asked many times about the origin of this name, which, in incorrect form, as "Sangamon," had been applied to our county and river. Legends differ, but the most reliable one indicates that

"Sangamo" was the name of the chief of the Illini tribe of Indians in our part of Illinois, when the first whites came there, about 1815. Years later, during the World War, a story started in New Zealand by one of our English competitors, that "Sangamo" was a Japanese name, and so great was the prejudice there against Japanese goods that we had to make a sworn statement as to the origin of our name.

Incorporation of Sangamo Electric Company — January, 1899

WELL, with the important question of a name settled, the little Sangamo Electric Company was organized on January 11, 1899, under the laws of Illinois, with a capital of $10,000, the incorporators being Mr. Jacob Bunn, his brother Mr. Henry Bunn, and Mr. Ludwig Gutmann. Mr. Henry Bunn was elected President, Mr. Gutmann Vice President, and Mr. Jacob Bunn Secretary and Treasurer.

That same week Mr. W. W. Low, President of the Electric Appliance Company, came down with Mr. Millard to meet Mr. Bunn, and to sign a sales contract between his company and Sangamo, and thus began a devoted friendship between Mr. Bunn and Mr. Low which lasted until Mr. Bunn's death.

By the end of January we had the little meter factory,—known then, and for many years, in the Watch Factory, as the "meter department,"—equipped and going, and had employed several more people, including one girl, to wind coils, and what a terrible job she made of it!

First shipment of Gutmann meters, March, 1899, and the troubles therewith.

AFTER many difficulties, we completed a few meters late in March, and triumphantly shipped our first order,—from Electric Appliance Company, to the City of Logansport, Indiana, municipal electric light plant.

About two weeks later, as I was trying to test a few more meters, Mr. Bunn walked in with a yellow carbon copy of a letter from Electric Appliance Company, containing "bad news" about those Logansport meters, and I've disliked yellow paper ever since. Every one of the six meters had developed a different kind of trouble, so I had visions of an early end of the budding little Sangamo, but Mr. Bunn said we had to find out what was wrong, and I went to Logansport, my first of many "trouble-shooting" trips.

The meter man at the plant greeted me with the remark that "thems the rottenest meters I ever seen," and he was right, for on going with him to the places where five of them were installed, I found two that wouldn't run on light load, one stopped entirely, and one that hummed so loud we could hear it out in the street,—no wonder the wife of the owner told us that "my old man couldn't sleep last night account of that thing, and you'd better fix it, for he's awful sore."

So I asked them to return all the meters, and after receiving them, Mr. Gutmann came over from Peoria, and we spent some time trying to correct our troubles, the worst of which was that the meter ran on no load with the cover off. I knew this before we

shipped the meters, but, in my ignorance of other meters, supposed it was to be expected, but now had to find out the cause of this serious defect. It was simple (it didn't seem so then)—we had a coil on only one leg of our U shaped shunt magnet, causing a great unbalance in field at the two pole tips adjacent to the cylinder, so when the meter was correctly adjusted before the cover was put on, the tinned steel cover shunted some of the flux at the strong side, and the meter ran backward on no load. I had therefore tested all the meters with cover on, and now found that the slightest change in position of a cover caused a change in light load accuracy.

Correction of first troubles and resumption of shipments.

SO we tried covers of brass and zinc, and they were all right, but expensive, then we suddenly realized that a coil on the other leg would correct the trouble. So, after a month's delay, we again started "production," and by the end of '99 had made the huge total of 540 meters. Once during the summer the Electric Appliance Co. sent us one order for fifty 10 ampere, 50 volt, 133 cycle meters, which was so huge we required nearly a month to fill it.

By the end of the year, we needed more space, so rented a small room in the next building south for painting, and the old rag shed in the back yard for a testing room, which required the sending back and forth of all meters, a boy carrying one on a hook, in each hand. That was the first job of Al Gillespie, who came with us in January, 1900, just after we moved into the new "laboratory."

I forgot to say that we now had electricity from a small 125 cycle generator in the engine room, which I had installed the previous winter, and at the same time had wired the timing and finishing rooms of the Watch Factory for electric lights, a great improvement over the old open gas lights. During 1900, the entire plant was wired, and we had our first 60 cycle service from the down town plant. A few years later, the old belt drive for power was abandoned, and motors installed throughout the Watch and Meter factories.

Sangamo's first attendance at an electrical convention, Milwaukee — January, 1900. First meeting with Tom Duncan.

IN January, 1900, we attended our first convention, the Northwestern Electrical Association, at Milwaukee, where we had a small exhibit with the Electric Appliance Company, and where I first met Tom Duncan, then, as to the end of his life, one of the best and best-known meter engineers in the country. I have never forgotten his kind attitude to me, a young and *very* green newcomer in the meter business. Thus began an intimate friendship which continued until Mr. Duncan's death in 1929.

At this time there were besides our Gutmann meter, five induction meters on the United States market: The Westinghouse round pattern "A," which had succeeded the original rectangular bulky meter of 1896; the first General Electric induction meter, as G. E. had opposed induction meters until 1898 with the Thomson commutator meter; the Ft. Wayne (Duncan) meter, succeeding their Slattery amperehour A.C. meter brought out about 1893; the Schieffer, improved over the original of 1895; and the Stanley, famous for the magnetic flotation of its moving system, the most advanced in design of all.

The little Sangamo company thus faced severe competition, plus the probability of patent litigation, which was actually started against us in the spring of 1901 by Westinghouse, under the famous Tesla patents covering the operation of an induction motor on single phase current.

In the meantime, Sangamo made considerable headway in 1900 with the cylinder type Gutmann meter, which, that spring, was shortened in dimension from the wall, and otherwise improved, though still not compensated for inductive load. Production that year therefore reached the large total of about 2000 meters, so the little company managed to remain in existence, but that was about all.

How the oval SANGAMO trade-mark came about.

IT was at this time, probably the early spring of 1901 that the oval Sangamo emblem came into existence. We had been trying to work the name into some kind of trade-mark, and one day I sketched an oval outline, with Sangamo in conventional straight letters. When I showed it to Mr. Bunn, he said it needed "some style," and suggested I show it to Granville Kindred, then head engraver at the Watch Factory, and a skilled designer. "Granny" looked at it a moment, then said, "why don't you give the letters a wiggle, to make them look like lightning had hit them, since you're an electric concern?" Then, with a few strokes of his skilful pencil, he made a beautiful design, which we have used ever since, in every country on earth, in fact, the oval Sangamo was long since registered as a trademark in nearly thirty countries.

By the early part of 1901, it was evident that we would have to make a radical change to further increase our sales, which was emphasized on a trip I made to Memphis, then one of our best customers, in April. The General Manager there, Mr. Proutt, was a very able, clear thinking, and fair-minded engineer, and during my visit gave me most valuable suggestions, which, on return home, I discussed with Mr. Gutmann, and we then decided to experiment with a disk armature, instead of the cylinder, the general principle of operation being otherwise the same as in our first meter.

Development of the disk type Gutmann meter — Summer of 1901.

THE disk type Gutmann meter was therefore developed during the next three months, compensation for inductive load being added, and during the late summer tools were made, so that the first meter was assembled in September, and I took it to Memphis, for Mr. Proutt's approval, which he gave.

During my absence for a month, from the middle of October, for the important purpose of a wedding trip, made possible by Mr. Bunn's consideration and kindness, a few meters were produced, the first of which was sent to me at Montreal, where I "demonstrated" it to our original Canadian agent, Mr.

John Forman, who had started selling Gutmann meters the previous spring, our first export business. He and his men were as enthusiastic about the new meter as I was, but on my return home in November, I found plenty of trouble with the few meters that had been finished, principally in absence of torque, and consequent erratic performance. The situation was particularly bad because the Electric Appliance Company had gotten a large order—some 600 meters—from the City of Tacoma, and the customer was more than irate because of delayed shipment.

So Mr. Gutmann came over, and after a week of working together, we added some iron in the series coils, and thus got up to the large (!) torque of 15 millimeter-grams, which wasn't bad for those days. We soon shipped the Tacoma meters, but I've never forgotten the prepaid express bill we had to pay to get them there promptly.

The new meter, backed by the enthusiasm of the Electric Appliance Company, and especially that of I. A. Bennett, their General Sales Manager, "took hold" rapidly, and by the early spring of 1902 we were making over forty meters a day, a good volume considering the small meter business of that day, and the strong competition we faced. Our position was further strengthened by the fact that we now had the first meter with a separately accessible bottom terminal box, a cover with screws sealed at the back, and that we were the first to offer glass covers without extra charge.

Our patent connection with Charles A. Brown and Prof. D. C. Jackson.

DURING these months since the spring of 1901, we had retained as our patent counsel Mr. Charles A. Brown, of the Chicago firm of Barton and Brown, with whom Mr. Gutmann had had previous satisfactory experience. Mr. Brown, as a very young man, had been General Manager of the Western Electric Company, then, aided by Mr. Enos Barton, the President of that company, he left to study patent law, and soon after he completed this work, became the partner of Mr. George Barton, brother of Mr. Enos Barton. Mr. Brown was (and is today) a man of great ability, and assumed our defence, in the several suits that had been filed against us, with vigor and enthusiasm. He chose as our principal expert Prof. Dugald C. Jackson, then head of the department of Electrical Engineering at the University of Wisconsin, later to become famous as head of the electrical department of Massachusetts Institute of Technology, and as President of the A. I. E. E.

None of the early patent suits were brought directly against us as a manufacturer, but against agents and users in scattered places, one of the principal purposes in patent litigation in those days being to thus cause added expense of defence to small, struggling competitors like ourselves.

The principal suits, therefore, in which we were concerned in 1901 to 1903, were one against the H. C. Roberts Supply Company of Philadelphia, our Eastern agent at that time, and the other against the Mutual Life Insurance Company of

N. Y., who used our meters in their building in Elmira, N. Y.

Mr. Brown soon obtained an agreement with the Westinghouse attorneys, Kerr, Page and Cooper of New York, that testimony should first be taken in the Roberts case, and this was started in the late fall of 1901, continuing, at Chicago and New York, at various times throughout 1902, during which I received my "baptism" in patent matters, expensive, but valuable in later years.

In addition to Prof. Jackson as principal expert, we engaged a number of other very prominent engineers, who testified for us, including Prof. William B. Anthony, of New York, one of the founders and Past President of A. I. E. E., Prof. Kennelly of Harvard, Mr. William H. Barstow, and others.

Our defenses were, first, that Tesla was fully anticipated in his invention by the great Prof. Ferraris, of Turin, second, that our mode of operation, on account of the spiral slots in our disk, and the arrangement of the fields, was not the same as Tesla had disclosed, and thirdly, even if one and two were rejected,—that Tesla was anticipated by several others in this art.

In preparing the defense of our case, I spent much time with Prof. Jackson at Madison and Springfield during the Spring and Summer of 1902, getting many valuable ideas from him. We made many experiments in his laboratory at Madison, and also at Springfield, in the attempt to sustain our position.

Sales arrangement with Western Electric Company. Summer of 1902.

IN the meantime, we were seeking an outlet for our meters in New York and New England, and in May, 1902—through Mr. Low,—Mr. Bunn and I met Mr. E. W. Rockafellow, Apparatus Sales Manager of the Western Electric Company at New York, who recommended to his superiors, Mr. Thayer and Mr. Wilkins, that they sell Gutmann meters.

So the deal was made, and late in June Mr. Bunn and I went to New York, where he signed the agreement with Western, and I "talked meters" to all their Eastern District salesmen, who had been called together for that purpose.

The eventful day was concluded by a celebration party given by Mr. Bunn at the old Cafe Lafayette, which I have never forgotten.

Within a few weeks, the Western salesmen had sold Gutmann meters in a great number of towns, and we were delighted, but our happiness was short lived, as Westinghouse sued for an injunction against Western within a few weeks.

Unfortunately, our counsel, Mr. Brown, had severed his connection with Mr. George Barton, on account of some personal difference with Mr. Enos Barton, President of Western Electric, so, when we told the latter that Mr. Brown would defend, at our expense, the injunction proceedings against Western, Mr. Barton told us that Mr. Brown could not appear in any case for them, but offered to defend the suit through their own attorneys, without expense to us.

Much as Mr. Bunn appreciated this, it was ob-

vious that we had to stick by Mr. Brown, and we so advised Mr. Barton.

So when the injunction hearing took place the end of August, Western Electric entered no answer, we were not represented, and the preliminary injunction was entered against Western, thus ending their fine effort to sell our meters after only two months.

My first meeting with Nikola Tesla April, 1902.

DURING the taking of testimony in New York in April, 1902, I met Nikola Tesla for the first time, and he impressed me then as a very unusual, excitable and brilliant man. Years later, in 1918, he telephoned me one day to come to see him in New York at once on an urgent, secret matter connected with the defense of our country, so I went, and left him, after a six hour discussion, with the feeling that his thoughts and ideas were not of this earth,—certainly the idea he put up to me, for Sangamo's cooperation, sounded like a Buck Rogers' dime novel.

Construction of No. 1 Building — Summer, 1903

DURING 1902 our business increased very satisfactorily, notwithstanding patent litigation, and the heavy expense thereof for our small company, and by the early part of 1903, we were faced with a pressing need for more space, so the Watch Company agreed to erect a building for us, our present Number One, which was started in the summer, and completed that Fall. We were just occupying it, when the crash of the decision in the Roberts' suit came down on us.

Injunction against Sangamo in Roberts' case at Philadelphia — September, 1903.

THE hearing in this case took place before Judge Archbold, of Philadelphia in January 1903, and for some reason he failed to hand down a decision until late in September, in which he upheld the Tesla patents against the Roberts Company, and gave the injunction asked for by Westinghouse.

Sales arrangement with Brush Electrical Engineering Co., London — Mr. Bunn's visit to England — Summer, 1903.

IN the meantime, we had started negotiations in the spring of 1903 with the Brush Electrical Engineering Company of London, to sell our meters in Great Britain, and Mr. Bunn went to England in July to close the contract with them. On his return late in September, I greeted him at New York with the bad news about the Roberts' case, and, as usual, he said, "Well, we're not licked yet."

However, it soon looked as though we might be, for, following the injunction against the Roberts Company, Mr. Brown, our counsel, told us to disregard it, as we were not the actual party defendant, so we kept on making meters through October.

Injunction against Sangamo and termination of Gutmann meter production — November 11th, 1903.

THEREUPON, the Westinghouse Company asked Judge Archbold to adjudge us in contempt of court if we failed to respect the injunction, so on November 11, 1903, he granted this action, and Mr. Bunn, who was in Chicago, telephoned me to stop all operations that night, a great shock to all connected with Sangamo.

During the balance of November and all of December we retained only a few employes,—in the hope of a successful appeal from Judge Archbold's decision (which we never obtained), also of carrying on in Canada, and finally, of developing quickly the mercury motor direct current meter, on which Mr. Gutmann had started me experimenting as far back as the spring of 1902,—but on which we had not made much progress.

Shipment of finished Gutmann meters to Canada and first manufacturing at Windsor — January, 1904.

IN December, Federal Judge Kohlsaat, of Chicago, granted a plea made by Mr. Brown, permitting us to ship all our stock of finished Gutmann meters, nearly all of which were in the Electric Appliance Company warehouse in Chicago, to Canada, or elsewhere outside the United States, on the ground that the Tesla patents covered a "system of operation," and not merely the motor—i.e. the meter—connected in the system, so that infringement did not exist until the meter was in operation. This was a God-send to us, especially as Mr. Bunn then went to Montreal, and through our agent, Mr. Forman, sold the entire lot of meters to the Montreal Light, Heat and Power Company. Not long thereafter, when in Montreal, I met a young man about my age named Donaldson then in the meter department of the Montreal Company. Years later, when we started British Sangamo, I had the pleasing surprise of meeting him again as Captain Donaldson, Managing Director of the North Metropolitan Electric Supply Company of London, for many years since then our largest customer in England.

Under Judge Kohlsaat's decision, we were also free to manufacture parts for meters, and even assemble them, so long as we did not operate them on current, so, taking advantage of this, we decided to start a small assembling and testing plant in Canada, to supply our trade in Canada and England, also in Mexico, Japan and some other foreign countries, in which we had a fair business for those days.

So, at the end of December, Mr. Bunn and I went to Detroit, to find a location in Windsor, across the river. En route, we were in Chicago December 30th, and tried to get seats for the performance at the Iroquois Theatre that afternoon. Fortunately for us, there were none to be had, so we took the afternoon train to Detroit, and at Kalamazoo learned of the terrible Iroquois fire, with the loss of nearly 600 lives.

After several days search at Windsor, we found a second floor store-room, so I remained several weeks in January 1904 fitting this up, assisted by Frank Pride, who came up from Springfield, and remained in charge of our little place at Windsor,—later transferred to Walkerville,—until we found the venture so unprofitable that we discontinued it after two years, not to resume manufacturing in Canada until many years later.

Development of first mercury motor meter — 1904.

DURING December, 1903, Henry Hodde (alias "Dutch") started working with me to develop the mercury meter, our only hope for business in the United States.

By this time Mr. Gutmann had ceased to have a very active connection with us, although still retaining his interest and position in the company, so the development of the mercury meter was carried on by Otis White, Dutch Hodde and myself, and as I think back to all the wild schemes we tried during the first six months of 1904, to make a meter reasonably accurate on light load, and on change in voltage, I realize how little we all knew then about mercury meters.

Fortunately, Mr. Bunn was patient and understanding, as always, even though we were losing money (that we did not have) month after month, so, encouraged by him, we tooled up the original type "C" mercury meter in the summer, and produced the first lot in August.

First type C mercury meters shipped September, 1904, to Oneida, Illinois and the troubles with them.

THESE meters were shipped in September, on order from the Electric Appliance Company, to Oneida, Illinois, a small town near Galesburg, and it was another case like Logansport, only worse, for when I received a frantic call to go over there early in October, I found the mercury had leaked out of the armature chamber of *every* single meter! During my two days' stay there, the situation was made more enjoyable by having to sleep on a cot in a livery stable.

The trouble proved to be in the material used for the mercury chamber,—Electrose,—a shellac and mica compound, which we found would soften at about 125 degrees F., which had never occurred to us at all. The meters at Oneida had been piled up in the boiler room of the plant, with resultant temperature well above the softening point of the Electrose.

So we now had to find a more heat resistant material, and while Hodde experimented at Springfield, I went to the Electrose Company, at Brooklyn, and others, in the endeavor to get such material. The Electrose Company were very helpful, and by adding asbestos fibre and reducing the proportion of shellac in the mixture, they produced for us in about two months, a brown material, which proved sufficiently heat resistant. Thus, in December, 1904, we finally got started on the production of type "C" meters that seemed satisfactory, and during 1905 we shipped several thousand of these meters.

Development of mercury motor watt-hour meter — 1905.

HOWEVER, the type "C" was neither a true watthour meter nor an amperehour meter, so Hodde and I continued experiments to the end of obtaining a watthour meter, no mercury watthour meter having been made, up to that time, in England, the birthplace of mercury meters, or elsewhere.

We obtained the desired result in the summer of 1905 by the simple expedient of adding damping magnets and a damping disk carried on the armature shaft, outside the mercury chamber, and four meters of this construction were built as models, and sent to Denver and Peoria for test in July 1905. The results reported were so satisfactory that we decided

to supersede the type "C" with the new "type D," on which tooling was started at once, and the first meters produced in November.

In passing, it is interesting to note that the original model type "D" sent to Peoria was in successful use there, at the Block & Kuhl store, for over twenty years, until destroyed in a fire.

Settlement of Tesla patent litigation with Westinghouse Company — January, 1905.

GOING back to the litigation on the induction meter, Mr. Brown endeavored during 1904 to have the injunction against us set aside, but lost on appeal, and the Westinghouse Company then demanded an accounting and damages. After hearings over several months, a decision on this matter was rendered in January 1905, and, Mr. Brown having then ceased to be our counsel, Mr. Bunn engaged Mr. Carl Meyer, one of the best known lawyers in Chicago (then and now) to go with us to New York, and negotiate a settlement with Westinghouse and General Electric, who, under their patent agreement of those days with Westinghouse, were a party to the matter.

Our opponents, represented by Mr. Charles Neave, a classmate at Yale of Mr. Meyer's, started off with impossible demands, a royalty of five dollars per meter on the 30,000 we had made, both cylinder and disk type, and also demanded we go out of business failing our agreement to which demands one of their attorneys said they would go after all our users, and make them remove the meters. Mr. Meyer told them emphatically that

To be continued.

The Standard Electric Time Co.

Continued from page 18

For Controlling Signals Only

List Numbers

With Relay	*Without Relay*	
	95	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations

For Controlling Both Time and Signal Apparatus

With Gauge and Indicators	*Without Gauge and Indicators*	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations, and clock wired for:—
190	**193**	1-time circuit
191	**194**	2-time circuits
192	**195**	3-time circuits
	196	4-time circuits
	197	5-time circuits

This STANDARD Master Clock can be equipped with either *Metal Ball* or *Mercurial* Compensating Pendulums. In ordering or writing for prices, state which is desired, as well as the list number. If clock is to control Time Stamps or other apparatus specify number and operating voltage.

Cases will be furnished in oak or mahogany of standard or special finishes.

72-Beat Master Clock

Fig. 481. Page 21. Roman Numerals

List Numbers for Different Wiring and Equipment in STANDARD Master Clock Case

List Number 394. For Clock arranged to run itself only

For Controlling Secondary Clocks Only

List Numbers

With Gauge and Indicators	*Without Gauge and Indicators*	*Number of Circuits of Secondary Clocks*
62	**57**	One
63	**58**	Two
64	**59**	Three
	60	Four
	61	Five

Continued on page 22

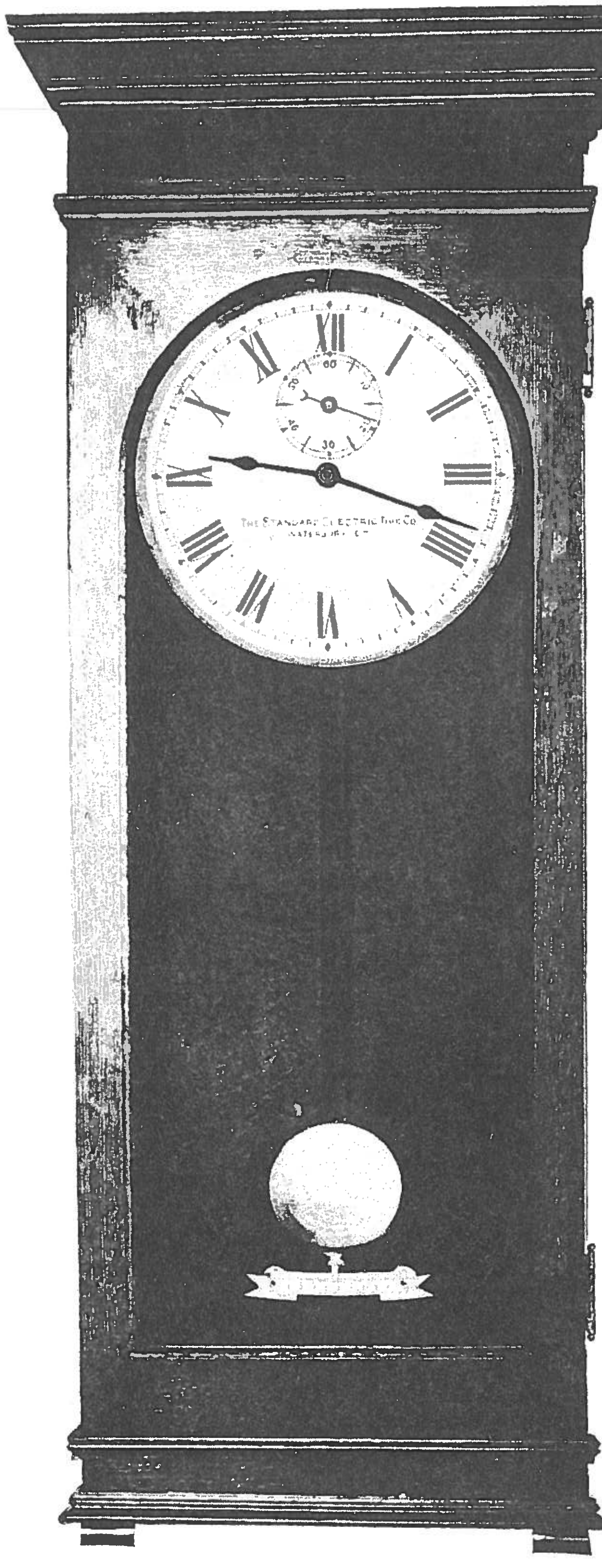

Fig. 481. List No. 394. Oak

MASTER CLOCK. 72 BEAT

Metal Ball Pendulum

EXTREME DIMENSIONS

Dial	*Height*	*Width*	*Depth*
12″	51½″	20″	9″

Continued from page 20

For Controlling Signals Only

List Numbers *With Program Relays*	*Without Program Relays*	
	65	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control any desired number of signal stations
68	66	2-Circuit Program Clock in Master Clock case
69	67	4-Circuit Program Clock in Master Clock case

For Controlling Both Time and Signal Apparatus

With Gauge and Indicators	*Without Gauge and Indicators*	Master Clock equipped to control Program Clock in separate case, which in turn may be for 2, 4, or 6 circuits and control unlimited number of signal stations
149	152	1-time circuit
150	153	2-time circuits
151	154	3-time circuits
	155	4-time circuits
	156	5-time circuits
With Program Relays	*Without Program Relays*	2-Circuit Program in case, without indicators and gauge, and clock wired for:—
157	171	1-time circuit
158	172	2-time circuits
159	173	3-time circuits
160	174	4-time circuits
161	399	5-time circuits
162	175	2-Circuit Program in case, with indicators and gauge, and clock wired for 1-time circuit
		4-Circuit Program in case, without indicators and gauge, and clock wired for:—
164	177	1-time circuit
165	178	2-time circuits
166	179	3-time circuits
167	180	4-time circuits
168	181	5-time circuits
169	182	4-Circuit Program in case, with indicators and gauge, and clock wired for 1-time circuit

This STANDARD Master Clock is equipped with *Metal* Ball Pendulum. If clock is to operate Time Stamps or other apparatus specify number of Stamps and operating voltage.

Cases are regularly furnished in oak of standard finishes. Other finishes or woods supplied to order.

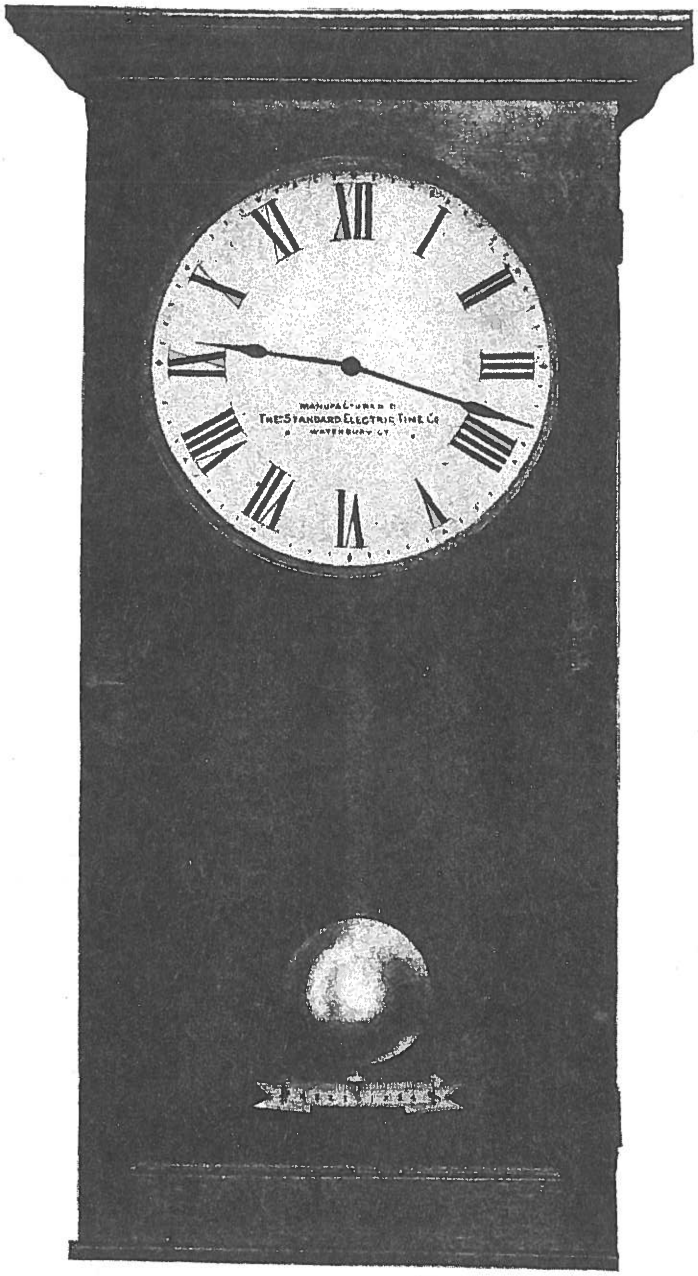

Fig. 578

SELF-WINDING CLOCK. 80 BEAT

Metal Ball Pendulum. Oak Case

List No. **75,** When arranged to run itself, only. No secondary apparatus
List No. **70,** When equipped with circuit closer to operate Time Stamp Without Relay. For low voltage stamps
List No. **71,** Ditto, with Relay. For low voltage stamps
List No. **33,** Ditto, with Relay. For 110-volt stamps

This 80-beat clock proves a popular, inexpensive one for controlling Time Stamps
If more than two low-voltage Time Stamps are used a relay must be employed
With 110-volt Time Stamps a relay must *always* be employed

Extreme Dimensions

Dial	*Height*	*Width*	*Depth*
12″	36½″	19½″	8½″

Winding Type Hall Clock

8-DAY MOVEMENT

Circuit closers can be placed on a key wind clock movement so that it is capable of operating a system of Secondary Clocks or signals. A hall clock of good quality and time-keeping properties may already be in place, so that it is simpler and less expensive to have it control any desired Secondary equipment.

Circuit closers are regularly made for clocks with the Graham Dead Beat Escapement type of movement. If other types of movement are to be equipped special circuit closers must be designed and movement sent to the factory to be attached.

Fig. 615, page 25, illustrates a key wind hall clock in handsome case, ornamental dial, and circuit closing attachment to movement. This clock may be furnished with or without Westminster Chimes.

List number with chimes, **198.**

List number without chimes, **72.**

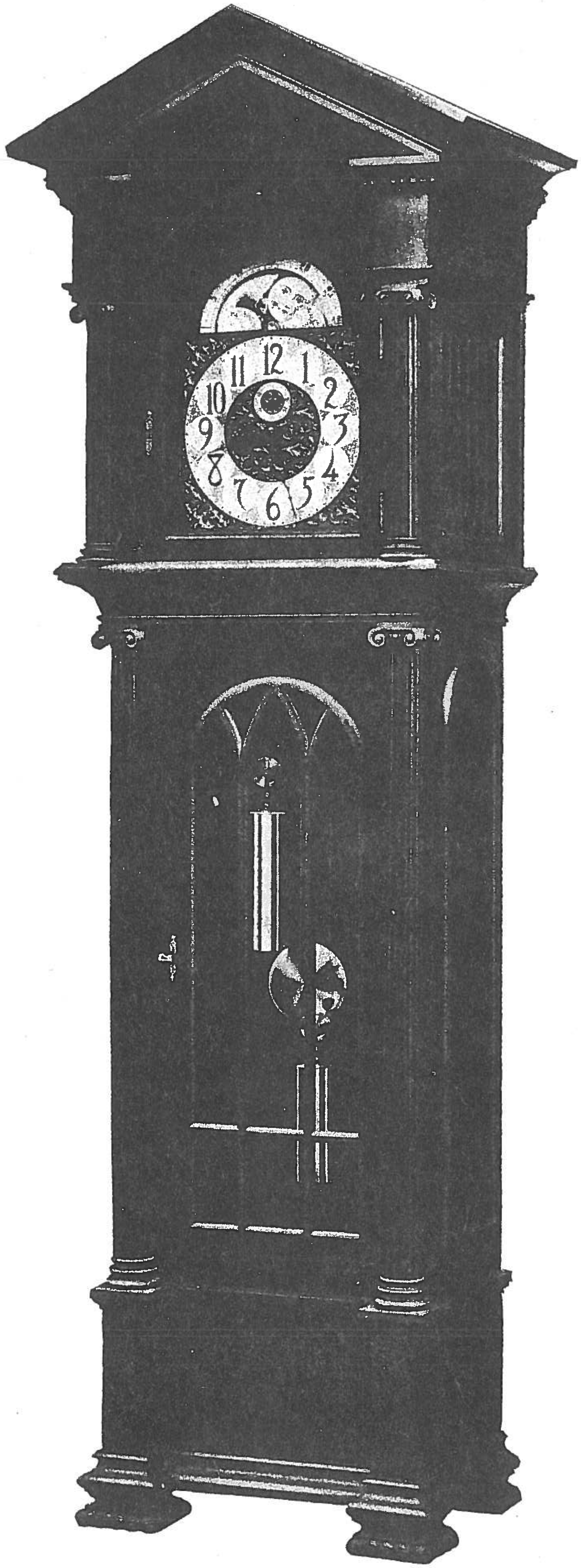

Fig. 615
Key Wind

8-DAY HALL CLOCK. 60 BEAT

EXTREME DIMENSIONS: *Dial*, 12″; *Height*, 98″; *Width*, 25″; *Depth*, 18″.

25

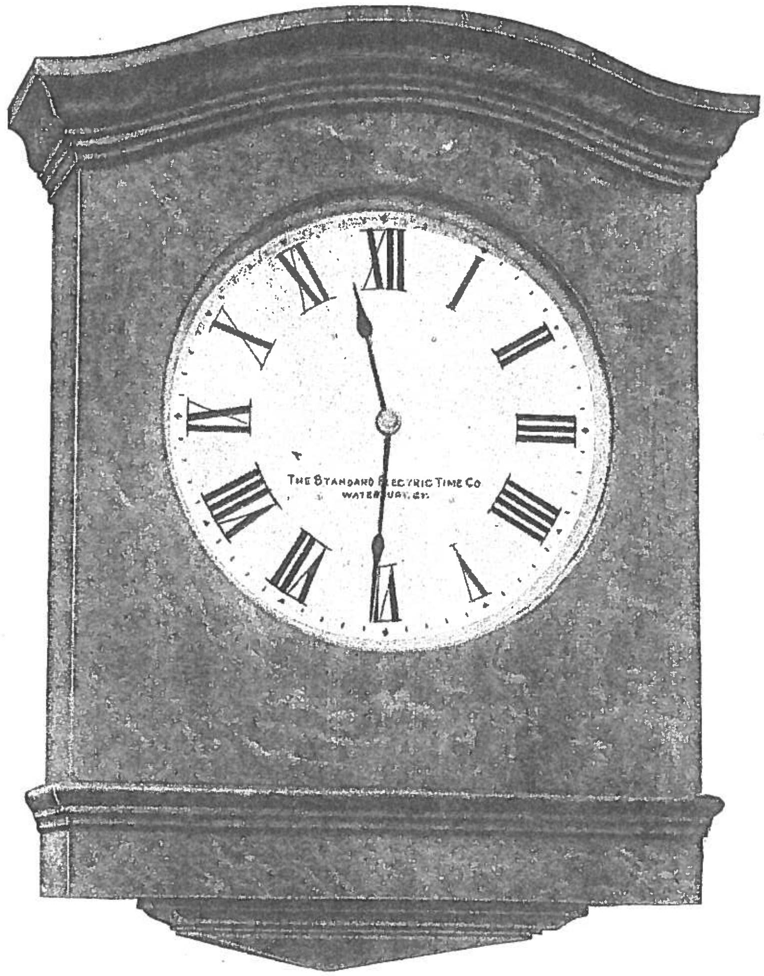

Fig. 15. Oak

120-BEAT SELF-WINDING CLOCK

Winding Batteries in Same Case

This 120-beat clock can be run independently of a time system or controlled by an hour or minute impulse system when equipped with proper synchronizing device.
A simpler, square pattern case can be furnished in place of Fig. 15. This case is similar to Fig. 22, page 30.

List Numbers

	Size Dial	*Fig. 15*	*Square Pattern*
When run independently of time system	12″	**73**	**76**
	14″	**74**	
When synchronized by hour impulse time system	12″	**185**	**189**
	14″	**186**	
When synchronized by minute impulse time system	12″	**187**	**380**
	14″	**188**	

Extreme Dimensions

Dial	*Height*	*Width*	*Depth*
12″	25¼″	19¾″	7⅜″
14″	27¼″	21¾″	7⅜″

Secondary Clocks

Secondary Clocks are meant to be located at various places where time should be indicated. They are operated or controlled by the Primary or Master Clocks. Therefore, they (1) indicate the same time as the Master Clock; (2) agree precisely with each other; (3) require no winding, setting, regulation, or oiling; (4) do not run down; (5) are not affected by temperature or vibration; (6) may be located at the best points for observation without reference to their accessibility, and, therefore, can be used wherever winding clocks are applicable, as well as for much service that winding clocks will not adequately meet. Furthermore, they do their work without error and require no attention, care, or forethought in their operation.

The Essential Working Parts in the STANDARD No. 2 Secondary movement are illustrated in Fig. 575, page 28, which shows the clock from the rear:

M & *N*	Parts of Hour and Minute Hands	*A*	Driving Pawl
I	Actuating Magnets	*B*	Back Pawl
L	Armature	*F*	Driving Ratchet Wheel
D	Actuating Lever	*E*	Locking Wheel (*F* is back of *E* and the teeth are reversed)
J	Pinion for the Actuating Lever	*C*	Stop pin (carried by *D* and engaging *E*)
H	Phosphor Bronze Spring	*K*	Locking Adjustment
G	Tension Adjuster for Spring		

Operation of the Secondary Clocks is simple. Current impulses from the Master Clock energize the magnet, *I*, on the sixtieth second, thus attracting armature, *L*, and raising the lever, *D*, against the tension of the spring, *H*. This movement is sufficient to permit the driving pawl, *A*, to engage a notch on the driving ratchet wheel, *F*. This action is instantaneous, and in its performance the magnets need only be energized for an instant.

Description continued on page 29

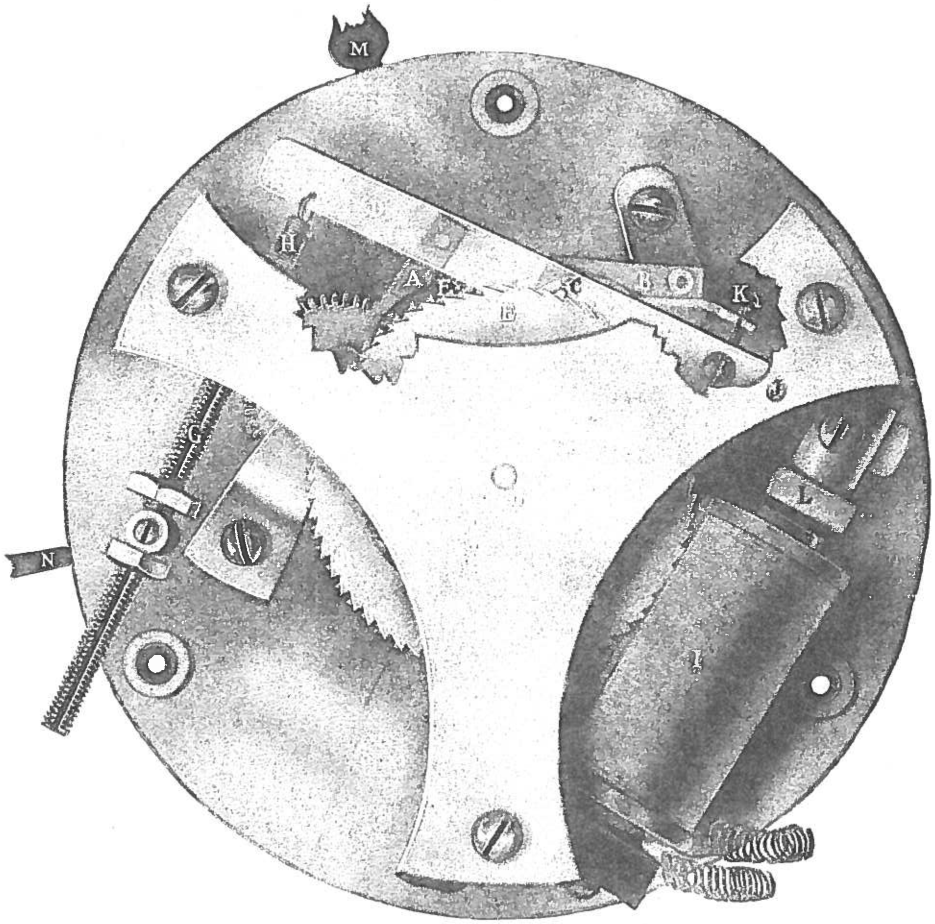

Fig. 575

STANDARD No. 2 SECONDARY CLOCK MOVEMENT

Used for clocks with 15″ to 30″ diam.

For description see pages 27 and 29

Description continued from page 27

After the magnet circuit is broken the spring, *H*, will draw *D* back to its initial position, and in doing so will drive the hands forward one minute. This spring exerts the steady pull best suited to overcoming any inertia of hands or other moving parts. Its tension is constant and uniform. The forward motion of the clock is therefore positive. Still, the energy consumption is minute, since the magnets are only energized for the briefest interval.

Locking Mechanism.— It is essential that adequate locking mechanism be used to insure the positive movement of the hands one minute, and only one, per impulse from the Master Clock.

Back pawl, *B*, absolutely prevents at all times any backward motion of hands. Stop pin, *C*, locks the clock in the other or forward direction EXCEPT at the instant *D* is lifted, or when the clock is about to move ahead.

To prevent overrunning at this instant, the back pawl, *B*, carries a tail with set screw, *K*, so arranged therein that the lever when raised holds the pawl, *B*, down on the driving ratchet wheel, so that it cannot move forward.

To be continued.

FOR SALE: **SWCC** Western Union, 15-1/2" convex "glass". Actually it is plastic, but it beats a naked dial. $20.00 (I'll pay UPS up to $5.00) Paul M. Hopkins, 2717 Millwood Rd., Birmingham, AL 35243 (205) 967-1237

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Wining's Clock Service, 2910 Farmdale Rd., Akron, OH 44312 (330) 628-9655

BANGOR Electric Clock Parts, New Factory original parts too many to list separately. Call or e-mail with your needs. Elmer Crum, (727)868-0181, electrichorology@juno.com

"Synchronome Brisbane 1903-1991" The story of the Jackson family of electrical clock makers. An Historical Project by Chapter 104. A 32 page booklet about the operation of the Synchronome Elec. Co. of Australasia. $5.00 Norman Heckenberg, 30 Depper St., St. Lucia, Qld. 4067, Australia

Glass Domes for the **Tiffany Never Wind** and other early electrical & battery clocks. If I don't have it in stock I'll try to get it. E-mail www.glassdomes.com
Ben Bowen, Rt. 3 Box 134C, Monticello FL 32344, (850) 997-3797 phone & fax.

Electronic "master clock" for old slave dials: $50. "Governor" makes Eureka clocks keep quartz-accurate time with no change to the clock: $95. Voltage regulators: $35 to $55.
Bryan Mumford, 3933 Antone Road, Santa Barbara, CA 93110; (805) 687-5116; www.bmumford.com

ITR master clock probably for school bell system with mechanism for paper tape, but tape is missing. L.A. Seymour (206) 842-5835 or seymochla@aol.com.

Sangamo and **Hamilton Sangamo** movements, motors, platforms, and other parts. Send SASE for list.
"Electrical Timekeeping", by F. Hope-Jones. 2nd Ed, 1949 Dust jacket a little ragged, contents are fine $35.
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WEB SITES: **"Introduction To Electric Clocks"**, by Michel Viredaz, with animation by J. E. Bosschieter:
w ww.mypage.bluewin.ch/electric-clocks