THE JOURNAL OF THE

ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78 NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

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Fellow Horologists:

We are extremely fortunate to have obtained a complete set of Sales & Engineering Bulletins covering International Time Recording clocks and accessories. It is anticipated that this material will appear in future journals as part of a series, mixed with other subject matter to provide something of interest for each of our members. This issue contains an overview of the models A, B, C, & D, along with the Synchronized Time Recorder. We have also included the bulletins covering Dry Batteries, Marine Escapements, and Electro-Magnets.

A brief description of the HAHL Pneumatic Clock is also included originally published in 1909. A rare and interesting clock system in which compressed air (at low pressure) is employed to activate the slave clocks.

The MART pages, as is customary, include the ads which were renewed plus a few new ones. Those items which do not appear in this issue were deleted by virtue of failure to advise of the intent to renew, or by request to eliminate as no longer current. Space is ALWAYS available for MART insertions... simply advise our editorial team or Harvey Schmidt, chapter secretary.

Most of our members, now numbering 132, have paid their 1994 dues in the amount of $10 for U.S. members, and $15 for foreign members which covers the additional postage costs. If a notice appears on this page advising of a dues delinquency, your name will be deleted from the roster and this will be your final issue, unless payment is received before the mailing of the next journal. The roster includes a dozen members from out of the United States including Great Britain, Canada, Germany, Switzerland, and The Netherlands. Welcome All...

A meeting for members of the Metropolitan NY area is scheduled at the home of Jeff Holz... RSVP by phone for travel information and the address... (201) 845-8445. The date is **MAY 22nd, 1994**.

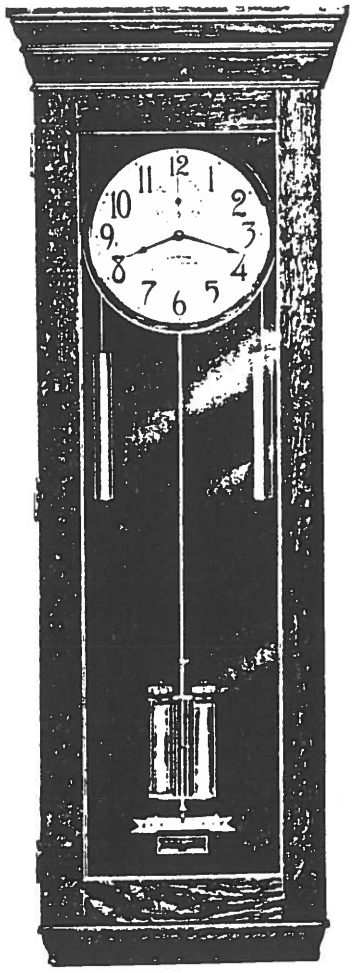
Meetings are also scheduled for the following Regional NAWCC meetings during the balance of 1994: Ft. Mitchell, KY; Syracuse, NY; and Dearborn, MI. It is anticipated that we will have meetings at Orlando, FL and Richmond, VA during 1995, in addition to the locations mentioned above.

--continued to page 30---

International MASTER CLOCKS

BULLETIN No. 1

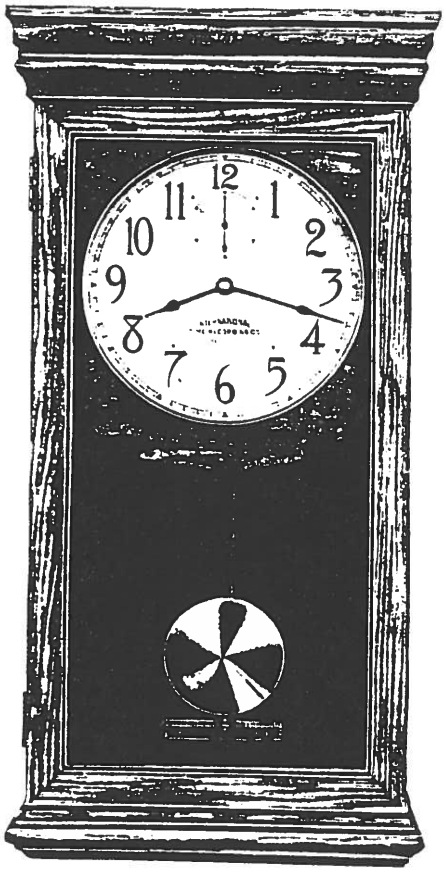
THE Master Clock, as the term implies is "Master of the situation" of electric time systems. Accuracy of time demands a clock movement of the highest grade in every detail. The electrical connections must be absolutely correct in principle, and the feature of self-winding must be positive and thoroughly dependable. As the location of the master clock, generally, is such that it is conspicuously displayed, proper attention must be given to its size, design, dimensions and finish, as well as to its timekeeping quality.



Another important point about master clock construction is that the case should not contain any auxiliary equipment. Actual experience has proven that the frequent opening and closing of the door of the master clock, in order to adjust program schedules or to manually ring program bells, has seriously interfered with accurate timekeeping, and the conscientious, well-informed manufacturer of today has learned from experience that the contents of a master clock case should be restricted to master clock mechanism only.

Type A Master Clock

THE type A Master Clock is designed to meet the demand for an inexpensive electric self-winding clock that can be used both as an individual time piece and also to control two or three



Type A Master Clock

secondary units. It is a small 80-beat clock with a ten-inch diameter etched and silvered Arabic dial and seconds circle. The case measures approximately 30" by 15" by 7" and is regularly furnished in plain oak finished dark golden. Will be furnished in birch finished standard mahogany, upon request. Can be furnished in special woods and to match any special finish at a small additional cost.

The type A Master Clock must be operated from a low voltage battery. It is regularly arranged for a 12-volt battery but will be furnished for 6 volts upon request. The electrical connections are such that the clock winds itself and operates the secondary apparatus from the same battery.

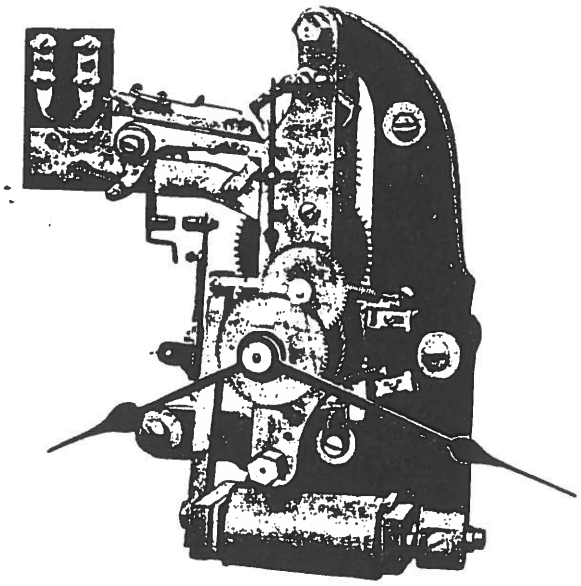
It is possible to use this clock to control heavy secondary units operating on high voltages by using one of our master relay cabinets or a type B enclosed relay to handle the secondary units and a low voltage battery to wind the clock and control the relay.

This clock is kept wound by means of an electromagnet operating through a ratchet and pawl. The movement contains a minute interval contact that once each minute closes the electric circuit through the magnet and winds the clock up the amount it ran down during the preceding minute.

A heavy duty circuit closer or contactor is attached integrally with the magnet armature so that when the armature is pulled up on the even minute a secondary electrical circuit is momentarily closed.

This circuit closer, or contactor, is heavy enough to carry 2.5 amperes at 12 volts and is intended to directly handle any secondary units controlled by the clock. If the current consumption of the secondary units exceeds 2.5 amperes at 12 volts or 5 amperes at 6 volts, distribution relays must be used to reduce the load on the clock circuit closer.

This special circuit closer used in the type A clock takes the place of a master relay. It has adjustable special metal contact points with auxil-



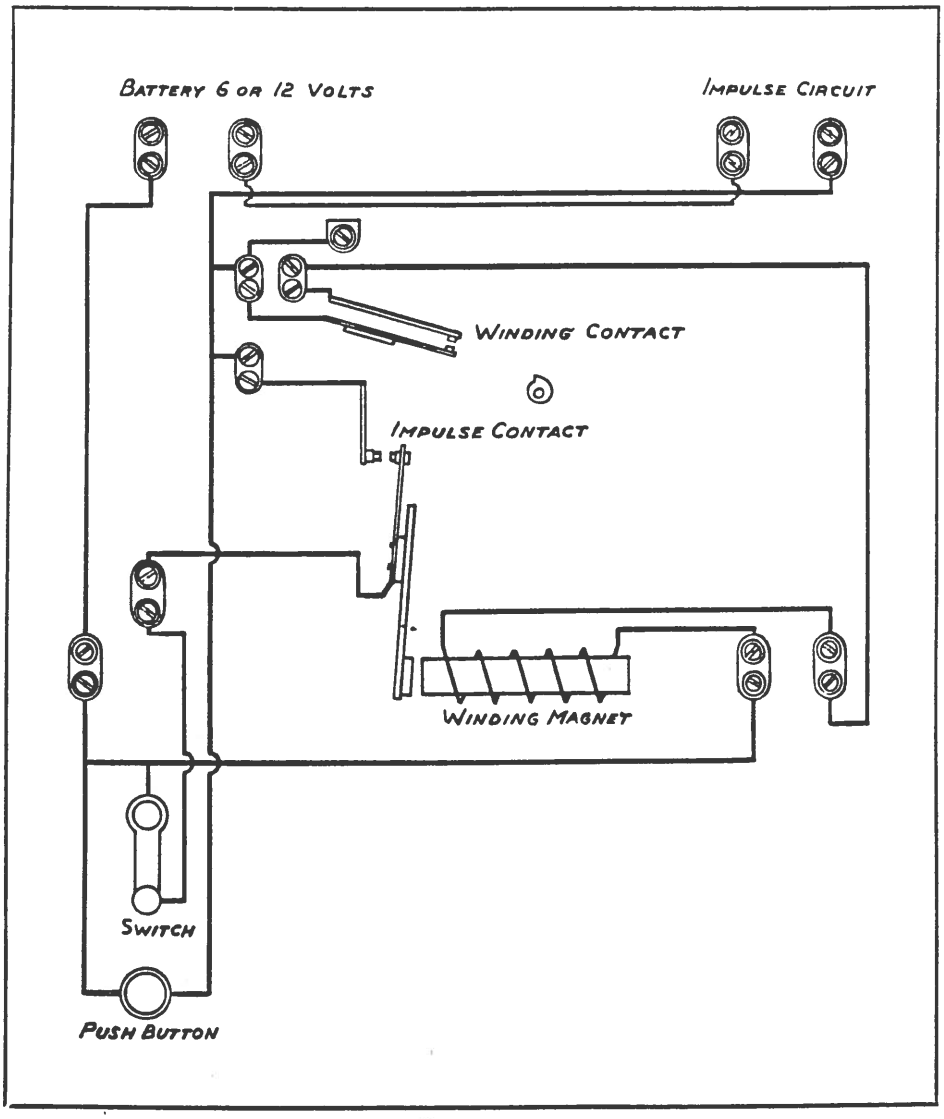
Type A Clock Movement

iary carbon points to absorb any inductive sparking or arcing.

The minute interval contact used on this movement is the same as is used on our highest grade clocks. It is of the finger and cam type and very substantially constructed. The fingers themselves do not carry the electric current. They simply operate to close a pair of contactors that are made of a special non-corrosive contact metal of such low electrical resistivity as to insure practically a dead closing of the electrical circuit when the contact fingers come into position. The cam is of metal and is carried on the seconds arbor of the movement. The contact fingers are eccentrically pivoted to provide for a contact duration adjustable from a fraction of a second to several seconds' duration.

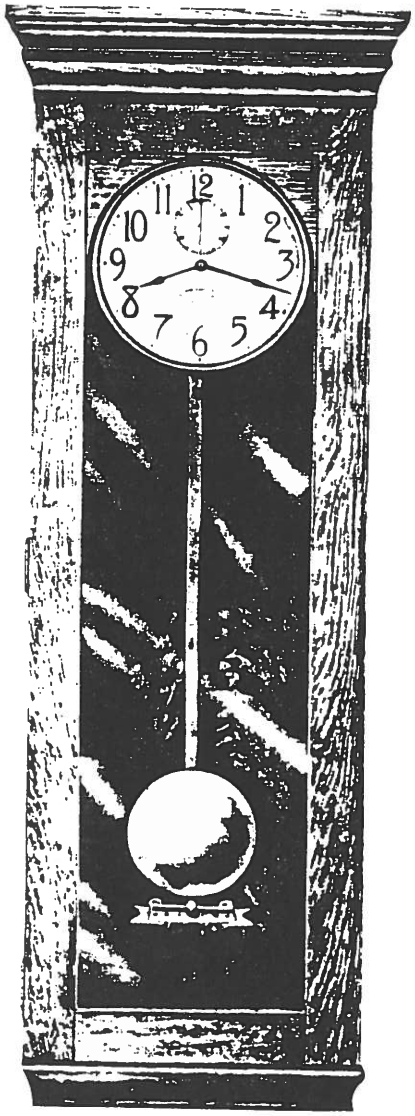
The minute contact, winding mechanism, and clock movement are all assembled on a heavy cast iron frame that serves to hold them in perfect alignment with each other at all times. The movement is very substantially built of tool steel and hard brass. Pinions and gears are specially cut and burnished. Pivots are hardened and lapped to size. All bearings are wide and carefully polished. The escapement is of the Graham dead-beat type. The pendulum is of the wood rod brass bob type and weighs 2½ pounds.

The movement in the type A Master Clock can be equipped at a small additional cost, with a signal duration timing contact for use in connection with one of our wood case wheel type program cabinets. This timing contact is adjustable for a signal duration of from two to ten seconds.



Type B and Type C Master Clocks

INTERNATIONAL type B and type C Master Clocks are designed to meet the demand for a medium priced clock that is substantially built and is accurate in operation. These clocks are spring driven and automatically keep themselves wound from a battery, usually the storage battery used to to operate the time system controlled by the clock. They wind once a minute and will run for about an hour with the battery disconnected.



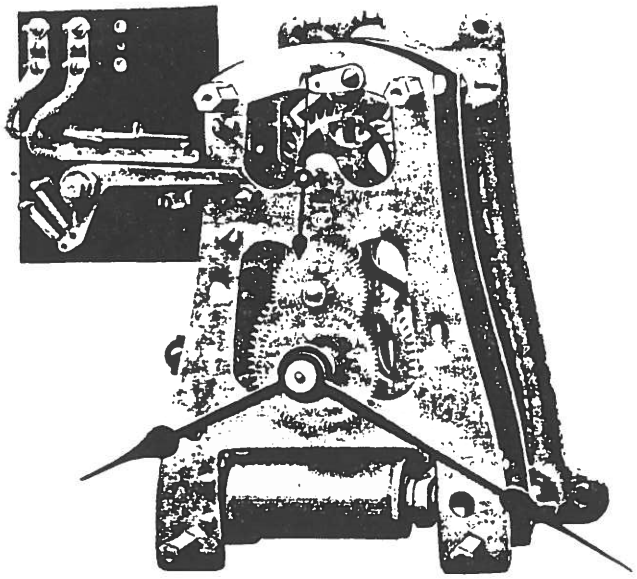
Type C Master Clock

The type C Master Clock is a 60-beat regulator and comes in a case measuring approximately 65″ by 24″ by 10″ with a twelve-inch diameter and etched, silvered Arabic dial with seconds circle. It is regularly equipped with a 10-pound wood rod brass bob pendulum. A 15-pound mercurial compensating pendulum can be furnished where extra close time keeping qualities are desired. *We will guarantee this clock equipped with mercurial pendulum to rate within ten seconds per month of correct time when hung in a place free from vibration and regulated in position.*

The type B Master Clock is in reality a small edition of the above described type C. It has a 72-beat regulator movement, ten-inch diameter etched and silvered dial with seconds circle, and comes in a case measuring approximately 48″ by 18½″ by 9″. It is equipped with a 2½-pound wood rod brass bob pendulum only.

The cases for both type B and type C Master Clocks are furnished in quartered oak, finished dark golden or in birch-mahogany. They can be furnished in special woods and to match any special finish at a small additional cost.

All electrical equipment in these clocks is constructed and installed in accordance with the requirements of the Underwriters' Laboratories for voltages not exceeding 250 volts. They are designed to operate from a constant source of electric current supply and therefore should not be connected to the electric lighting service excepting where such service is operated in connection with a storage battery for



Types B and C Clock Movement

the purpose of keeping it constant. These clocks will operate from direct current only.

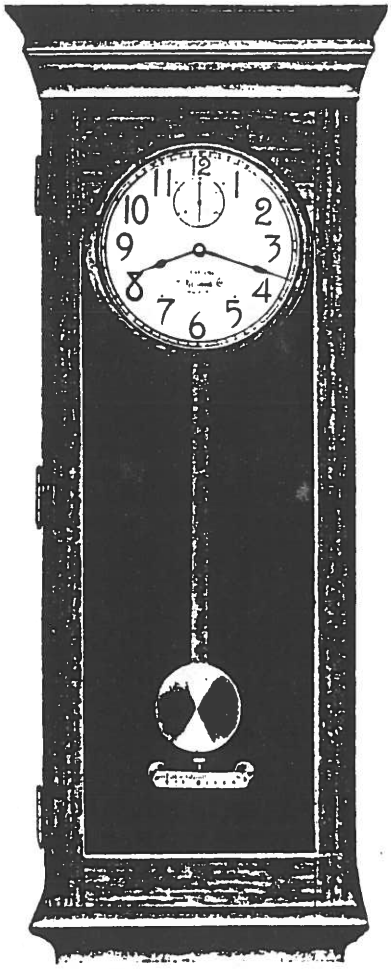
The movements in the type B and type C Master Clocks are identical excepting that they are fitted with different sized escapements and the type C is a more highly finished movement. They are very substantially built of tool steel and hard brass. The pinions and gears are specially cut and burnished. The pivots are hardened and lapped to size. All bearings are wide and carefully polished. The escapements are of the Graham dead-beat type and are fitted with screw adjustments for putting the clocks in beat.

The minute interval contacts used on these movements are of unusually heavy construction. They are of the finger and cam type. The fingers themselves do not carry the electric current. They simply operate to close a pair of contactors that are made of a special non-corrosive contact metal of such low electrical resistivity as to insure a practically dead closing of the electrical circuit when the contact fingers come into position.

The contact fingers are eccentrically pivoted to provide for a contact duration adjustable from a fraction of a second to several seconds' duration. The operating cam is of metal. It is carried on its own shaft independent of the clock train and therefore does not interfere in any way with the time keeping qualities of the clock.

The movements in these clocks are substantially mounted on heavy cast iron brackets. These brackets also carry the pendulum support. This construction serves to always keep the clock movement and the pendulum in perfect alignment with each other which is very important for the securing of even time keeping qualities.

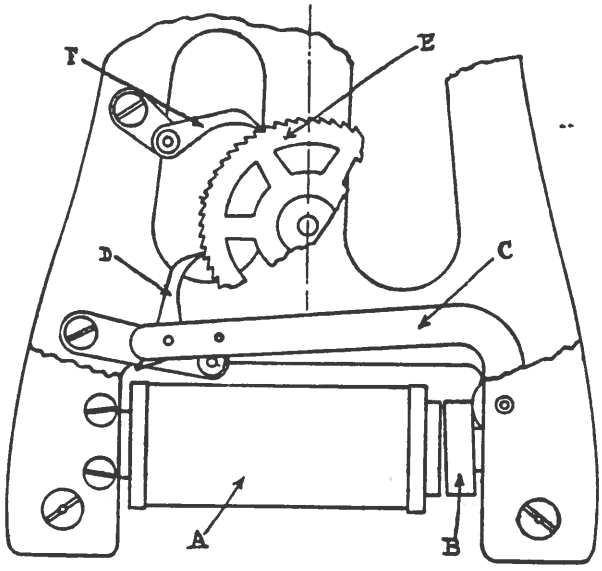
The clocks are kept wound bymeans of an electro-magnet and ratchet and pawl that are built into the movement itself. The electrical connections are so



Type B Master Clock

arranged that once each minute the magnet is energized and winds up the driving spring as much as it ran down during the preceding minute. The arrangement contains no delicate parts and operates perfectly so long as battery is kept connected to the clocks.

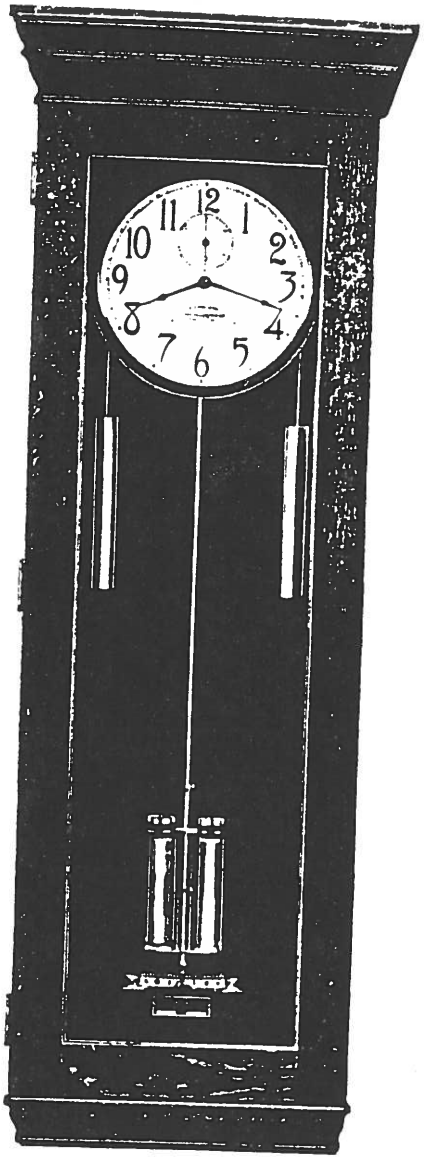
The diagram at the left illustrates the winding arrangement used in the type B and type C Master Clocks. A is the electro-magnet, B is its armature, D is the driving pawl operated by the armature B thru the arm C. E is the ratchet wheel that winds the clock spring. F is a back-stop pawl that prevents backward rotation of the ratchet wheel E.



Winding arrangement—Types B and C Master Clocks

Type D Master Clock

THE International type D Master Clock represents the most modern development in commercial time keeping devices. It was designed to meet the increasing demand for an accurate, substantially built, self-winding unit that is entirely automatic in its operation and that is independent of batteries and varying local conditions.



Type D Master Clock

The clock automatically keeps itself wound from the electric lighting service by means of a standard universal motor that works from either alternating or direct current. To insure uniform driving power at all times, the movement is weight driven. The clock will run for several days with all power shut off and will automatically rewind itself when the power comes on again.

The movement for winding the clock is flexibly mounted on the back plate so as to insure absolutely quiet operation and deaden any vibration.

The movement is very substantially built of tool steel and hard brass. Pinions and gears are specially cut and burnished. Pivots are hardened and lapped to size. All bearings are wide and carefully polished. The main bearings are all of the ball bearing type running in oil. The escapement is of the Graham dead-beat type and is fitted with a micrometer screw adjustment for putting the clock in beat.

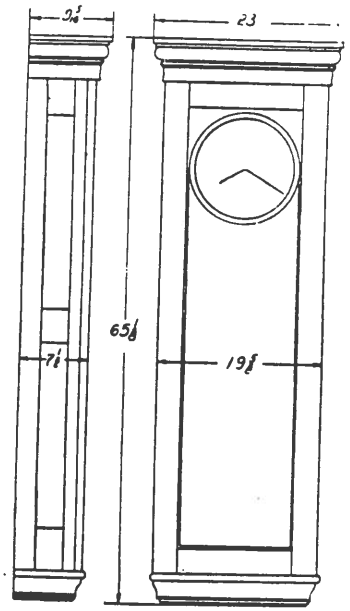


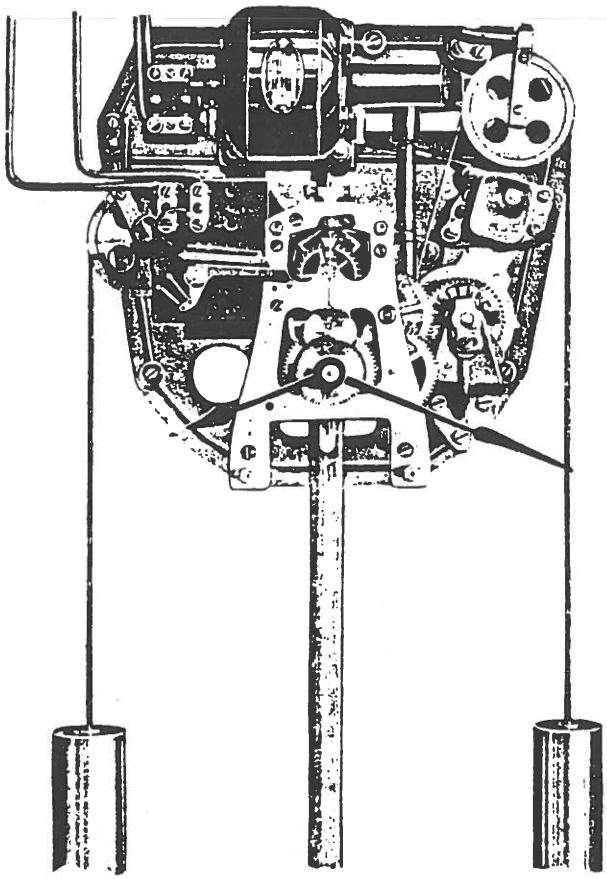
Diagram Showing Size of Case D Master Clock

The photograph on the opposite page shows the substantial construction followed out in the assembly of the clock movement and the winding arrangement. Note the heavy casting used for mounting the mechanism and suspending the pendulum. This casting insures a perfect and permanent alignment of all parts.

The minute interval contact used on this movement, is of unusually heavy construction. It is of the finger and cam type. The fingers themselves do not carry the electric current. They simply operate to close a pair of contactors that are made of a special non-corrosive contact metal of such low electrical resistivity as to insure a practically dead closing of the electrical circuit when the contact fingers come into position.

The contact fingers are eccentrically pivoted to provide for a contact duration adjustable from a fraction of a second to several seconds' duration. The operating cam is of metal. It is carried on its own shaft independent of the clock train and therefore does not interfere in any way with the time keeping qualities of the clock.

The case for this clock measures approximately 65" x 24" x 10". It is regularly furnished in quartered oak finished dark golden. Will be furnished in birch finished standard mahogany on request. Can be furnished in special woods and to match any special finish at a small additional cost. The dial is twelve inches in diameter, etched and silvered on brass. The weights are highly polished brass. The pendulum beats seconds and is regularly

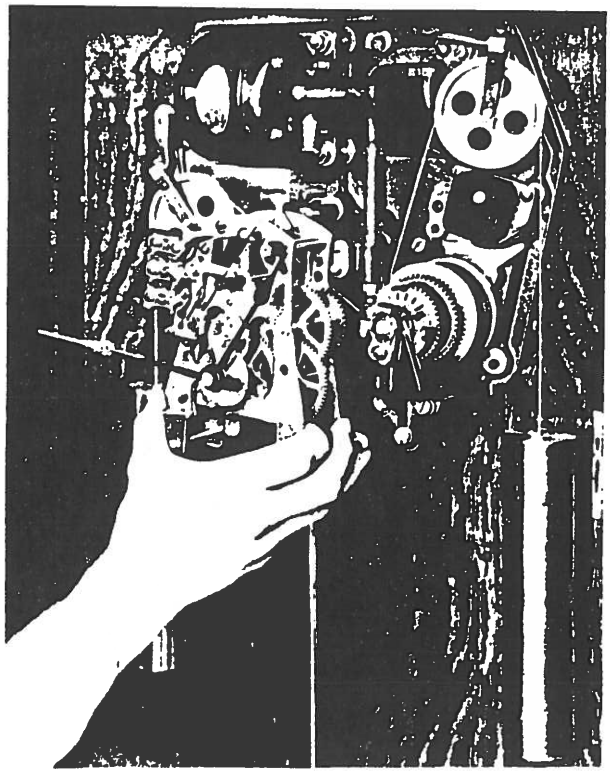


Type D Clock Mechanism

furnished in the wood rod brass bob type. It weighs ten pounds. A fifteen-pound mercurial compensating pendulum can be furnished where extra close time keeping qualities are desired. *We will guarantee this clock equipped with mercurial pendulum to rate within ten seconds per month of correct time when hung in a place free from vibration and regulated in position.*

Because of its even time rating, the type D Master Clock makes a very fine regulator for jewelers and watch inspectors. Secondary clocks and the like are controlled from it through a master relay. All electrical connections are located in the top of the case where they are accessible from the outside. A cover is provided for the opening in the top to protect the connectors.

All electrical equipment in this clock is constructed and installed in accordance with the requirements of the National Board of Fire Underwriters' Laboratories.



Showing accessibility of D Master Clock Movement for inspection and adjustment

Photograph (at left) shows how readily the clock movement may be removed from the winding and driving gears.

INTERNATIONAL TIME RECORDING CO. OF NEW YORK
50 BROAD STREET, NEW YORK, N. Y.

Engineering Bulletin

No. 1 *International Time Recording Co., of N. Y.* ENDICOTT, N. Y. May 15, 1919

DRY BATTERIES

By J. W. Bryce, Supervising Engineer

J. W. BRYCE

The "dry battery" found in commercial use consists usually of a tubular zinc container, approximately 2 1-2" x 6" which forms the negative pole of the cell.

In this is placed a carbon rod or plate which is surrounded by a closely tamped mass of broken coke, graphite and manganese dioxide. Outside of this mass and between it and the zinc is an obsorbent coating of pulp. The whole is then saturated with a solution of sal-ammoniac and zinc chloride. The top is sealed with asphalt and the completed cell is usually slipped into a cardboard container.

It will be seen from the above that a "dry cell" so called is not really dry. If it were it would have no chemical action and would not furnish any current. It is really a modification of the wet cell known for years under the name of the "Leclanche" cell. It is a sal-ammoniac cell suitable for use on open work and for furnishing small volumes of current intermittently.

The internal resistance of dry cells--that is, the resistance existing within the cell itself and opposing the flow of current- is comparatively high. In new cells it is usually less than O. 1 ohm, but as the cells get older this resistance increases. It is for this reason that it is possible to use an ammeter right across the terminals of a cell momentarily to find out its condition and quality. To make this test it is merely necessary to connect the ammeter momentarily to the terminals of any individual cell and note the reading of the ammeter. If it shows less than 18 amperes it is not a properly constructed cell or is not a new cell.

The ammeter should be disconnected immediately after the needle has come to rest long enough for you to read the ampereage. In all discussions of the dry cell in this paper we refer to the dry cell ordinarily used commercially which is (2 1-2" x 6") in size.

It should be noted that an ammeter should never be placed across the terminals of a **storage cell** as the internal resistance of even the smallest of those cells have a very low internal resistance and the ammeter would be immediately **burned out.**

The terminal voltage of a dry cell on **open** circuit is about 1.5 volts. It is useless, however, to test a cell on open circuit to find out its condition as a very old and exhausted sell will indicate full voltage when it would not actually be capable of doing any useful work.

To show that the test with the ammeter really shows the condition of a dry cell we need only refer to Ohm's law. If the cell shows 25 amperes on momentary contact the internal resistance is found by the formula $R = \frac{E}{C}$ or $R = \frac{1.5}{25} = .06$ ohm. If the cell had deteriorated the internal resistance would be higher and the current correspondingly less.

Dry cells rapidly age. Even if they are stood away and not used at the end of from 10 to 12 months they will be practically useless.

Dry cells of standard size (2 1-2" x 6") rapidly depreciate if much current is drawn from them. They will have practically full life and give their maximum capacity if not much more than 1-4 ampere is drawn from them and that only intermittently.

To increase their capacity they are often connected in multiple series. Thus, if one-half ampere is required and there are two sets of cells in multiple, it is obvious that each set will only have to furnish 1-4 ampere.

It will readily be seen then that it requires a great many dry cells to carry anything but the smallest kind of a load and as they have to be frequently renewed their cost soon out runs the cost of a storage battery of suitable capacity for carrying an even greater load.

It is possible and in fact dry cells are usually loaded with a much larger load than we have indicated, but it is done at the sacrifice of the life of the battery.

The dry cell is clean and is cheaper in first cost than storage cells and it is very useful for emergency purposes particularly with small installations and comparatively low voltages and requires no attention except occasional test to see if they are becoming exhausted.

It will be apparent from the above outline of the characteristics of dry batteries why we do not recommend them for use on clock circuits or for furnishing the motive power for driving time recorders.

In figuring the comparative cost of dry cells as compared with storage cells one must always take into consideration the cost of the labor necessary in replacing the day cells and the annoyance of interruption in the use of the devices they are causing to operate.

Engineering Bulletin

No. 2 | International Time Recording Co., of N. Y. | ENDICOTT, N. Y. | June 2, 1919

ELECTRO-MAGNETS

By J. W. Bryce, Supervising Engineer

J. W. BRYCE

The Electro-Magnet that is ordinarily used in time recorders and in electrical apparatus generally, is illustrated in Fig. 1. and consists of two pieces of soft round iron provided with "heads" and upon which insulated wire is wound. These two pieces of iron which are called the "cores" are connected at one end with a "yoke." This construction results in a very efficient magnet of the so-called "horsehoe" type.

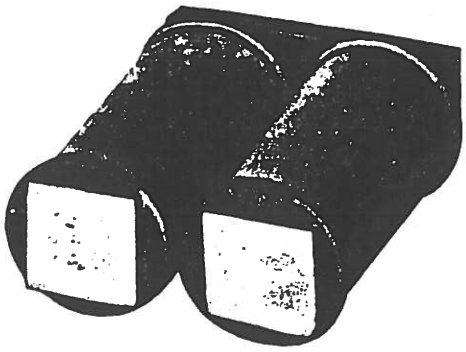


FIG. 2

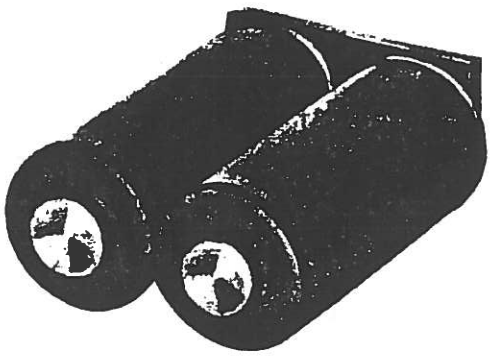


FIG. 1

In order to have the magnet perform useful work it is provided with a piece of iron called the armature. It is a well known fact that when a magnet such as is described above is energized by passing an electric current through the coils, that it will attract the armature with a considerable force if it is only a short distance away and that such attracting force rapidly falls

off as the distance of the armature from the pole faces of the magnet increases. It is also a well known fact that any gap or air space that exists between the magnet and the armature tends to greatly reduce the pulling power of the magnet or its ability to do useful work. There are two general ways to keep down this resistance to the magnetism or reluctance as it is called, to a small amount. First, the armature is kept close to the poles of the magnet and is connected by a system of levers to the device it is to operate. Second, the reluctance of the air gap may be reduced by increasing the area that the magnet poles present to the armature. A magnet with these enlarged pole faces is illustrated in Fig. 2. This is the type of magnet that is used in all Electric Drive International Time Recording devices. By this we are able to get the maximum effort from the Electro-magnet used and it enables us to use a comparatively small magnet and use the minimum amount of electric current.

In order to illustrate just what is saved by this construction the writer has given below the results of tests, Fig. 3, of a magnet of the ordinary construction and one of the improved construction.

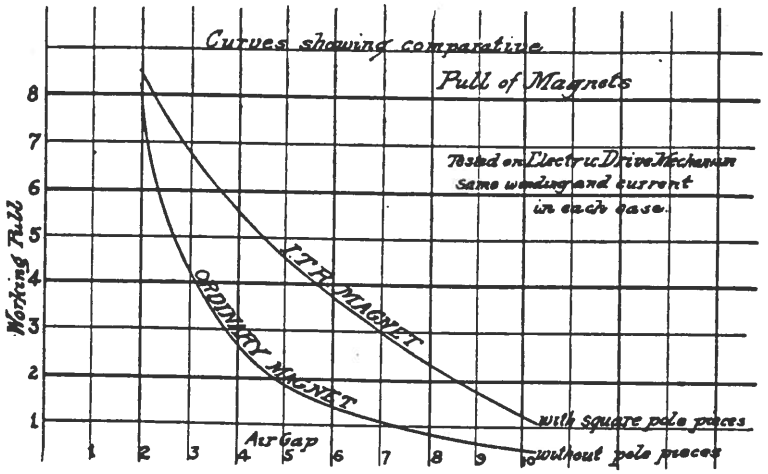


Fig. 3

It may be of further interest to know that all I. T. R. magnet windings are very thoroughly insulated from the cores by a wrapping of Empire cloth and repeated tests show that these magnets will stand easily upwards of 1000 volts tests between the winding and the iron work or cores.

The iron that is used in the construction of all the magnets is tested from time to time in the laboratory to see that it is of proper grade to produce the best possible magnet.

In very small magnets and in the lighter type of relay we do not use the extended or enlarged pole pieces because the amount of current used is so extremely small that the saving in current would be more than off-set by the increased cost of construction. For example, with the ordinary plain pole faces used on the small carbon relay, it is designed to operate on twenty thousandths of an ampere and will actually operate on considerable less. The same condition obtains to a large extent in the small secondary clocks as they use very small amounts of current.

Engineering Bulletin

No. 3 | International Time Recording Co., of N. Y. | ENDICOTT, N. Y. | June 14, 1919

MARINE ESCAPEMENTS

By C. E. Larrabee

C. E. LARRABEE

Marine escapements are used in clock movements where a pendulum escapement would be impractical and impossible to use. They have the great advantage of being easily portable, working equally well whether they stand plumb or not. The correct setting and adjustment of these escapements is essential to obtain the proper operation and time keeping.

Of the several types of marine escapements of the Graham dead beat type, two are shown in the several figures in this article, the main difference being in the movement and control of the escapement lever and the verge. In the one case banking pins are used to limit the movement of the escapement lever, while in the other the same result is obtained by a suitable design of the escapement lever where it engages the balance wheel staff as in Fig 2. In the first instance the escape wheel staff carries a roller to control the escapement lever as shown in Fig. 1 while in the other the balance staff is cut half away to serve the same purpose as shown by Fig. 2, the cut allowing the lever to pass the staff in its movement.

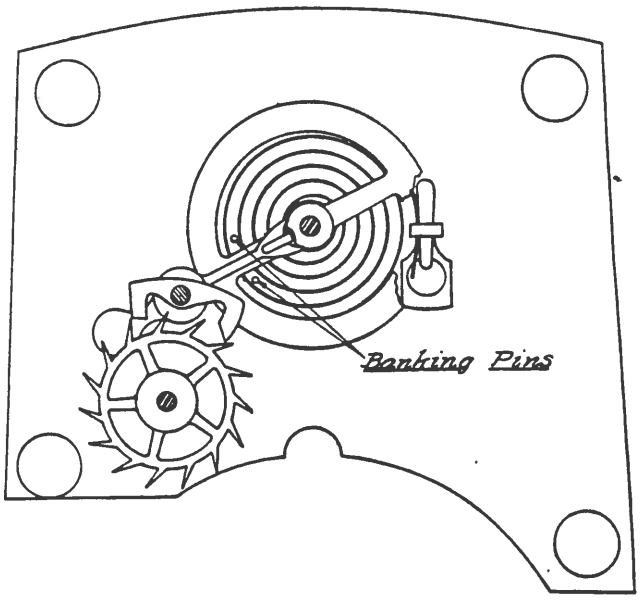


Fig. 1

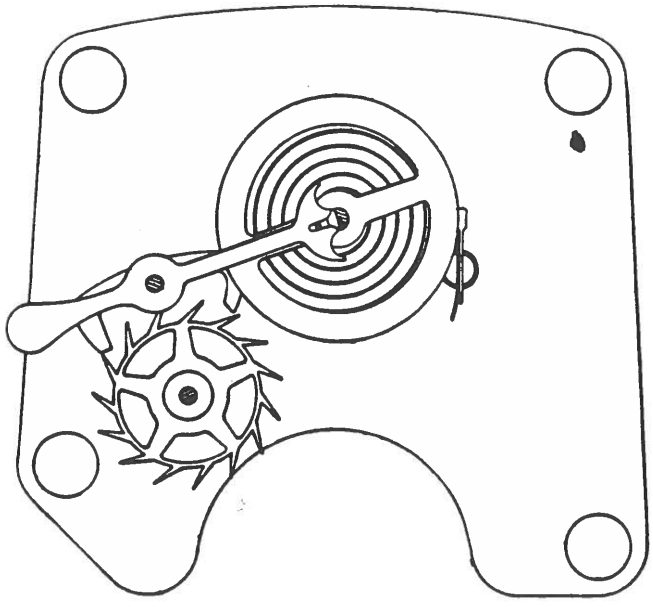


Fig. 2

The regulation of marine escapements is accomplished by varying the length of the hair spring under vibration, lengthening it to cause slower action, and shortening it to cause increased or accelerated action just as we lengthen or shorten the pendulum rod to obtain similar results. Fig 3. shows the regulator lever and the manner in which it controls the amount of the hair spring which can vibrate, the spring vibrating only to the regulator pin.

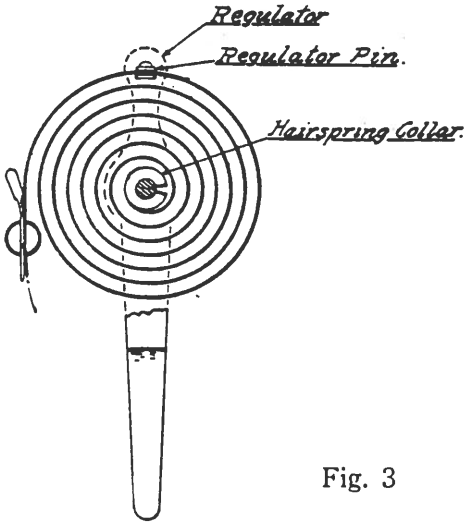


Fig. 3

To obtain proper regulation it is necessary that the escapement be in beat, that is, it should "tick even" on both beats. In its inactive or dead position the roller jewel on balance wheel should be on the center line between the centers of the escapement lever and the balance wheel as shown in Fig. 2. Ordinarily this may be done by moving the hair spring in its anchorage in anchor post Fig. 4 without changing its regulation beyond the range of the regulator.

If it is found that the escapement runs either fast or slow beyond the range of control of the regulator it may be necessary to lengthen or shorten the spring at its anchorage and then slip the center collar to which the hair spring is attached around slightly to get it in beat again. This must be done very carefully to avoid bending the pivots on the balance staff and it is best always to remove the balance wheel to do this adjusting. Care should be exercised not to get the balance screws set up too tight. The balance staff should be somewhat "sloppy" in its bearings.

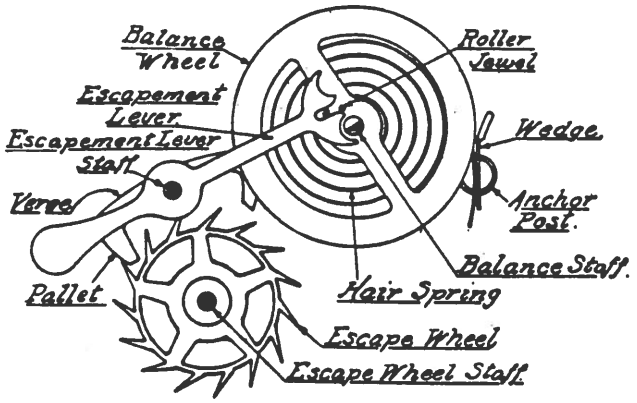


Fig. 4

A change of 1-8" to 3-16" in the length of the hair spring will vary the time sufficient for the average case. The verge should be set deep enough so that the escape wheel teeth in advancing will strike on the circular face of the pallet as shown in Fig. 4. A very small quanity of oil is sufficient on bearings of the escapement and only first quality of clock oil should be used.

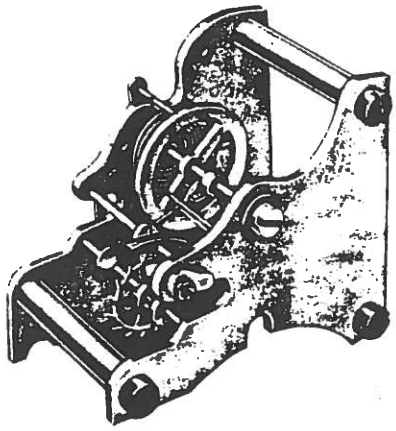


Fig. 5

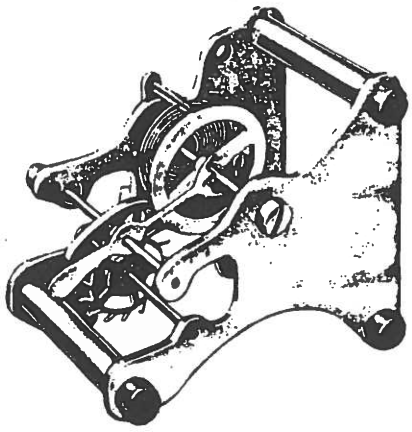


Fig. 6

Engineering Bulletin

No. 4 *International Time Recording Co., of N. Y.* ENDICOTT, N. Y. July 1, 1919

FIG. 1

THE INTERNATIONAL SYNCHRONIZED CLOCK MOVEMENT

By J. W Bryce, Supervising Engineer

This clock is a self winding so-called eight day movement with double springs and marine or lever escapement. It is adapted to be synchronized hourly by a suitable master clock by means presently to be described. The particular clock movement described in this article is the one used in the card recorder but the same principle applies to all others used in the I. T. R. recorders, simple changes in design or location of parts being made to adapt it to the different types of recorders.

Fig. 1 is a front view of the recorder completely assembled.

Fig. 2 is a view of the clock movement mounted on the test bench in the laboratory.

Fig. 3 is a close up view from a different angle showing the same clock movement with counter attached to accurately record the number of times the clock was actually wound up and run down.

Fig. 4 is a view of the "works" of the clock after the ten year test run (front plate of clock removed). This shows the small amount of wear even after this test which was more severe than a clock would ever get in use.

Fig. 5 is a close up face view of the interior of the gear box which connects the motor shaft to the main springs of the clock, and by which the clock is kept wound up. This photograph shows the gear box just as it was removed from the clock after the ten year test and with all lubricating grease removed. Gears R. were somewhat worn. These have been strengthened in those being manufactured.

Fig. 6. This is a perspective view showing how perfect the gears were after winding the clock for equivalent of ten years use.

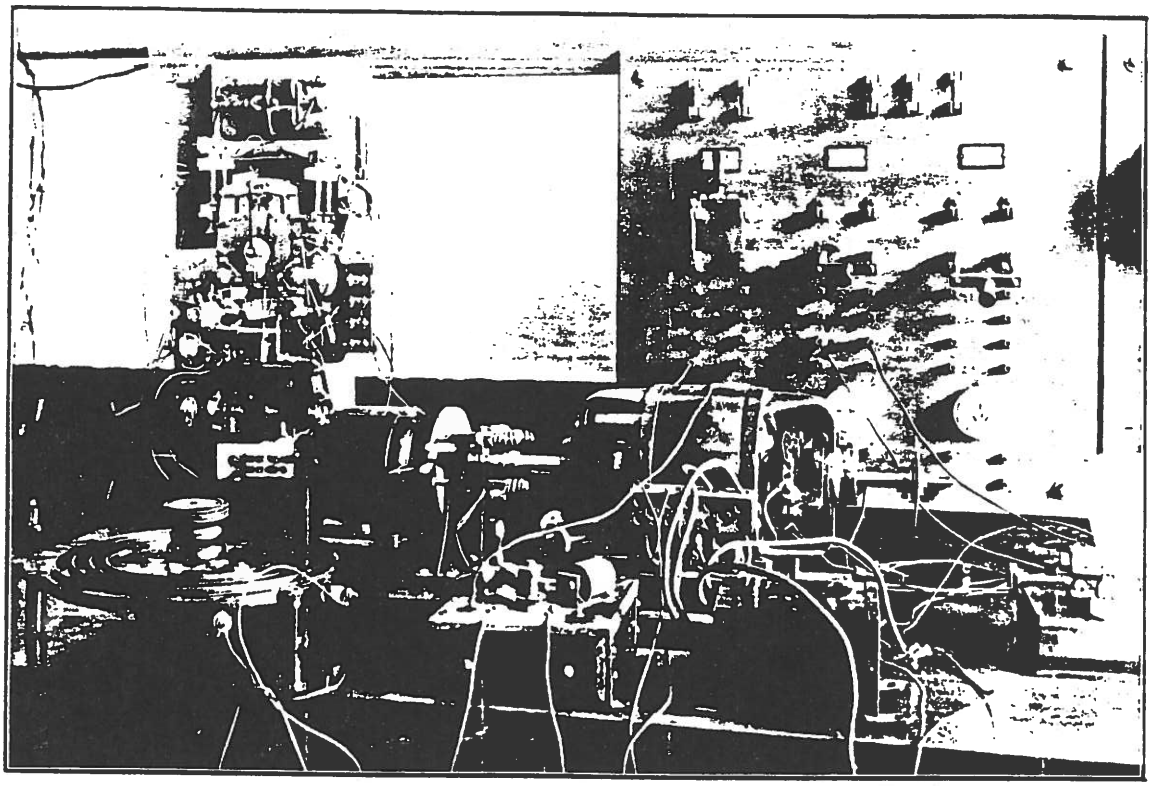


FIG. 2

View showing clock set up on the laboratory bench for testing. This photograph has not been retouched. The apparatus shown in this picture is for laboratory test only and has nothing to do with the ordinary use of the clock.

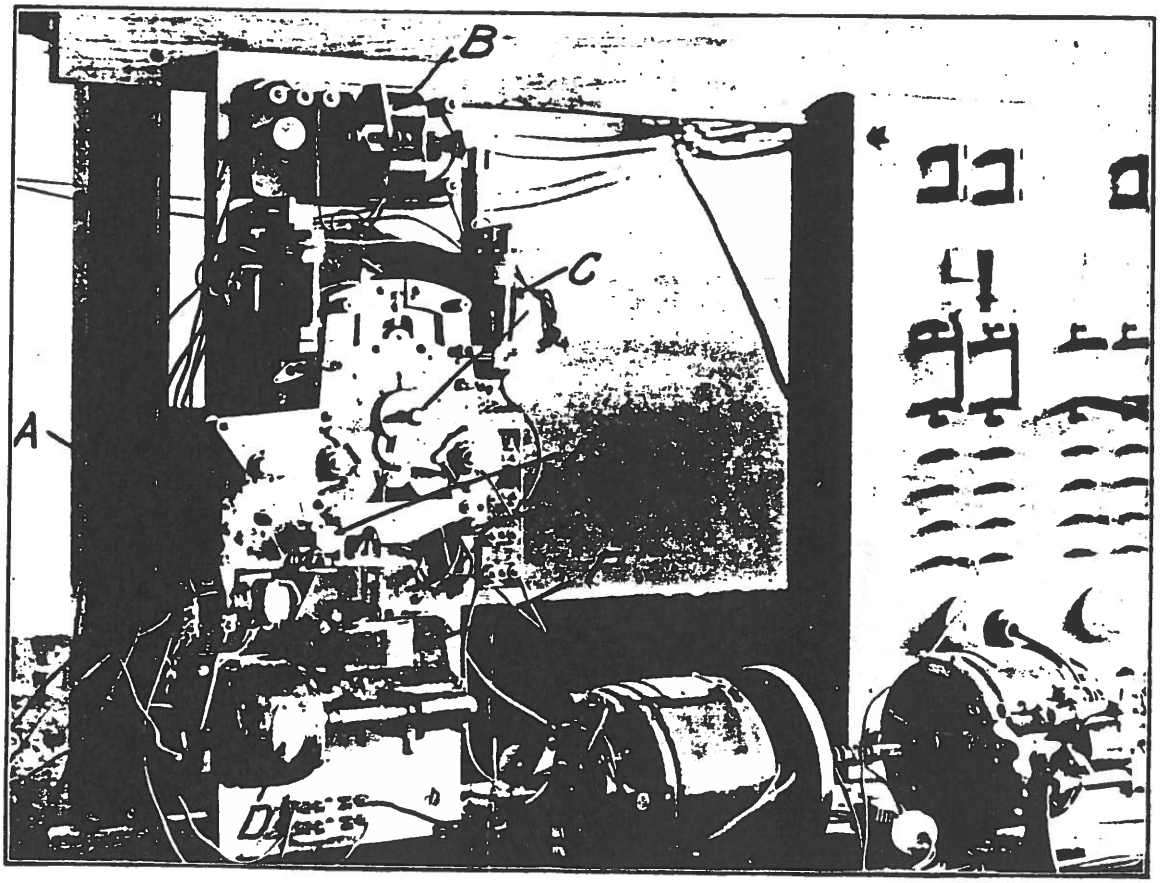


FIG. 3

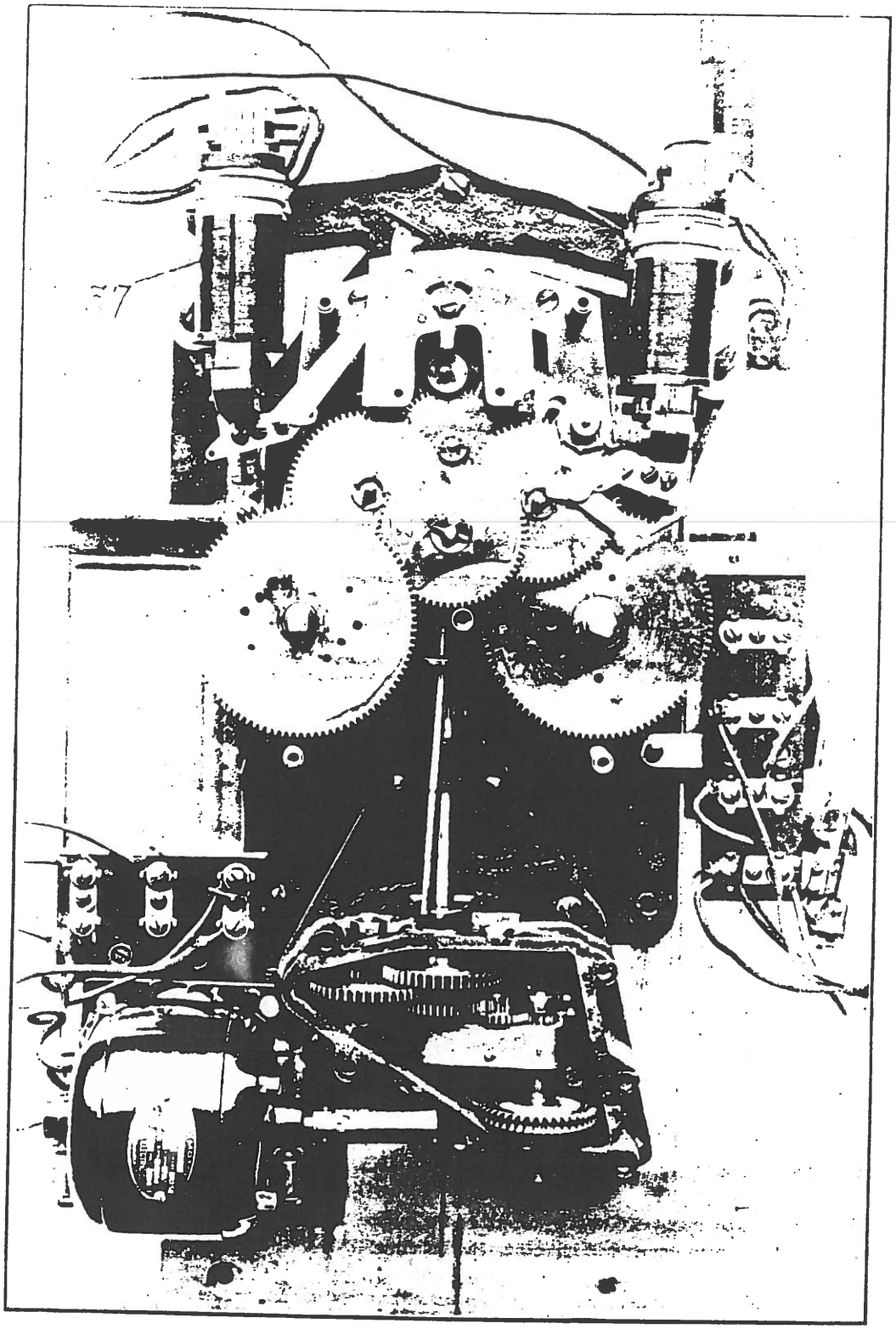


FIG. 4

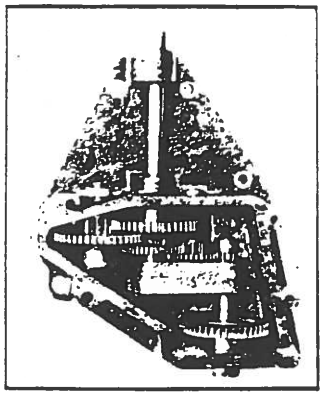


Fig. 5

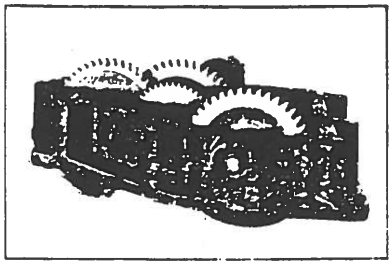


Fig. 6

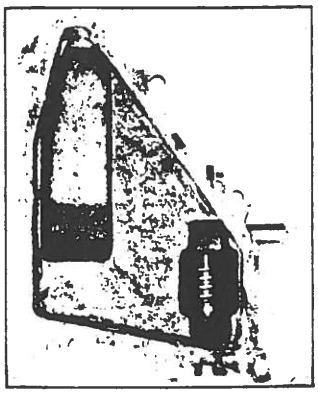


Fig. 7

Fig. 7. This is an inside view of the gear box cover and shows the perfect condition of the driving worm after the test.

Fig. 8. is a view of the case after a clock had been shipped from Binghamton to Detroit and return. It will be noted that the 3-4" oak case was badly smashed but when the clock was set up it immediately began to run without any special adjustment. This shows the sturdy design of the clock.

Fig. 9 is a view of the magnet "C" shown in Fig. 3.

Fig. 10 is a view of a magnet as used in the commercial devices.

Fig. 11 is a diagrammatic view of the circuits of the master clock, master control relay and one secondary or recorder clock.

Fig. 12 is a face view of the master clock.

Fig. 13 is a view of the general appearance of a synchronized dial recorder.

THE TEN YEAR TEST

The design of the clock is such that when fully wound it will run a week(if necessary) without any winding. However, the switch mechanism "A" Fig. 3 is so designed that when the clock has run down one day the switch to the winding motor is snapped closed and the clock immediately winds up, when the motor is automatically cut off.

In this test the clock was not allowed to wind down all the way each time but only far enough to throw the winding switch. This as explained above is equivalent to a single days run. This more nearly approximated running conditions and kept greatest tension on all gearing, as springs were always near their maximum power.

In order to expedite the matter, the speed magnet "C" (see fig. 3) was energized by means of the relay"B" just as soon as the motor "D" had completed its winding operation. By this means it will be seen the clock was alternately wound fully and then allowed to run down rapidly by means of the synchronizing fan escapement to the point where the motor switch was thrown.

This again actuated relay "B", cut off current from magnet "C" stopping the running down of the clock and energizing the motor "D" immediately winding the clock and adding one on the counter "E".

As a matter of interest it may be stated that this was run on a 110 volt 60 cycle single phase alternating current.

The test was continued until nearly 4000 was registered on the counter or equivalent of more than ten years run. That is to say the clock was wound up and partly run down approximately 4000 times.

For general information it may be stated that there is always a strong tendency for magnets operating on single phase current to buzz or chatter. The magnets on these clocks are provided with copper rings or shading coils on the pole tips, the action of which is two fold. They reduce the tendency to hum or buzz and also act as a non-magnetic spacer to keep the armature from direct contact with the poles of the magnet. These coils are clearly shown in the photograph of the magnet used in this test in Fig. 9

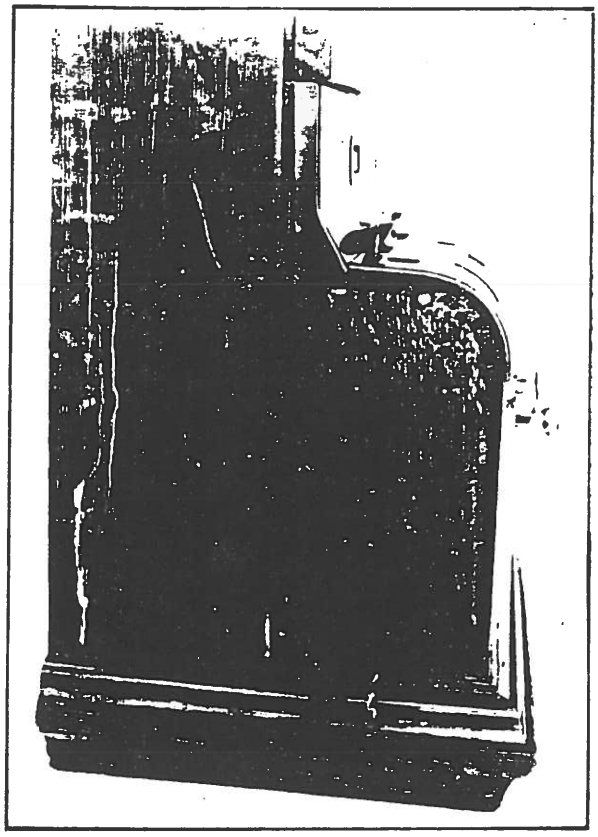


FIG. 8

View of lower part of International Card Recorder. Cut shows time recorder case damaged in shipment. Clock movement was uninjured.

at M. The magnet used on the commercial apparatus will be in all respects like these except the coils will be fully finished and properly covered so as to present a pleasing appearance(see Fig. 10). In this article however, the writer has shown everything just as used in the laboratory for the test. None of the photographs have been retouched.

It should be noted that to secure quiet operation on alternating current the armature must come up squarely against the copper coils on the magnets. If it strikes on one edge or corner the armature will chatter and the value of the shading coils will be lost.

The magnet or armature should be adjusted to remedy this condition.

As an index of the wearing qualities of the clock movement this very severe test was a complete success, the photographs show the wear on the gears, etc. to be insignificant.

In ordinary use the winding gear box is filled with grease and fitted with oil cups on the motor drive bearings. The bearings or gears therefore, need no attention whatever.

It should be noted that clocks when first set up should be tested for time keeping qualities before the synchronizing circuit is attached, as it sometimes happens that the lever escapement is out of adjustment so that while the synchronizing lines are attached the clocks will keep practically perfect time even though the clock escapement alone would permit it to run out as much as an hour in a day. This condition would probably do no harm if the current was on most of the time, but if it should be shut for over night or over Sunday, for example, the clocks would run out so far that they could not be synchronized as they would be outside the synchronizing range which is fifteen minutes slow or fifteen minutes fast from the time shown by the master clock.

In Fig. 11, is shown diagrammatically the circuits of the master clock, control relay and one secondary or recorder clock.

The general plan under which the synchronizing system operates will be better understood by reference to this figure.

The wires 1, 2 are connected to any suitable source of current such as the electric light supply for the building. The current may be direct or alternating. From the wires 1, 2 the current flows through the switch 3. To make the description clearer we will trace the circuits from the points 4, 5 of the switch 3.

It may be well at this point to state that synchronizing by the method described in this bulletin is accomplished by what is known as overlapping periods and not by a single impulse from the master clock.

To accomplish the synchronizing a potential(electric pressure) is thrown on the wires 6, 7, known as the synchronizing circuit at fifteen minutes of the hour and is maintained until the exact hour. This is, of course, controlled by the master clock, the circuits of which will now be described.

THE MASTER CLOCK

From terminal 5, current flows through wire 8, wire 9, to the terminal (1) in the relay cabinet, wire 10, contact 13, contact 14, wire 12, contact 16, wire 12, to the terminal (3) in the relay cabinet, wire 17, relay coils 18, wire 19, resistance coil 20, wires 21, 22, to terminal 4 to line. This energizes relay coils 18 and they attract the armature 23. This closes a circuit from terminal, 5 wire 8, relay coils 18, wire 19 and circuit as before back to line, thus "locking" or holding relay circuit closed.

Thus when contact 16 opens a second or so later no sparking occurs on these points.

The master clock mechanism is so arranged that the cam 25, which is fastened on the shaft 26, which revolves once per hour, permits the contacts 13, 14 to come together at about 20 seconds before the clock reaches the fifteen minutes of the hour position. When it gets to the exact fifteen minutes of the hour position and the seconds contact 16 closes and completes the circuit as before described. The cam 28 revolves once per minute and is fastened on the escape wheel shaft 27 of the clock.

When the master clock gets to a position about 20 seconds before the exact hour, cam 25 permits contacts 13, 14 to open and 14, 15 to close and when the exact hour is reached (exact to the second) contact 16 closes again and current flows from wire 11 through contacts 14, 15 back by wire 12 and contacts 16, terminal(3) of the relay cabinet, to wire 17. This it will be seen forms a short circuit path around the coils 18 of the relay. As a result the magnetism rapidly falls to zero and releases the relay. The current is prevented from rising to a dangerous degree by the resistance 20. As the current is being supplied by the path through the armature 23 of the relay, when it releases the spark appears at contact 24 on the relay so that when contact 16 in the clock opens a second or two later no spark appears at that point. We therefore, have sparkless contacts in the master clock as they never open a circuit.

Another feature of this arrangement is that, should current be interrupted during the synchronizing period the clock automatically restores conditions as soon as the next minute contact occurs after the current is restored. Therefore, interruption of current does not upset the operation of the device.

The action of the armature 23 when attracted is to throw current on to the synchronizing circuit 6 and 7. Reference to the figure 11 will show current may flow from switch terminal 5, wire 8, armature 23, contact 29, wire 30, to wire 6, returning by wire 7, wire 22 to switch terminal 4.

As described above, the armature is raised at fifteen minutes of the hour and dropped back at exactly the hour.

THE SECONDARY CLOCK

The secondary as described elsewhere in this bulletin is a self wound movement. The winding circuit is however, kept entirely separate from the synchronizing circuit because it keeps the load of the motor current off the master relay and enables the user to plug it in to any outlet and use the clock independently without reference to whether the synchronizing circuit wires have been run or not.

Mounted on the hour driving shaft of the clock 31, is a cam 32 revolving in the direction indicated by the arrow on the diagram. In the position indicated the cam corresponds to the fifteen minutes of the hour position.

Resting on cam 32 is a cam wiper or contact strip 33. From half past the hour until fifteen minutes of the hour wiper 33 is on the rise 34 of the cam 32 and contact 35 is closed. Therefore, if the secondary clock is exactly on time contact 35 opens at exactly the time the master clock throws current on the wires 6, 7 and as no circuit is established nothing happens. Should the clock be slow, however, (up to as much as 15 minutes) contact arm 33 will still be on rise 34 of the cam and contact 35 closed and the current will flow from wire 6, through the resistance 41, contact 35, the coils of magnet 36 and back over wire 7.

This will energize magnet 36 lifting the pawl out of engagement with the stop ratchet on the fan train (see Figs. 3 and 4) and permitting the clock to run ahead rapidly until wiper 33 falls off rise 34, opening the circuit through contacts 35. This leaves the secondary at the fifteen minutes of the hour position and in agreement with the master clock.

Should the clock be fast, however, cam 32 will be advanced from the position it should be and the notch 42 will reach the position where wiper 33 falls into it and closes contacts 40 before the master clock cuts the current off the wires 6, 7.

It is to be noted that when the wiper 33 falls into the notch 42, the secondary clock points to the exact hour.

If the secondary is on time, just as contact 42 closes the master clock cuts the current off the line and nothing happens. Should it be fast, when the contact 40 closes, current flows from wire 6, resistance 41, contact 40, wire 39, magnet coils 37, wire 7 back to line. This energizes magnet 37(see Figs. 3 and 4) and puts the brake on the balance wheel and stops the clock, until released by the master cutting the current off the line. It does this at the exact hour so that synchronism is again established.

It is to be noted resistance unit 41 is provided with a tap marked A.C. Where alternating current is used connection is to be made to this; and to the D. C. terminal where direct current is used. All frequencies of A. C. may be used from 25 to 60 cycles.

The apparatus is designed for operation on 110 volt circuits. It will work however, on a much lower voltage. Trials in the laboratory show some clocks to operate on as low as 60 volts. This cannot be guaranteed as the clock would have no margin of safety. A drop of 20 per cent would not be dangerous. It will be interesting to note that the winding will operate at even lower voltage than the synchronizing.

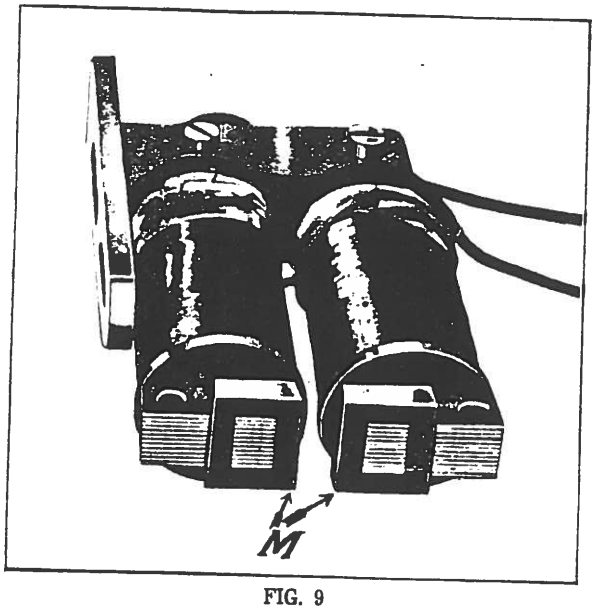


FIG. 9

View of magnet used on clock during test

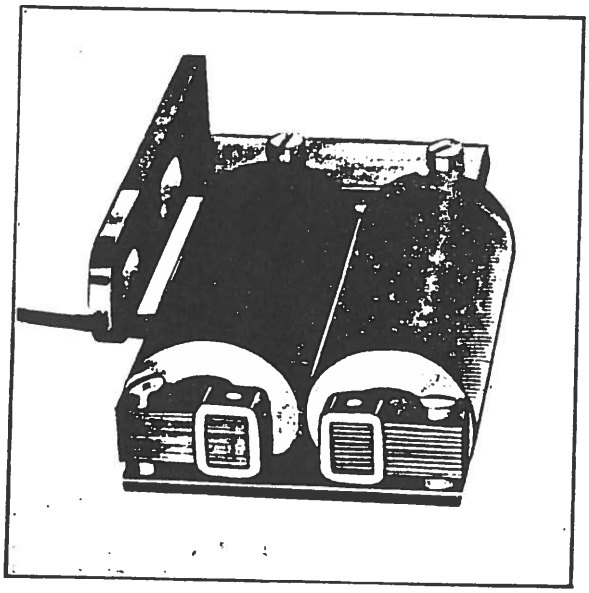


FIG. 10

View of magnet fully finished for use on commercial time recorders.

For operation on 220 volt direct current, resistance is put in the motor circuit and additional resistance in the synchronizing circuit. No other changes are made.

For operation on 220 volt and 440 volt A. C. circuits, a transformer is to be used, as it is cheaper and safer than resistance units. The transformer will step down the current supply for the whole system, thus only one need to be used.

Not more than 20 recorders should be put on any one relay on 110 volt circuits.

Below is a table showing the current required for winding and for synchronizing. It should be noted that there will be some variation in this between different clocks but it represents average conditions.

WINDING CURRENT			MINUTES TO WIND PER WEEK	MINUTES TO WIND PER DAY
60 Cycle A. C.	110 V.	.35 Amp.	11.5	1.65
60 Cycle A. C.	65 V.	.24 Amp.		
50 Cycle A. C.	110 V.	.34 Amp.	10.1	1.60
50 Cycle A. C.	65 V.	.26 Amp.		
25 Cycle A. C.	110 V.	.34 Amp.	9.25	1.45
25 Cycle A. C.	65 V.	.29 Amp.		
Direct Current	110 V.	.30 Amp.	9.45	1.50
Direct Current	65 V.	.28 Amp.		

SYNCHRONIZING CURRENT		SERIES RESISTANCE	AMPERES
25 Cycle A. C.	115 V.	600 Ohms	.106
40 Cycle A. C.	115 V.	600 Ohms	.092
50 Cycle A. C.	115 V.	600 Ohms	.089
60 Cycle A. C.	115 V.	600 Ohms	.080
Direct Current	115 V.	1200 Ohms	.090

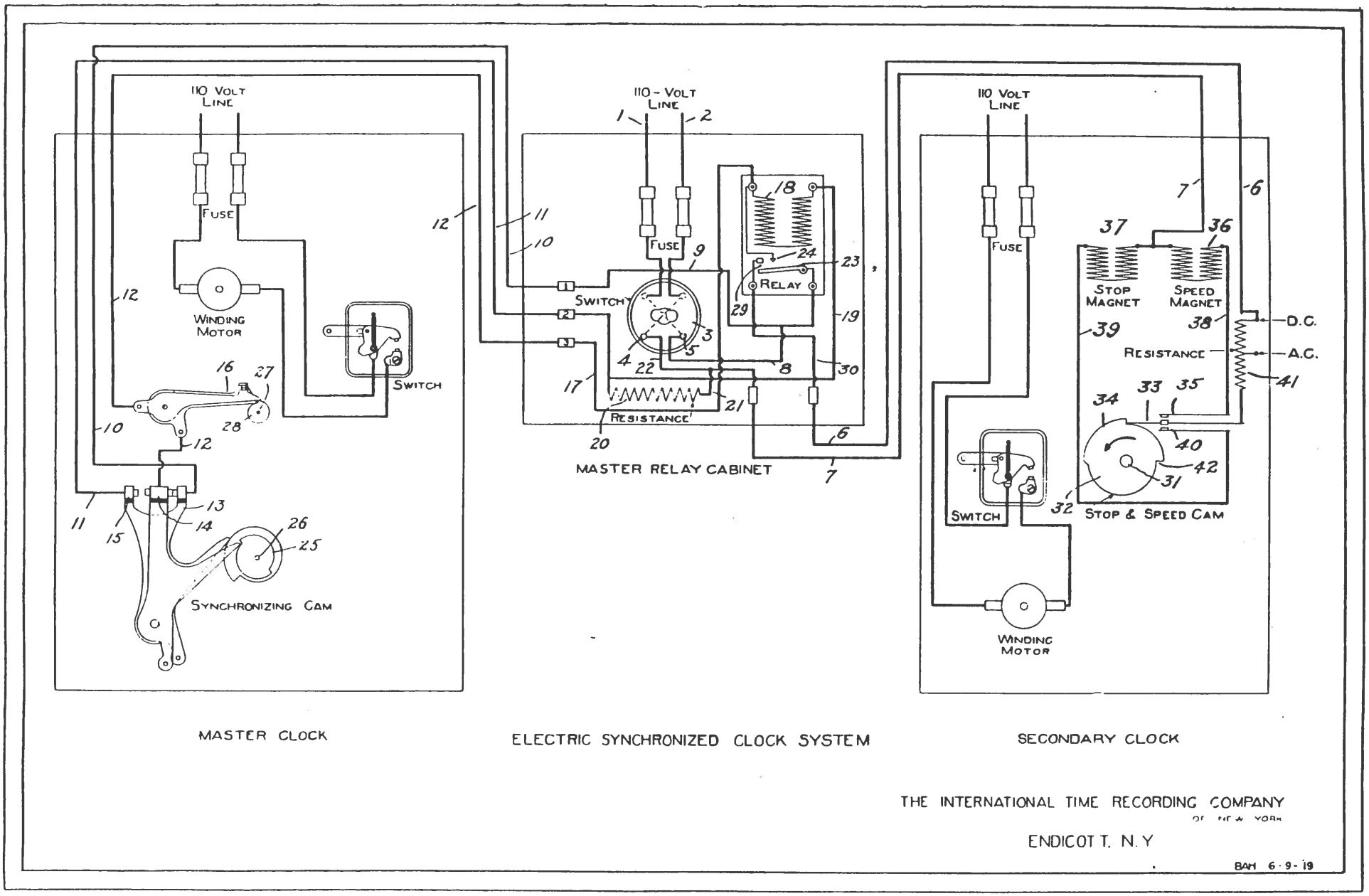

110 VOLT LINE
FUSE
WINDING MOTOR
SWITCH
SYNCHRONIZING CAM
MASTER CLOCK
110 - VOLT LINE
FUSE
SWITCH
RESISTANCE
RELAY
MASTER RELAY CABINET
ELECTRIC SYNCHRONIZED CLOCK SYSTEM
110 VOLT LINE
FUSE
STOP MAGNET
SPEED MAGNET
RESISTANCE
D.C.
A.C.
SWITCH
WINDING MOTOR
STOP & SPEED CAM
SECONDARY CLOCK
THE INTERNATIONAL TIME RECORDING COMPANY
OF NEW YORK
ENDICOTT. N.Y
BAM 6-9-19

FIG. 11

INTERNATIONAL
SELF WINDING MASTER CLOCK

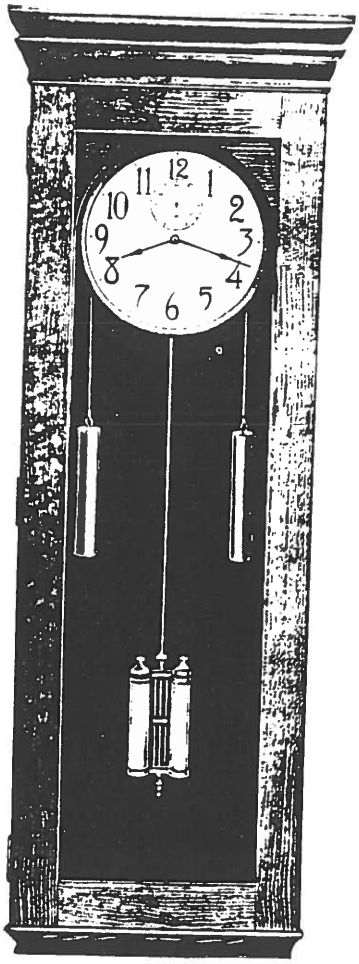
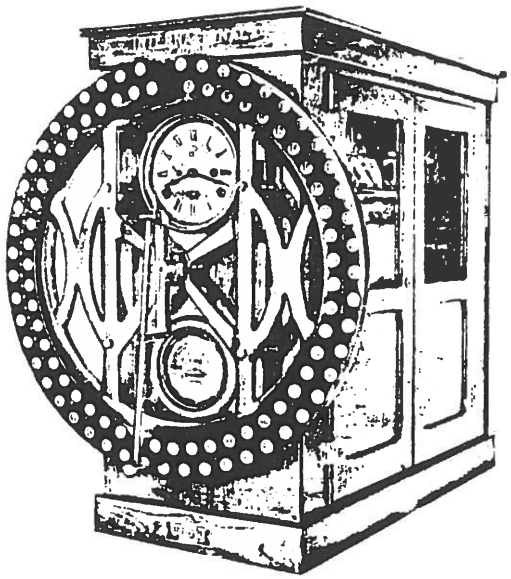


FIG. 12

FOR
ELECTRIC SYNCHRONIZED TIME SYSTEMS

With mercurial compensating Pendulum, wound with motor, clock driven by weights and capable of running a full week without current.

WINDS ITSELF



SETS ITSELF

FIG. 13

Illustrates General Appearance of International Electric Synchronized Dial Recorder

ADVANTAGES OF THIS MOST MODERN TIME SYSTEM

1 – Uses no batteries.

2 – May be operated on either alternating or direct current.

3 – Operates on all commercial frequencies of alternating current—no rectifiers.

4 – Operates on standard voltages 110 or 220 volts.

5 – Permits of long periods of interruption of current supply without disturbing the operation of the system.

6 – Any secondary unit may be removed from the circuit and used independently, without interfering with other units.

7 – The master clock may be removed without stopping the system.

8 – Every unit in the system is automatically synchronized every hour.

9 – Any number of clocks may be synchronized by one master clock.

28

THE HAHL AUTOMATIC CLOCK CO.

SOLE MANUFACTURERS OF

The "Hahl" Pneumatic Clock System

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CHICAGO, ILL.

TELEPHONE, CENTRAL 3724

(1909)

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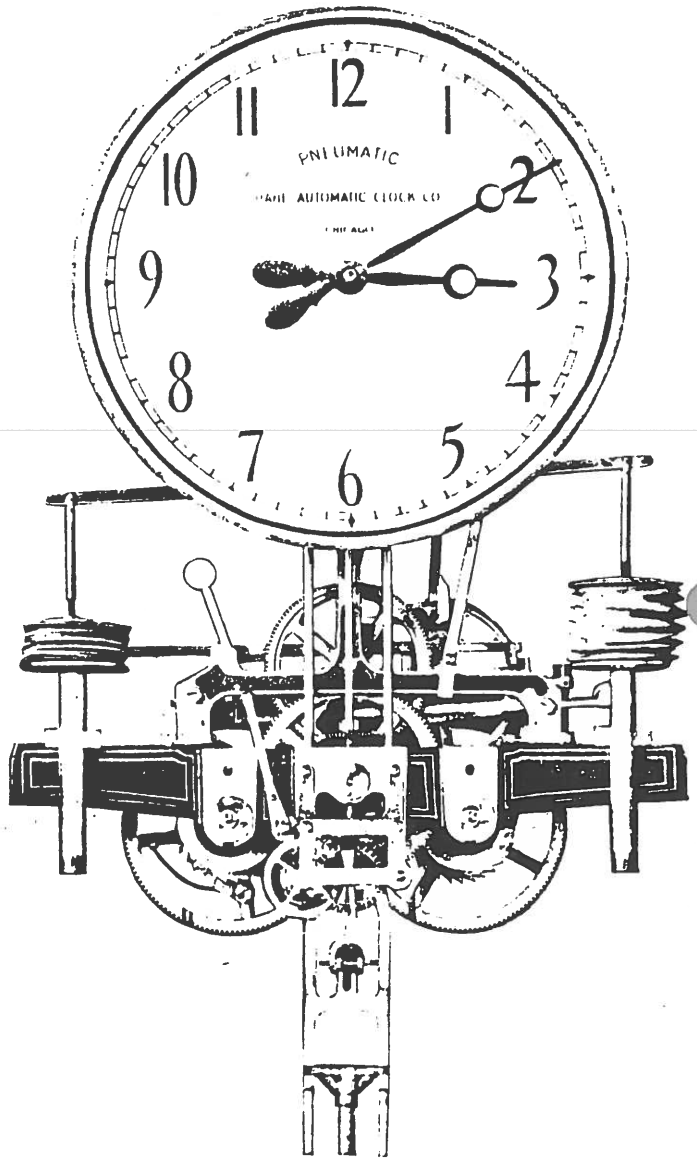
THE SYSTEM. Master Clock is operated by gravity. Time-train has self-compensating pendulum, propelled by spring, automatically wound every minute. Air impulse and release of air emanating from the pneumatic device within the clock controls the secondary clocks without the aid of any auxiliary apparatus whatsoever. The air within the tubing is brought under slight pressure (1-inch water gauge) during one minute and is released by a valve in the master clock, remaining open the next minute, thereby allowing the air to regain its normal atmospheric pressure.



"HAHL" PNEUMATIC CLOCK SYSTEM MASTER CLOCK

AIR CONDUITS. One quarter inch wrought-iron pipe for mains, $\frac{1}{8}$ inch for branches. No return pipe. Start with two mains from location of master clock in systems over twelve clocks, each main feeding about one half of the clocks. Not over five clocks to be fed by $\frac{1}{8}$-inch branch.

PROGRAM CLOCKS. (A) Master Clock Program Apparatus—Program cylinder located within master clock case is built up in sections of one program each. New sections may be added as required. Lugs upon face of cylinder make contacts for signals of required duration at one minute intervals.

(B) Secondary Program Clock—Is absolutely mechanical; requires no batteries or wiring. Operated by air impulse from master clock. Signals may be given at any desired minute by adjusting lugs on program dial.

CASES. Illustrations of our standard cases will be mailed on request. We build cases and dials to order.

ADVANTAGES. Motive powers employed being free atmosphere and gravity, cost of operation is entirely eliminated and a high degree of reliability and accuracy is attained under our system.

REFERENCES. Our system has been adopted by:

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Michael Reese Hospital, Chicago, Ill.
Cook County Court House, Chicago, Ill.
Sears, Roebuck & Co., Chicago, Ill.
Wisconsin State Capitol, Madison, Wis.
School Boards of Chicago, Ill., Kansas City, Mo., St. Louis, Mo., and Madison, Wis.

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SCOTT BATTERY Electric Shelf Clock (London Stereoscopic Co.) Circa 1905. Photo & Details in A. & R. Shenton "The Price Guide to Collectable Clocks." Fig. 404. (800) 221-0424 X206
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Alan Seymour, 10847 Bill Point Bluff, Bainbridge Island WA 98110

Editorial Message, continued from page 1...

We hope to expand our meeting and program schedule still further by including additional NAWCC Regional Meetings where practical, and when the individual program schedules permit. Chapter 78, when first organized, was one of the first "non-geographical" chapters with the journal publication acting as the vehicle for communication between electrical horology enthusiasts. With the advent of our modern hi-tech society and greater interest in all things technical, we find increased interest in get-togethers of kindred spirits, with formal programs as well as well as opportunities for the simple exchange of information and a chance to talk to one another.

With this in mind, we hope to arrange for 8 to 10 meetings each year, in as many diverse locations as may be available, affording all interested parties the opportunity to communicate, socialize, and enjoy each other's companionship, not withstanding the fact that local meetings take place wherever the occasion arises...

Martin Swetsky, FNAWCC... President
Harvey Schmidt } Co-Editors
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THE JOURNAL OF THE

ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78 NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

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Fellow Horologists:

Mitch Janoff has provided us with a fascinating article about his method of synchronizing his SELF-WINDING clocks by using the US Atomic Clock in Boulder, Colorado as his standard signal source. His material is clear and concise and includes references and parts sources for the specialized equipment. A vote of appreciation and a hearty Well Done!

Additional material is included in this issue covering the INTERNATIONAL TIME RECORDING DIVISION of IBM's disc (or drum) type of program device. The manufacturer claimed that this system was "more flexible and positive" than any other on the market, and when reviewing the information, one is inclined to agree... especially when we see that we can set up a program that will respond to ONE MINUTE increments, with a day-of-the-week calendar control as well! To round out this program device discussion, we've added the operating and set-up instructions that accompanied the unit, thereby completing this phase of our ITR serial.

At the may 22nd meeting of the metropolitan NY/NJ area members of chapter 78 held at the home of Mr. & Mrs. Jeff Holz, the office of 2nd Vice-President in charge of NAWCC Regional Meeting Programs was created, and Bill Ellison was appointed to this new position. He has graciously volunteered to try to arrange for a chapter 78 program as part of the schedule for the major regional meetings, providing a forum for those kindred spirits interested in things electrical relating to horology. Keep an eye peeled for dates and other information. The present schedule calls for meetings at the Chicago, Syracuse, & Dearborn Regionals.

A few "Thank You's" are in order... Mitch Janoff and David Lee for their frequent and generous contributions of material for journal publication, and Rose and Jeff Holz for their graciousness in hosting the recent meeting and opening their home to the prying eyes of the attendees.

Enjoy this issue... Good reading ahead...

Martin Swetsky, FNAWCC.... President
Dr. George Feinstein.....}Co-Editors
Harvey SChmidt.....}

HARVEY SCHMIDT, SECRETARY-TREASURER 75-80 179th STREET, FLUSHING, NY 11366

Computerized Synchronization of Clocks Manufactured by the Self Winding Clock Company of New York

Imagine that it's 9:50 on a Sunday morning, the time you set aside each week to wind and adjust each of your eight-day clocks. As you sit at the kitchen table, thinking about getting your keys together before beginning the arduous task, some of your clocks already have a head start. These clocks don't need winding, in fact they have been carefully winding themselves all week. But now, as the new week begins, they may need a slight adjustment of the second or minute hand. Now imagine that at 9:55 AM, your master clock begins the process. Your high-tech "smart" master clock places a telephone call to the U.S. Atomic Clock in Boulder, Colorado to obtain the correct time. Once your "smart" master clock is connected, it receives the exact time from Boulder and checks this against its own time. Noticing that it has been running a bit slow since the last call, your master clock makes a minor adjustment, checks the time once more and hangs up. Ready with the exact time and having corrected for the time zone, your master clock waits until precisely ten o'clock. At exactly ten, it sends a signal throughout your house. All the secondaries immediately sense the signal, and align their second and minute hands straight up. Having synchronized the secondaries, the master is finished and turns off. It's now a few seconds past ten. Your clocks are set and wound. You turn to the next story in the Sunday newspaper, pour another cup of coffee and relax.

Overview

The preceding scenario is a reality in my household, thanks to a *high-tech* method I have devised for synchronizing clocks made by the Self Winding Clock Company of New York. These synchronizing clocks can be identified by either "Naval Observatory Time Western Union" or "Synchronized Self Winding" written on the face or located on the case. Originally, these clocks were either local master clocks found in Western Union offices or secondary clocks, synchronized by the local master clock. The master clock was synchronized by a national clock in Washington using the Western Union telegraph lines. The clocks were in operation from the 1890's and diminished in popularity after World War II.[1]

Synchronizing these clocks is relatively simple. Each clock contains a solenoid. When energized within about thirty seconds of the hour, the solenoid forces the minute and second hands to point straight up. Signals received by the solenoid at other times are ignored. These clocks were made for Western Union by the Self Winding Clock Company of New York. At 11:50 A.M. each day, Western

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[1]American Clocks Volume 2, Tran Duy Ly, Arlington Book Company, 1991

Union suspended its regular work. Their telegraph wires around the country were turned over to the government for sending time signals. At exactly noon, the Naval Observatory clock in Washington sent out a synchronizing signal to all Western Union Offices east of the Rockies. (Another clock was used for the west coast.) This synchronizing signal set all the Western Union telegraph clocks to noon. From these master clocks, time was distributed hourly to Western Union Offices, stores, jewelers, and other businesses. Western Union provided the clocks, maintenance and time service for a single yearly charge of about $25.[2]

Although much has been written about the operation of these clocks, very little attention has been paid to their synchronization capabilities. The method described here simulates the now defunct Western Union Telegraph time distribution system, using the Naval Observatory Atomic Clock as the primary time source, with a local master clock and Self Winding clocks as secondaries.

Background

My primary objectives in setting up my high-tech synchronizing system were as follows: to maintain the correct time displayed at each of my Self Winding Clocks with little or no manual intervention, to distribute the synchronizing signal without running any additional wiring through my house, and finally, to design and implement the system at a minimal cost.
This was accomplished by using a personal computer as the local master time clock. My computer is an IBM PC/XT, but the techniques described here should work with almost any personal computer including IBM clones, Commodore, Apple IIe/IIc and Macintosh.

The personal computer receives the time from the US Atomic Clock in Boulder, Colorado on a regular schedule via a modem connection. It transfers this time to an interface unit, which distributes the time, on the hour, to clocks throughout my house using the existing house electrical wiring. The entire system is easy to set up, inexpensive (if you own a personal computer) and operates extremely well. The computer provides a mechanism for obtaining the exact time, however, I provide an alternative method at the end of this article that allows time synchronization without a computer.

Systems Operation

The basic idea is to set your computer to the exact time as provided by the Atomic Clock and then distribute it around your house. This is accomplished by having the computer call the Automated Computer Time Service (ACTS). ACTS is provided by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST). It is a telephone time service designed to

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[2]Milham, W.I., Time and Timekeepers, MacMillan Co., 1941

provide computers with telephone access to NIST time at accuracies approaching one millisecond. According to a government publication, features of the ACTS service include automated compensation for telephone-line delay and an ASCII-character time code which operates with standard modems and most computer systems.[3] I have provided information on obtaining the NIST program at the end of this article. Since I am using an IBM PC/XT, the internal clock keeps time only when the machine is operating. Once the machine is shut off, the time is lost and a call to ACTS must be initiated in order to restore the correct time. I am currently setting the computer clock once a week. The call lasts less than one minute, and costs approximately 14 cents when placed during night and weekend rates. There is no charge from NIST for using the time service.

Once the computer has the correct time, the next step is to distribute the time to the Self Winding synchronizing clocks. Since I did not want to run the computer all the time as the master clock, I needed a device that could obtain the time from the computer, and once the time was set, operate independently, distributing the time each hour according to a preset program.

I accomplished this by connecting the computer to the X10 CP290 Home Control Interface. This module is a self-contained unit that can be connected to the IBM PC via the serial communications port. It is fully programmable and once programmed can be disconnected from the computer. The CP290 provides a way to interface real world devices in the home (lights, appliances, air conditioning, coffee-maker) to a personal computer. The CP290 contains an internal clock and is generally used to turn devices in the home on and off at preset times. Since the CP290 uses standard house wiring to distribute the signals, no additional wiring is necessary from the computer to the clocks. The CP290 also eliminates the need for additional complex interface hardware between the clocks and the computer.

The CP290 sends *commands* through the house wiring such as "TURN ON" and "TURN OFF". Preceding each command code is an address code. These addresses correspond to interface modules that are plugged into standard 110 volt AC outlets. These are essentially relays "listening" for their address on the 110 volt house wiring, and follow the commands whenever their address is transmitted. In order to synchronize a clock, an "ON" command followed immediately by an "OFF" command is transmitted. Since standard X10 appliance modules are designed for 110 volt appliances, I use a special X10 interface module capable of switching low voltages. This module switches a three volt DC transformer connected to the clock's synchronizing solenoid relay whenever the "ON-OFF" command is received. Once an hour, a signal is transmitted from the CP290,

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[3]Research Material 8101 Automated Computer Time Service(ACTS), National Institute of Standards and Technology, Gaithersburg, MD

received by the X10 module, and the clock solenoid responds by aligning the second and minute hands. Since the CP290 is a self-contained module, once the time and program have been downloaded, it can be completely disconnected from the computer. The program, in this case, is a series of 24 commands, one executed each hour, to synchronize each of the secondary clocks.

Software Operation

There are two programs required for this synchronization operation. The first is the CP290 control program. This is the sequence of commands that the CP290 executes in order to control devices connected by X10 modules. This program is downloaded to the CP290 by software supplied with the X10. Once the 24 hourly synchronizing signals have been entered into the CP290 from the personal computer, the computer can be disconnected and turned off or used for other purposes. The CP290 operates independently requiring only a connection the 110 volt house wiring. In addition to synchronizing the clocks, the CP290 can store a multitude of commands for other appliances and lights.

The second program sets the PC internal clock as well as downloading the correct time from the PC to the CP290. The CP290 time is set in the following manner. The CP290 operating under its own program switches the computer on at 9:50 AM every Sunday. This is handled by the CP290 issuing an "ON" command to an X10 appliance module connected to the PC. The PC then starts executing its start-up program. This program first uploads the current time stored in the CP290. This sets the PC time and insures that the PC has the time and date in case the connection to ACTS fails. The PC then initiates the NIST ACTS dial program. This program automatically dials Boulder, CO., sets the computer time equal to the time on the Atomic Clock, makes sure the two clocks agree within a specified parameter, and disconnects. The start-up program then downloads the time to the CP290. The computer is automatically turned off by the CP290 after 5 minutes. At this point the CP290 is operating independently of the PC. Since the CP290 time is uploaded to the PC before the call to ACTS, the PC records the difference between the Atomic Clock and the CP290 clock each week.

Once the program has been entered and the time downloaded to the CP290, the computer can be disconnected until there is a need to re-set the CP290, or as in the case described above to make the weekly periodic time adjustments.

Accuracy

Although the time entered into the computer starts out matching closely the time on the Atomic Clock in Boulder, several problems arise in synchronizing to the secondary clocks. First, the PC operating system (DOS) stores the time as an integer that is an offset from a preset defined time. Therefore, it must convert the

time provided by NIST to this offset and perform some rounding off since not all times can be represented. Secondly, transferring the time from the computer to the CP290 involves reconverting the time to HH:MM. This will add additional errors into the system. Finally, the actual transfer to the CP290 and the internal processing in setting the CP290 clock add further delays. All of this should change the time by no more than a couple of milliseconds.

This inaccuracy is trivial compared to the error introduced by the Self Winding Synchronizing mechanism itself. For this system to function properly, the synchronizing solenoid on the clock should release at precisely zero minutes, zero seconds past the hour. Unfortunately, the CP290 does not handle commands between minute intervals. Therefore the second hand is released one or two seconds late each hour. The clocks are set slightly fast and make up for this error each hour. Therefore the clocks tend to be within two-three seconds of the Atomic Clock at any given instant. The clocks are able to maintain this accuracy as long as they are running.

Alternatives

An easy alternative to using the PC as a master clock is to use any master clock with some form of programming capability. I have also used a Standard Electric Master Clock that provides a two second pulse each hour. This clock connects to a special X10 interface module that senses a switch closure and sends an X10 "ON" signal. When the switch is opened the module sends an "OFF" signal. This interface module, along with a master clock, will perform the same function as the computer and CP290. Although this system will work in a similar fashion to the computer combination, it will only be as accurate as the master clock used for the synchronization since no connection can be made to ACTS.

Equipment

All the equipment described in this article is manufactured by the X10 Corporation. There is special software, however, required for automatic operation. I will provide this software free of charge if you send me a self-addressed, postage paid diskette mailer and a formatted diskette. I will handle both 5.25 (low density) and 3.5 inch diskettes and will provide all the necessary software and documentation to bring up the system under MS/DOS (version 3.3 or greater).

The X10 Corporation owns the protocols that are transmitted on the house wiring. They manufacture devices as well as license the technology to other companies. X10 sells directly to the public, however, they encourage consumers to use their retailers. They are located in Northvale NJ. Call (201) 784-9700 if you wish to learn the name of a retailer near you. In addition, all of the equipment

described in this article can be purchased via special order from Radio Shack.

The following items are required:

CP290-X10 Computer Interface Price $59.95: This serves as the master clock of the system. It receives the time from the PC, and is used for the hourly time signals to the secondaries.

Radio Shack (61-2688) Sounder/Actuator (X10 UM506) Price $18.95: This connects to the 110 volt house current and senses the signal from the CP290. It then closes an internal relay and allows the attachment of low voltage devices. (The Self Winding Clock solenoid is 3 volts.) Screw terminals are provided for connecting it to the 3 volt power supply and clock synchronizer.

Radio Shack (61-2687) Burglar Alarm Interface (X10 PF284) Price $24.95: This module senses a switch closure and sends an "ON" command. When the switch is opened, an "OFF" command is sent. If this module is connected to an hourly switch contact of a master clock it will send an "ON" command followed by and "OFF" command each hour. When combined with the Sounder/Actuator described above it will provide the same function as the personal computer and CP290 combination.

The NIST ACTS software is available directly from the National Institute of Standards and Technology in Gaithersburg MD. The software can be ordered by calling (301) 975-6776. The cost is $43 and credit cards are accepted. The mailing address is National Institute of Standards and Technology Building 202 Room 205, Gaithersburg MD 20899.

The combination of the CP290, the Sounder/Actuator, a PC and the ACTS software from NIST is all that is needed to set up the system described above. If you are interested in fully unattended operation, a special program can be obtained from me to set the CP290 internal clock under program control. I can be reached at (914) 997-5670 or write to me at: 3 Stratford Ave, White Plains NY 10605.

Mitch Janoff

An Electrically Wound Clock.

(Translated for THE JEWELERS' CIRCULAR-WEEKLY from the *Revue Chronometrique.*)

IN the Favereau system the electric energy expended is utilized in winding up the motive weight of the clock. The system of winding applied by the Sempire Clock Co. is in certain respects similar; we will therefore also give some description of the latter in order that the reader may see the difference between the two methods.

In the Favereau clock, illustrated in Fig.

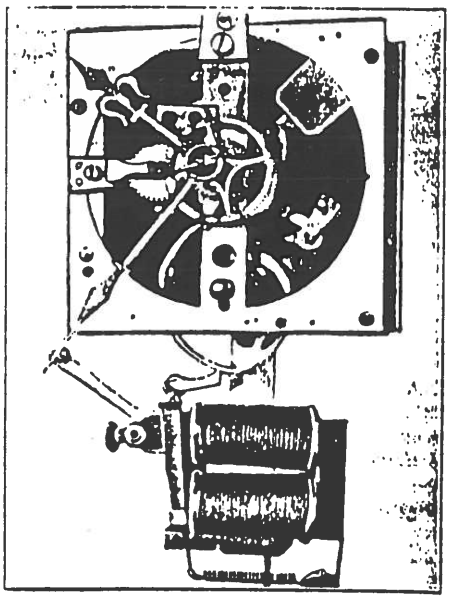


FIG. 1.

1, the motor weight is attached to the large arm of an elbowed lever, whose arbor revolves freely between the two plates of the movement. This weight acts by the intermediation of a spring click, of which the beak engages in the teeth of a ratchet solidly connected with the first wheel of the train. The pressure exercised on the ratchet by the mass of the weight determines the rotation of the mobile and keeps up, as ordinarily, the oscillations of the pendulum.

The small arm of the elbowed lever, placed below the motor arm, bears at its extremity a movable stud, which meets, when the weight is to be rewound, the convex part of a cam turning freely on pivots in the lower part of the frame of the movement. On the arbor of this cam is fixed a ratchet of large diameter having fine teeth.

The electric part of the system is composed of a horizontal electro-magnet with vibrating armature, arranged as in house electric bells. A click, visible in the illustration, surmounts the armature and engages in the teeth of the large ratchet. Under the action of an opposing spring, the click pivots on an arbor insulated by a non-conducting body from the current.

The electro-magnet and its accessories are fixed on a metallic piece attached to an arm of the plate of the movement. These two pieces are insulated electrically.

The striking part is arranged as in ordinary bells. The battery is connected with it by one pole, with the aid of a conducting wire; the other pole communicates with the mass of the pendulum, and another wire connects the cam with the electro-magnet. In these conditions there is a solution of continuity in the exterior circuit, which is restored at the instant the stud meets the cam. At this moment the current traverses the electro-magnet, the armature is attracted, and by its rapid oscillation determines a movement of the ratchet in the direction proper for rewinding the motor weight. When this has reached its culminating position, the cam under the action of a counter-weight, arranged on the ratchet, completes, of itself, the revolution which the electric energy has communicated to it, and the pieces are again in position ready for working.

The following is the system of the movement of the Favereau clock:

Motor ratchet No. 100, train work 90, into 8-80, into 7-30; minute work, 40 into 40-8, into 96.

In the system of the Sempire Clock Co. the motor weight acts on the train as in the preceding system, with this difference, that the motor arbor is not identical with that of the minute wheel and acts by an intermediate wheel. On the motor arbor is fixed an angular armature, whose rotation takes place near an electro-magnet, with hollow cores.

On the other hand, the lower stud does not itself close the electric current; its function is to bring a rocking-piece, B, into the position which it occupies in Fig. 2, when the weight is rewound, and to disengage the rocker at the moment when the weight is at the bottom of its angular course.

This last mechanical effect is produced

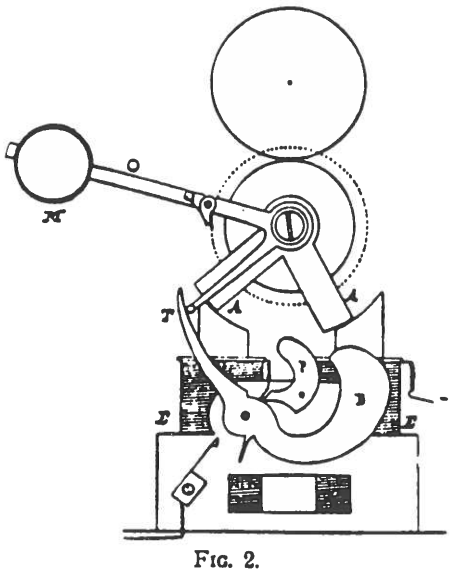


FIG. 2.

by the intermediation of a lever, P, or free click, pivoted, of which one arm rests on the swinging piece and serves as a stop to this piece. The other arm of the click can be met by the stud, T, at about the end of the course of the motor weight and displaced around its arbor in the suitable direction by disengaging the swing-piece.

Below its arbor of rotation this piece carries a finger, which can be made to come in contact with a spring, of which the heel, insulated electrically, is connected with one of the poles of the battery, the swing-piece and the electro-magnet being in the second part of the circuit, which communicates with the other pole of the generator.

When the weight descends, the electro-magnet is inactive, but the stud in its course raises the click and turns it backward. The swing-piece falls from its own weight, and a contact is established between this piece and the spring, in consequence of which the electric current is closed. This closing renders the electro-magnet active, and the magnetic power which it develops brings back with energy the armature towards the cores or even beyond them. The weight is rewound. At the same time the stud raises the swing-piece, and this, on account of its special form, restores the position of the click.

INTERNATIONAL PROGRAM DEVICE

METAL DISC MODEL

No. 500

Sept. 15, 1936

121 State St.
Albany 7, N.Y

INTERNATIONAL BUSINESS MACHINES CORPORATION
INTERNATIONAL TIME RECORDING DIVISION
CUSTOMER SERVICE DEPARTMENT
590 ~~270~~ Broadway
New York, N. Y.

INTERNATIONAL PROGRAM DEVICE

A device for controlling the operation of signals, such as bells, horns, and whistles, eliminating time on Job Time Recorders, or performing any other function according to any predetermined schedules is known as a Program Device.

DRUM TYPE PROGRAM

The drum type or universal program is much more flexible and positive in operation than any other program device on the market. It is designed to meet the most exacting requirements as it will handle very complicated schedules. It consists of a number (8 or 12) of slotted discs forming a drum-like stack. Each disc has 360 slots, or one for each minute during a six-hour period. These are supported on an iron base which also carries the driving magnet, the calendar attachment, the contacts, etc. The calendar drum is made up of discs in the same manner as the big drum but instead of being divided into minutes, it is divided into six-hour periods covering one week, one slot for each six-hour period, making 28 slots in all. The program schedules are set by inserting metal pins into these slots wherever a signal is desired. These pins projecting from both discs operate on the same set of contacts to ring the bells or perform other operations. The conditions under which both pins will press together on the same set of contacts is determined as follows: The larger drum which is advanced every minute makes one revolution in six hours. This means that one disc takes care of a six-hour period only. The calendar drum makes one revolution a week, being advanced one space every revolution of the large drum by a cam wiper dropping from a cam attached to the large drum. It is apparent, therefore that a pin, when inserted in a slot on the calendar drum, will determine the particular six-hour period of each day in which the signals, sets up on the large disc directly in line with it, will operate. (See Fig. 1).

It is easy to see that if another set of signals is to occur during the following six-hour period of the same day, a pin must be inserted in the next suceeding slot of the next small calendar disc, the signals, of course, being set up with pins on the large disc in line with the second calendar disc.

It is obvious that a schedule set up on the large disc will be repeated automatically every six hours, if the clips or pins are placed in the calendar disc for the six-hour period.

In order to fully understand the operation and flexibility of the Program Device, the difference between a program schedule and a program circuit must be thoroughly understood.

A program circuit may be defined as one where all bells and signals ring together and can be controlled from one push button or one automatic control. The only thing that limits the number of bells or signals on one circuit is the carrying capacity of the relay used.

One program circuit may ring the bells on several program schedules; that is, the same circuit could be used for Monday, Tuesday and Wednesday on one schedule and also operate signals on an entirely different schedule for the remainder of the week.

A separate circuit must be provided for signals that are to be operated when the other signals are silent. This holds true even though but one bell is required to be silent on a single day although it rings during the other days on the same schedule as all other bells.

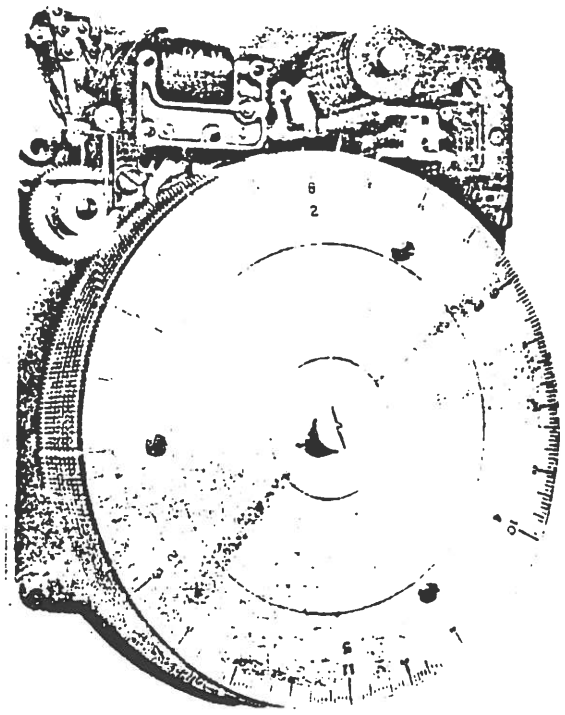


FIG. 1

Only such bells can be included on one circuit as ring in unison on all schedules, in other words, the schedule that applies to one bell on a circuit must apply to every bell on that circuit without variation or exception.

For example, supposing in a school program, the yard gong must ring at 9 A. M. every day except Saturday and Sunday, and in the school rooms the bells must ring every half hour from 9 A. M. to 4 P. M. every day except Saturday and Sunday.

It is plainly seen that, if made into one circuit, all bells, including the yard gong, would operate each half hour.

To handle a twelve-hour schedule, for instance, any combination of signals between 6 A. M. and 6 P. M. for one day, two discs are required. Likewise, an eighteen-hour schedule requires three discs and a twenty-four-hour schedule four discs, all because of the fact that one revolution of the big drum controls only a six-hour period.

If the schedule of signals varies on certain days of the week, additional discs must be used for the changed schedule on the basis of one disc for every six-hour schedule. If on a twelve-hour schedule the signals must operate on a different schedule on any one day, two additional discs are required, and if they are to operate on an entirely different schedule Saturday morning, an additional disc must be used, making five in all. It is understood that these signals will be silenced at night, Saturday afternoon and Sunday by leaving pins out of the proper section of the calendar drum.

Another important thing to bear in mind is that a schedule that is operated on a given circuit for one day cannot be transferred to operate on another circuit on some other day, from the same disc. Each individual circuit must be connected permanently to enough discs to handle all the schedules of signals required by that circuit. There is no way by which a calendar drum can shift a schedule from one circuit to another.

To better understand the procedure of laying out a schedule properly, study the following example.

Assume that bells are to be rung as follows:

High school bells at 9:00 A. M., 9:30 A. M., 11:00 A. M., 12 M., 1:15 P. M., 3:00 P. M. and 5:20 P. M., on Monday, Tuesday and Wednesday, and at 9:15 A. M., 9:45 A. M., 11:15 A. M., 12:15 P. M., 1:30 P. M., 3:15 P. M., and 5:30 P. M. on Thursday and Friday.

Grammar school bells at 9:30 A. M., 10:15 A. M., 11:00 A. M., 11:45 A. M., 1:15 P. M., 2:00 P. M. and 2:45 P. M., on Monday, Tuesday, Wednesday and Thursday, and at 9:30 A. M., 10:15 A. M., 11:00 A. M., 11:45 A. M., 1:15 P. M., 1:55 P. M. and 2:35 P. M., on Friday.

Outside gongs at 8:45 A. M., 8:55 A. M., 12:00 M., 1:00 P. M., 1:10 P. M., and 5:20 P. M., on Monday, Tuesday and Wednesday, and at 9:00 A. M., 9:15 A. M., 12:15 P. M., 1:15 P. M., 1:25 P. M. and 5:30 P. M. on Thursday and Friday.

All bells are to be silent on Saturday and Sunday.

After studying the above program, it will be noted that no two of the schedules are the same. If we attempt to put any part of the two schedules on the same circuit, the bells would be ringing at the wrong time and place, causing confusion.

As each disc will take care of only a six-hour period and each schedule covers a twelve-hour period, it will be apparent that an eight-disc program device would not be sufficient and that a twelve-disc program device would be required to handle the above program.

Assuming the calendar change to be regular (approximately three minutes past 6 and 12) the twelve-disc program device would be wired in three circuits of four discs each; the first four discs for the High School circuit, the next four for the Grammar School circuit and the last four for the outside circuit.

We will set the schedules for the various circuits, starting with the High School.

Insert pins at the following places:

On the large drum: 9:00, 9:30, 11:00 and 12:00 in the first disc; 1:15, 3:00 and 5:20 in the second disc; 9:15, 9:45 and 11:15 in the third disc; 12:15, 1:30, 3:15 and 5:30 in the fourth disc.

On the calendar drum; the second A. M. section of the first disc for Monday, Tuesday and Wednesday; the first P. M. section of the second disc for Monday, Tuesday and Wednesday; the second A. M. section of the third disc for Thursday and Friday; the first P. M. section of the fourth disc for Thursday and Friday.

The schedule for the Grammar School is set up as follows:

On the large drum: 9:30, 10:15, 11:00 and 11:45 in the fifth disc; 1:15, 2:00 and 2:45 in the sixth disc; 1:15, 1:55 and 2:35 in the seventh disc.

On the calendar drum: the second A. M. section of the fifth disc for Monday, Tuesday, Wednesday, Thursday and Friday; the first P. M. section of the sixth disc for Monday, Tuesday, Wednesday and Thursday; the first P. M. section of the seventh disc for Friday.

It will be noted that the Grammar School schedule for the program period from 6:03 to 12:03 is the same for all days of the week. Therefore, there will be no pins in the eighth disc of either the large or small drum as the schedule for Friday morning is taken care of by inserting a pin in the second A. M. section of the fifth disc on the calendar drum for that period. Just the schedule for the six hour period that deviates from the regular schedule is all that needs to be set on a separate disc.

The schedule for the outside gongs is set as follows:

On the large drum: 8:45, 8:55 and 12:00 in the ninth disc; 1:00, 1:10 and 5:20 in the tenth disc; 9:00 and 9:15 in the eleventh disc and 12:15, 1:15, 1:25 and 5:30 in the twelfth disc.

The pins in the calendar discs are placed at the following positions:

Second A. M. section of the ninth disc for Monday, Tuesday and Wednesday; first P. M. Section of the tenth disc for Monday, Tuesday and Wednesday. Second A. M. section of the eleventh disc for Thursday and Friday and the first P. M. section of the twelfth disc for Thursday and Friday.

No pins are placed in the calendar device at the positions for Saturday and Sunday. Thus the signals are silent during these days.

This very clearly shows that as the big drum revolves, the calendar drum does likewise and as a pin on the big drum reaches the specified time, it closes the contact and at the same time the other contact is closed by the pin on the calendar drum, completing the circuit for a signal.

CHANGING A SCHEDULE

The usual practice is to call the circuit controlled by the outside group of discs No. 1, the second group of discs from the front No. 2, etc. The discs of the program device that control any one circuit are generally grouped together. The number of discs on any circuit may be ascertained by checking the connections to the contact fingers. (See Fig. 2). One side of the contacts is common and all are connected together. The other side of the contacts are connected together according to circuits. As each contact represents a disc, the

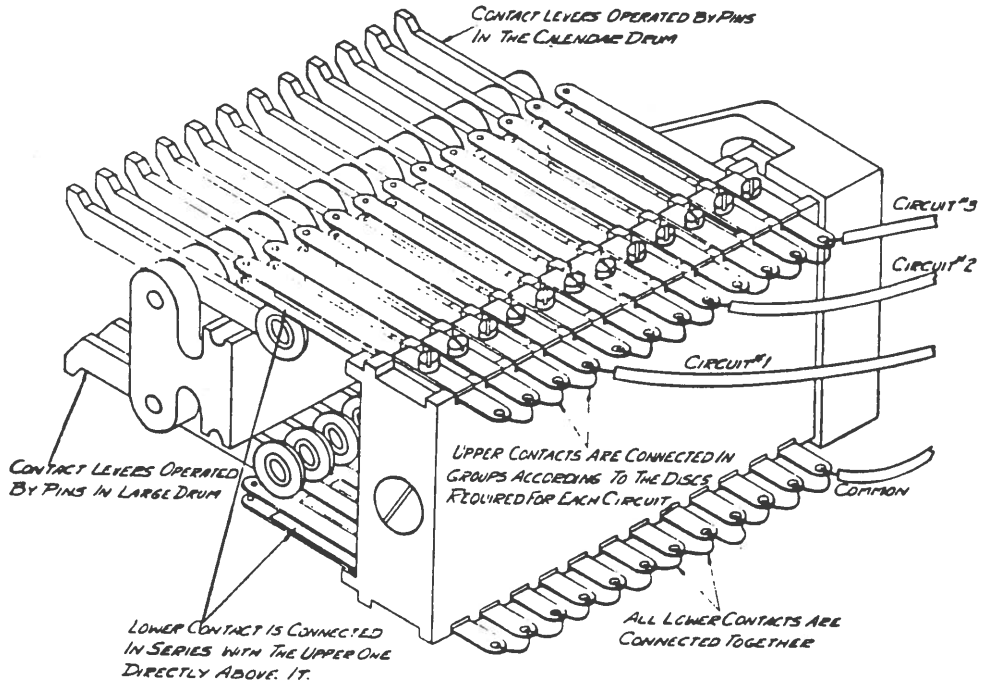


FIG. 2

number of contacts connected together represents the number of discs on that particular circuit. To change the number of discs in a circuit all that is necessary is to change the contact connections.

The actual change in schedule is accomplished by pulling out a clip (using small pliers) and replacing it in the proper slot of the proper disc. Always pinch the prongs of the clip slightly to insure its fitting snugly into the disc and then tap the clip gently into position. Make certain that it is properly seated in its slot. (See Fig. 3).

The disc on the front of the drum is marked with the hours and minutes to assist in locating the pins in the proper slots. The calendar device is also marked with arrows pointing to the sections covering six-hour periods. (See Fig. 4). The pins in the calendar drum determine which discs in the large drum are operative. Before changing any pins in the large drum first determine which disc controls the schedule for the time the change is required. This may be determined by checking the location of the pins in the calendar drum.

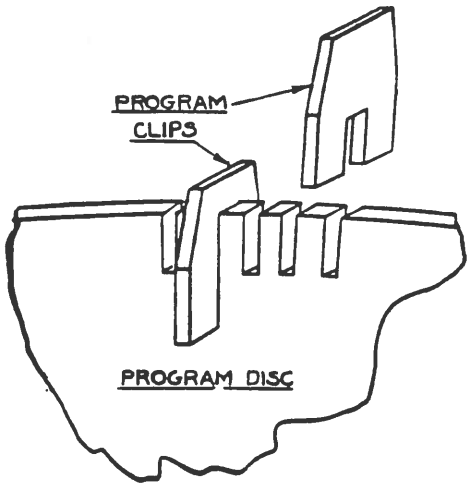


FIG. 3

To determine the proper slot in which to insert the pin, ascertain first whether the set of bells (circuit) is to be operated through a duration contact in the Master Clock or through a timing relay.

If operated from a duration contact which is usually the case, the pin should be inserted in the slot in line with the minute on which the ringing of the bells is to occur. This holds true if a timing relay is used in conjunction with the duration contact to give an extra long ring on one or more circuits, such as yard gongs, etc., also if the timing relay operates every minute.

If a timing relay is used instead of a duration contact the pin should be inserted in the slot one minute prior to the time the ringing is to occur.

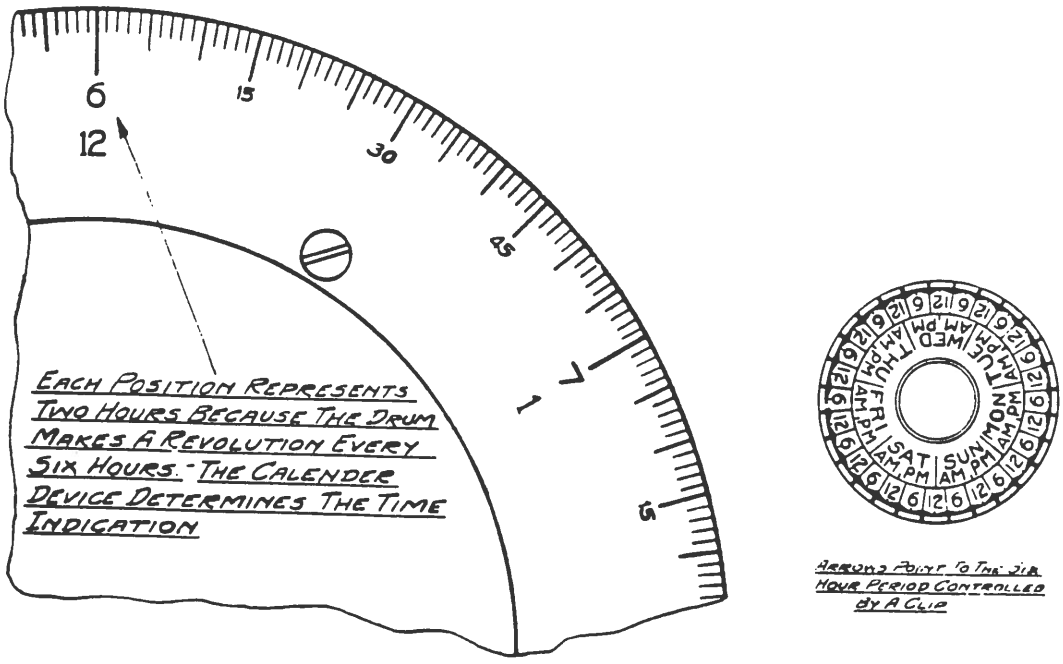


FIG. 4

In changing the schedule which is set up shortly before or after six or twelve o'clock, care must be taken not to confuse the ringing periods. The regular change of the calendar wheel occurs at 6:03 and 12:03. It will be observed, therefore, that if bells which operate at 5:55 are to be changed to ring at 6:10 another disc must be used, as at 6:03 the calendar device will introduce a schedule set up on a different disc. The same theory will apply when a schedule change occurs between 11:55 and 12:10 or if the calendar change occurs at some time other than regular.

The schedules may be easily changed without removing the drum; in fact, the drum should be removed only when necessary and then it must be replaced in the same position in relation to the supervising switch, otherwise the program device will be thrown out of step with the Master Clock by the automatic supervising feature. The supervising switch must shift from one wire to the other as the drum advances to the 4th and to the 59th minutes. Also check to see that the cam wiper for the calendar device is riding properly on its cam.

ADJUSTING DURATION OF RING

If a timing relay is used, raise the weight (by loosening the thumb screw) on the pendulum of the timing relay to shorten the duration of ring, and lower the weight to lengthen the duration of ring. Tighten the thumb screw in the weight after the setting has been determined. Be sure that the head of the thumb screw is toward the front of the relay.

If a duration contact in the Master Clock is used to control the duration of the signals it is necessary to remove the clock hands and dial in order to gain access to the contact. This, being a rather delicate procedure, requires the services of a skilled mechanic. Therefore, it is recommended that a representative of the company be called to make the necessary adjustment.

ADVANCING THE MINUTE DRUM

If it is necessary to advance the drum, press the armature to the electromagnet and turn the drum *counter clockwise*. Never attempt to turn the drum in a clockwise direction.

ADVANCING THE CALENDAR DRUM

If the large drum has not advanced more than two hours since the calendar drum automatically advanced, operate the small lever which projects below the contact block assembly. By pressing toward the left as far as it will go and then releasing same, the calendar will be advanced one space (6 hours).

If the large drum has advanced more than two hours since the calendar drum automatically advanced, press the calendar setting lever and turn the calendar discs carefully in a *clockwise* direction to the desired six-hour period. After having set the calendar drum in this manner, make certain that the retaining pawl has dropped in the proper tooth of the ratchet.

WIRING SCHEME

Fig. 5 is a schematic wiring diagram showing one of the methods of hook-up for operating bells, etc., when the duration of the signal is controlled by a duration contact in the Master Clock.

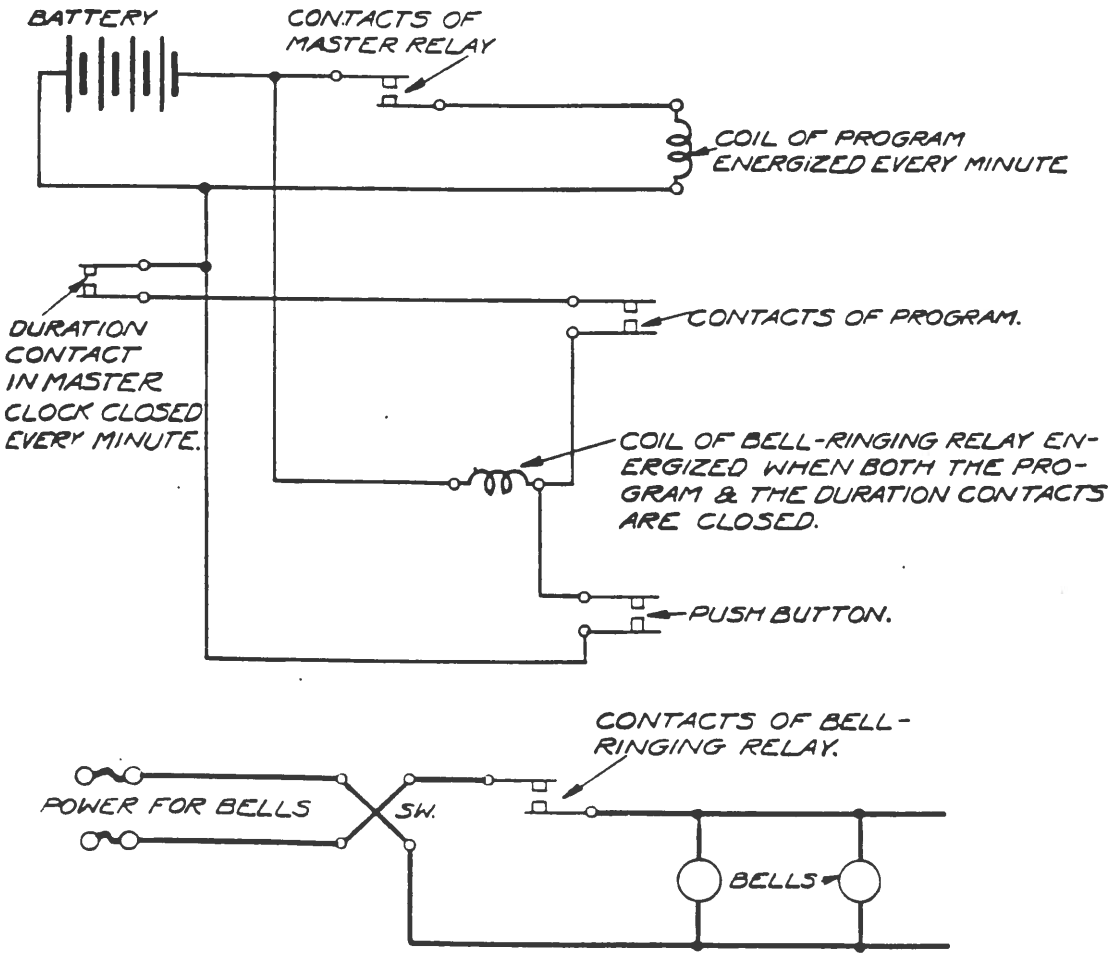


FIG. 5

The contact points of the program device and duration contact must necessarily be of light construction, therefore, only enough current to energize the coils of a relay is passed through them and the contact points of the relay carry the bell load. The coils of the relay are always connected in series with both the program contacts and duration contact. The duration contact makes every minute, but the program contacts only make when pins are inserted in the drum, therefore, the circuit is completed to the coils of the relay only when both contacts are made. The contacts of the relay connect the bells direct to the power supply.

Fig. 6 is a schematic wiring diagram of a program device equipped to operate one circuit of signals (classroom buzzers) with a short ring, and one circuit (outside gongs) with a long ring. The duration contact in the Master Clock controls the duration of the first mentioned circuit while on the second

mentioned circuit a timing relay is used in conjunction with the duration contact. The circuit for the short ring is exactly the same as the previous wiring diagram. (Fig. 5). The circuit for the long ring is the same except that it goes one step further. The coil of the timing relay is connected exactly the same as the coil of the circuit closing relay on the circuit for short signals. The coil of the circuit closing relay is then connected thru the contacts of the timing relay. The timing relay will be energized for the time the duration contact is closed. The signals will be operated during this time as well as while the timing relay is running down.

The contacts of the timing relay are light in construction, therefore; only enough current to energize the coils of a circuit closing relay is allowed to pass through them and the points of the latter relay are used to carry the current.

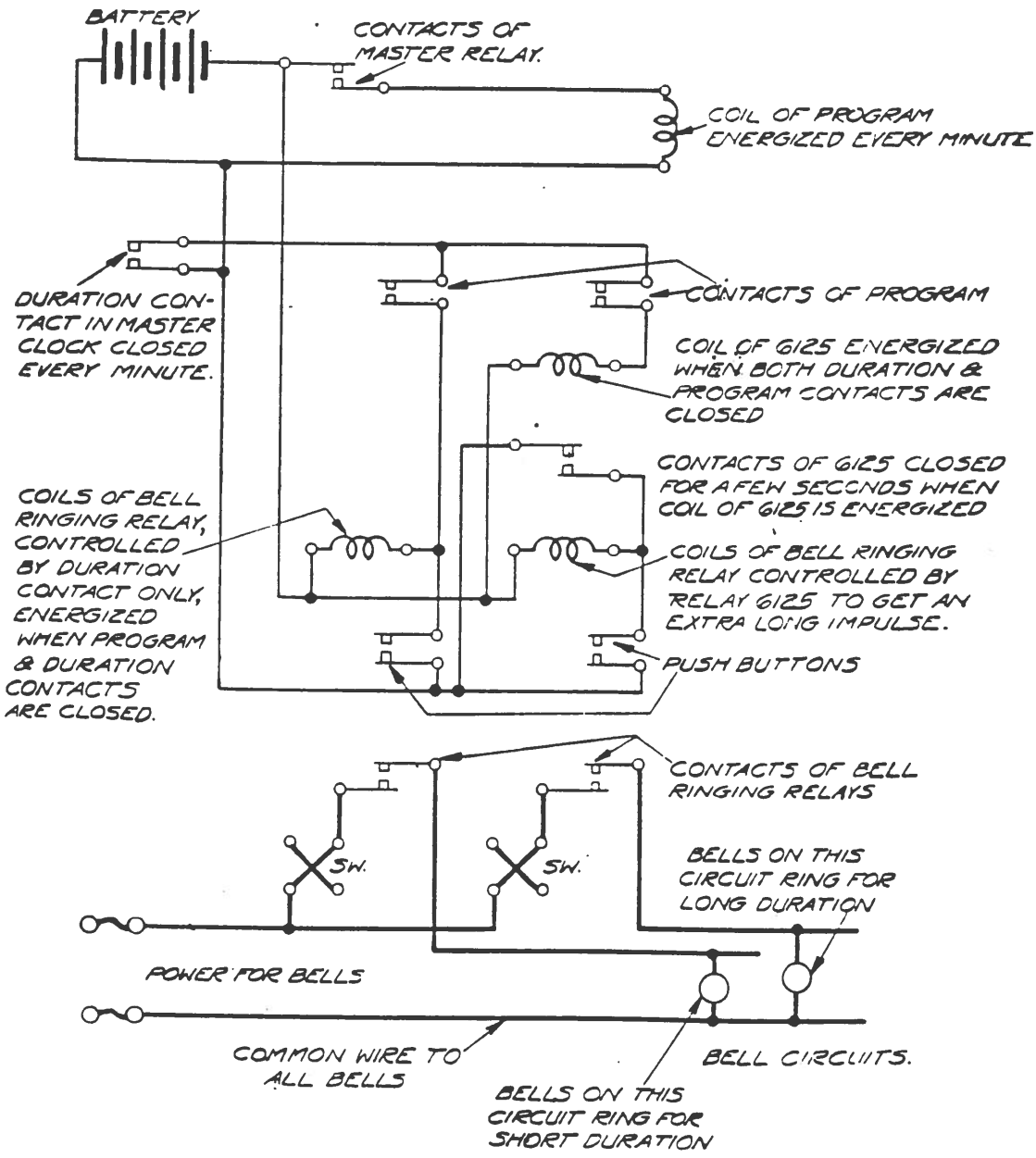


FIG. 6

ADJUSTMENTS

All adjustments of the metal disc program device are self-evident when Figures 7 and 8 are studied. Use extreme care when making adjustments so that the mechanism will not be damaged.

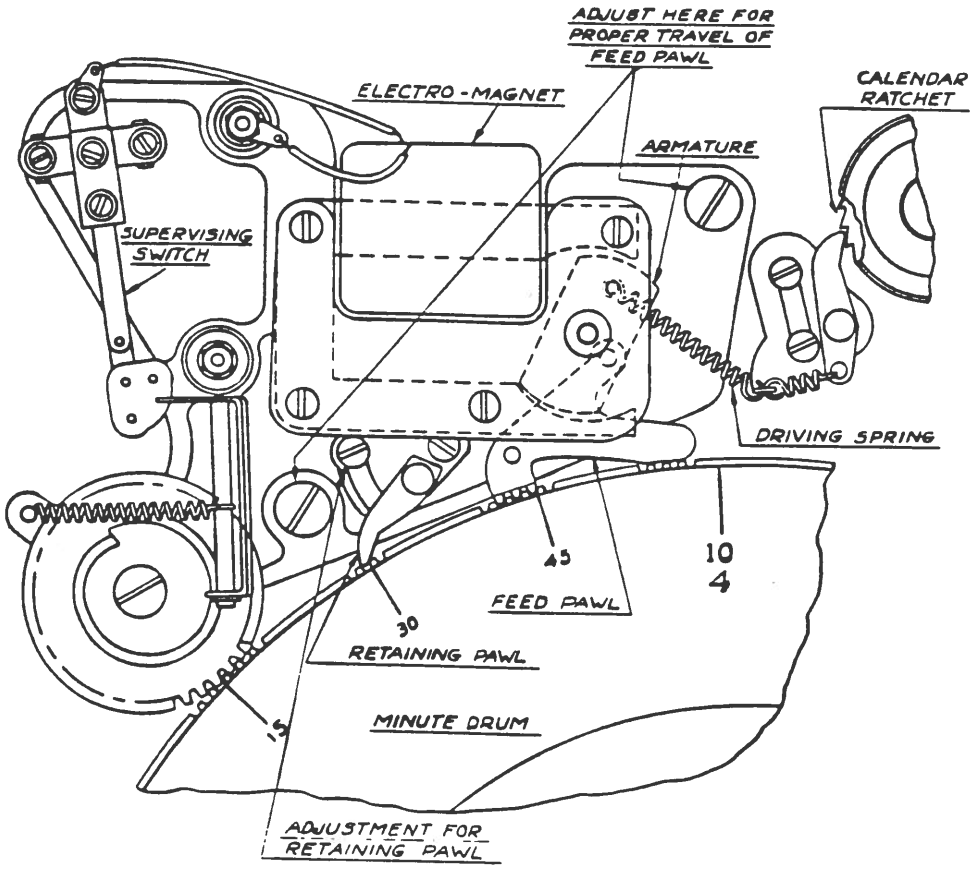


FIG. 7

SUPERVISING SWITCHES

All International secondary units may be hourly supervised so they are always in agreement with the Master Clock. The supervising switches must be adjusted as follows:

The switch cam is properly timed at the factory and should not require changing, however, the timing of the switch may be adjusted by shifting the entire switch block assembly. The secondary unit or recorder should transfer to the "B" wire just before it reaches the 59th minute. A quick drop of the lever from the cam is essential. If the lever rides down the face of the cam there is danger of a poor contact.

Make certain that the center switch blade does not touch both the "A" and "B" switch blades at the same time. The brass supports for the "A" and "B" switch blades should be adjusted so that the center switch blade makes equal and positive contact with each and so that the switch operating lever never rides on both cams at the same time. This assures that the full tension of the switch operating lever spring is applied to the switches. (See Fig. 9).

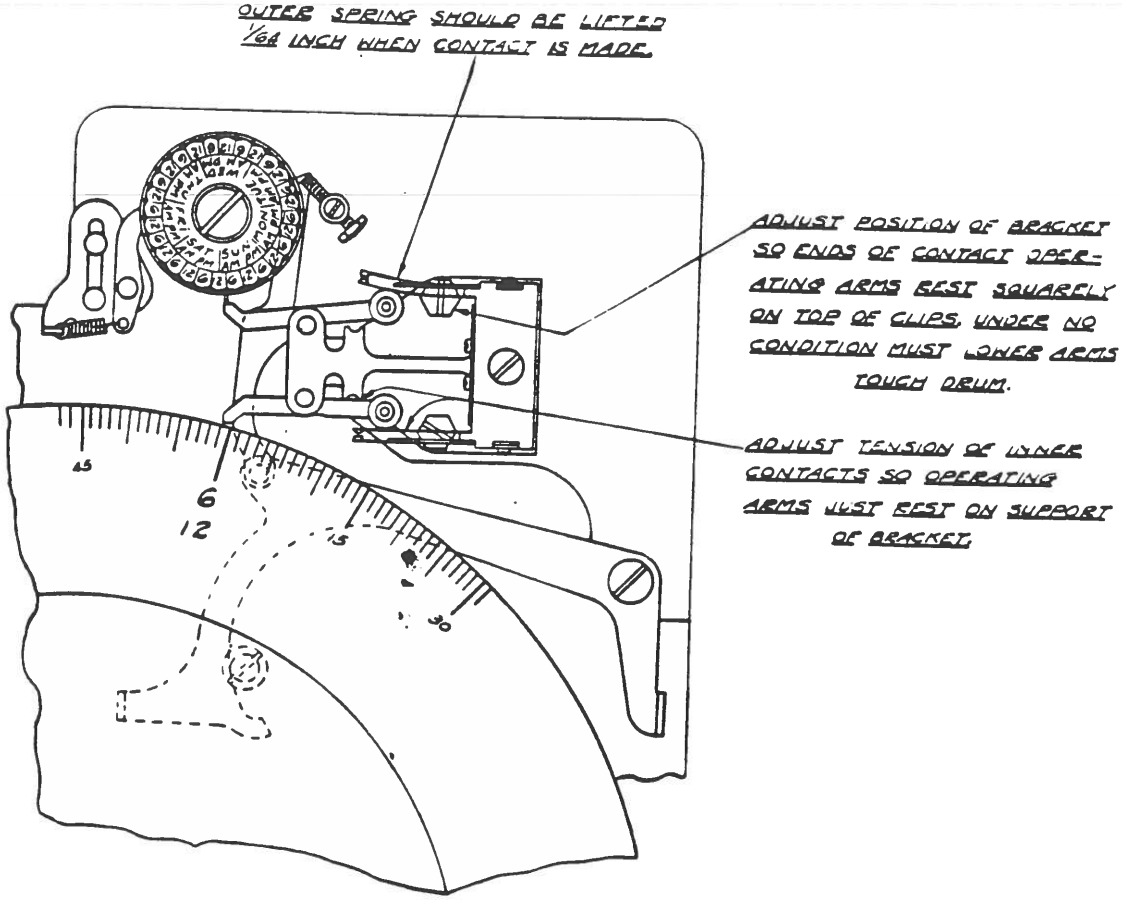

OUTER SPRING SHOULD BE LIFTED 1/64 INCH WHEN CONTACT IS MADE.
ADJUST POSITION OF BRACKET SO ENDS OF CONTACT OPERATING ARMS REST SQUARELY ON TOP OF CLIPS. UNDER NO CONDITION MUST LOWER ARMS TOUCH DRUM.
ADJUST TENSION OF INNER CONTACTS SO OPERATING ARMS JUST REST ON SUPPORT OF BRACKET.
45
6
12
15
30

FIG. 8

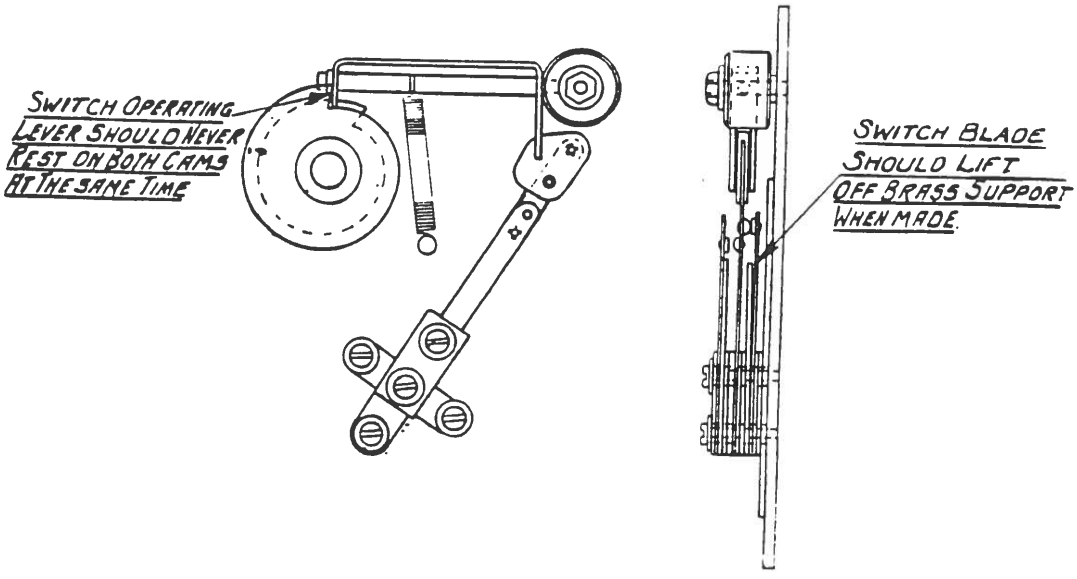

SWITCH OPERATING LEVER SHOULD NEVER REST ON BOTH CAMS AT THE SAME TIME
SWITCH BLADE SHOULD LIFT OFF BRASS SUPPORT WHEN MADE.

FIG. 9

THIS FOLDER IS VALUABLE . . .

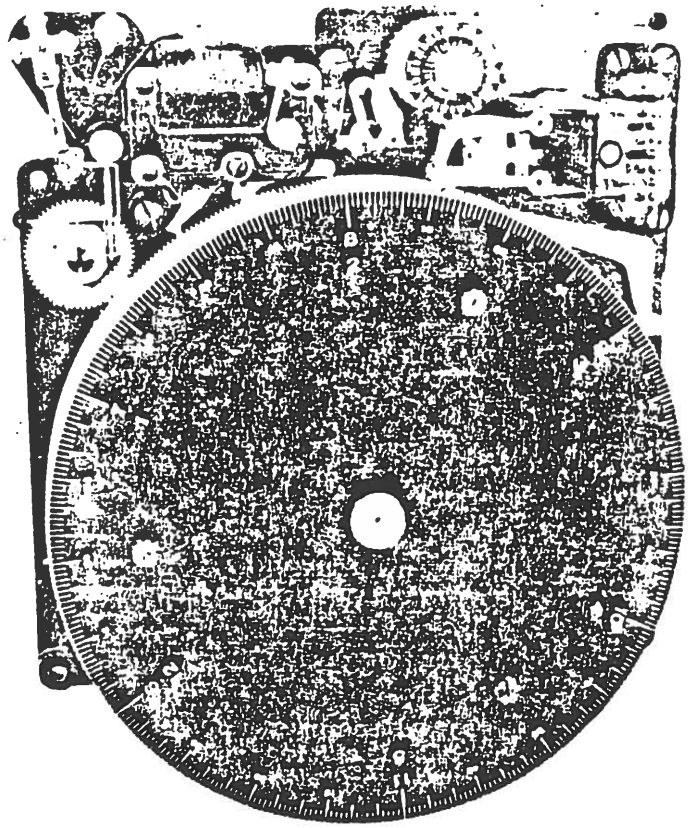
● It contains information pertaining to the maintenance and operation of your time signal equipment. File in a convenient place so that it is accessable at all times.

IBM

ORM 91-1603-1 5-1-47 Printed in U.S.A.

INSTRUCTIONS

FOR THE OPERATION AND CARE OF YOUR IBM PROGRAM DEVICE



INTERNATIONAL BUSINESS MACHINES CORPORATION
Factory, ENDICOTT, N. Y.

World Headquarters Bldg.
590 MADISON AVE.
NEW YORK, N. Y.

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INSTALLATION

Program devices are furnished in separate cabinets for master clock operation, or in cabinets containing master clocks or synchronous-motor driven control clocks. The cabinet in all cases must be plumb with the wall, and in a location free from dust, dirt, moisture, vibration, and extreme temperature. If the device is timed by a synchronous motor, it should be connected to a source of supervised alternating current which cannot be turned off.

CONNECTING DEVICE

The device should be carefully connected according to the wiring diagram sent with the system.

SETTING SYNCHRONOUS-MOTOR OPERATED CLOCK

If the clock is synchronous-motor operated, a setting lever or knurled knob is provided at the rear of the movement for setting purposes. IMPORTANT: Always set the minute hand so that it is pointing at a minute marker when the program drum advances.

ADVANCING DRUMS

To advance the large drum, depress the armature and turn drum slowly in a counter-clockwise direction. Never attempt to turn the drum in a clockwise direction.

To advance the small, or calendar, drum when the large drum has not advanced more than two hours since the calendar drum automatically advanced, operate the small lever which projects below the contact block assembly. Moving lever to the extreme left and then releasing, advances calendar one space (6 hours). If the large drum has advanced more than two hours, press the calendar setting lever and turn the calendar drum in a clockwise direction to the desired position. After setting calendar drum, check the retaining pawl for seating in the proper tooth of ratchet.

SETTING SCHEDULES

The large drum advances every minute and therefore each disc takes care of a six-hour period only. The calendar drum makes one revolution per week, being advanced one space every revolution of the large drum. Program clips should be inserted in the large discs according to the time the signals are to be sounded, and in the calendar discs according to the six-hour period of each day in which the signals are to operate. If another set of signals are to operate during the following six-hour period of the same day, clips must be inserted in the proper slots of the next succeeding discs of both the large drum and calendar drum. To handle an eighteen-hour schedule, three discs on each drum are necessary.

EXAMPLE: If a signal is to be sounded at 9:05 A.M., insert a clip on the first large disc at five points after the numeral "9." In the corresponding disc of the calendar drum insert clips in the slots between the "6" and "12" of the "A.M." sections for each day the signal is to sound. To sound another signal at 3:10 P.M., insert a clip at ten points after the numeral "3" on the second large disc. Insert the desired number of clips in the corresponding disc of the calendar drum between the "12" and "6" of the "P.M." sections.

NOTE: Clips should be inserted in the drums so the smooth edge operates against the contact levers.

The discs of the program device that control any one circuit are generally grouped together, and the number of discs on any circuit may be ascertained by checking the connections to the contact fingers. The number of contacts connected together represents the number of discs on that particular circuit. A separate circuit must be provided for signals that are to be operated when the other signals are silent.

SWITCHES

The switches located under the drum are used to control the various circuits. Placing these switches in their "OFF" position will open the signal circuits, but the signals can still be sounded by means of the manually operated push buttons.

MAINTENANCE

To obtain best results from this program equipment we recommend a periodic cleaning and oiling once every six months by an IBM Customer Serviceman. For further information contact the nearest IBM office.

--- **MART** ---

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SCOTT BATTERY Electric Shelf Clock (London Stereoscopic Co.) Circa 1905. Photo & Details in A. & R. Shenton "The Price Guide to Collectable Clocks." Fig. 404. (800) 221-0424 X206
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SWCC Western Union, 120 beat, metal & wooden case clocks. 2 Type "C" and several Model 33 CALCULOGRAPHS. (216) 442-0456
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ITR Master Clock w/ paper tape program mechanism (no tape), relays & switches for 2 bell circuits. 2 STROMBERG Model 25 Electric rewind pendulum clocks (no pendulums), one 40 v. & one 110 v. Resemble 60 beat master clock movement shown on page 9 of Aug. 1983 JEHS, in large round wall mount cases with heavy current relays. (206) 842-5835
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FRICK Milk Glass Gallery Clock, 24" Time Ring, 27" Overall, Dial w/ 4 lights to light signed Dial Slave Mvt. & Dial & Hands mvt. SWCC School Clock, New York ca. 1910, 11⅝" Time Ring, Oak Case as found 35" tall, bolt inserts, top each side.
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THE JOURNAL OF THE

ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78 NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XX, #3, SEPTEMBER 1994

Fellow Horologists:

This issue of our journal contains a reprint of a 1931 WALLACE & TIERNAN catalog in which their marine Radio Directional Signal equipment is described along with other, little known scientific apparatus manufactured by the company. The battery operated clock developed for the consumer market, while unimpressive in appearance and construction turned out to be a reliable performer and is very collectible. A vote of thanks is due Herb Freeland for his efforts in obtaining this material.

The ITR serial continues with bulletins #2 and 3, published in 1919 covering Secondary Clocks and Program Devices. Did you know that ITR produced, in addition to the ratchet & pawl secondary clocks, a POLARIZED movement as well? This type of mechanism in which each impulse to the secondary (or slave) clock must be in reverse polarity to the preceding one was employed most often in European clocks, and less often in American units. The principal advantage was that false triggering by chattering contacts was eliminated, but the manufacture was usually more complex. ITR included the polarized movement in an attempt to make their line as complete as possible by offering prospective customers this option in their secondary clocks.

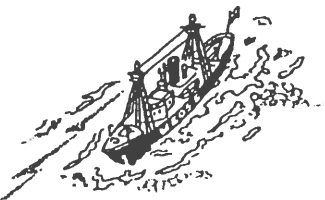
The bulletin describing the range of Program Devices includes key wound and electrically operated systems in disc as well as wheel varieties, and when added to the material published in Journal issue #2, completes the coverage of this phase of ITR's product category.

Journal #4 will contain a technical discussion by ITR of their Automatic Charging Systems, operated on AC and DC Current, and a bulletin in which the design and selection of Electromagnets is discussed. Both are interesting subjects, covered in easy-to-understand format, and worth looking forward to.

Thanks to Bill Ellison for his chairing the chapter's meetings at Syracuse and Dearborn. Programs were interesting and well attended.

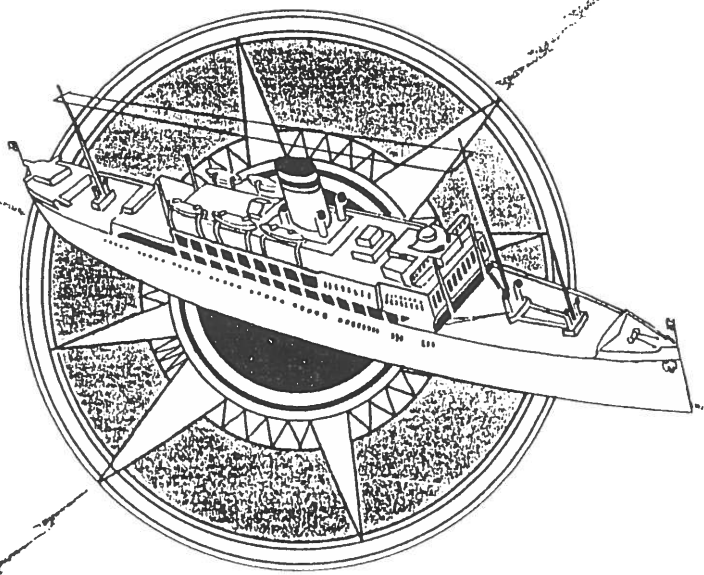
Good reading ahead...

Martin Swetsky, FNAWCC... President
Dr. George Feinstein.....
Harvey SChmidt..... Co-Editors



WALLACE

ELECTRIC CLOCKS



WALLACE ELECTRIC Clocks are a product of the same organization that developed and builds the primary and secondary control clocks controlling the Radio Beacon Directional Signals broadcast by the U. S. Lighthouse Service.

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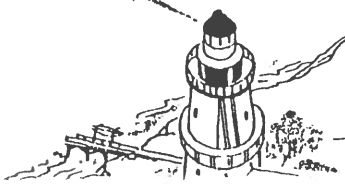

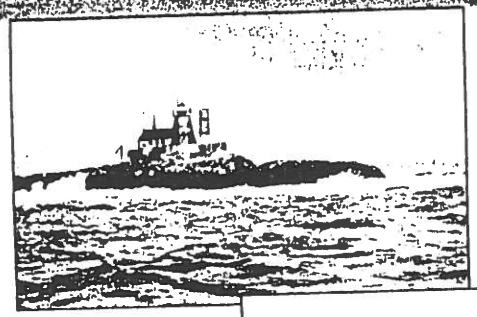

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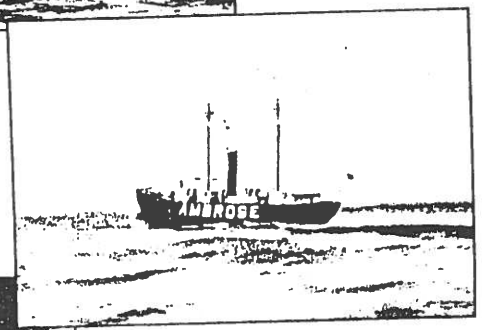
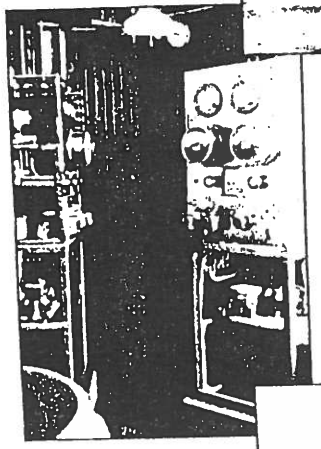
RADIO BEACON DIRECTIONAL SIGNALS

may be operated from either land stations or lightships at sea.

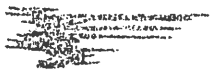
*

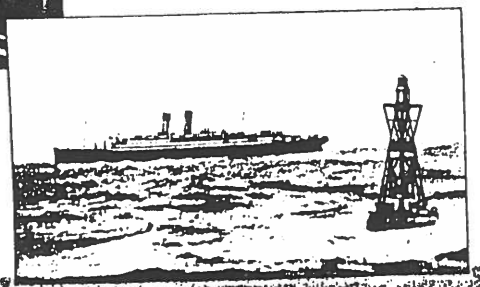




TRANSMITTING APPARATUS—

For the first fifteen minutes in every hour one station will transmit signals one minute out of every three; then a second station comes on the air for a further sixty seconds and following this a third station for the third minute.





*

In fog or heavy storms this signal program is carried on continuously.

*

WHEN storms and clouds obscure the heavens, when blackest darkness and blanketing fog close in on all sides, observation of sun or stars, age old means of navigation, is impossible. It is then that the guiding hand of modern science and modern engineering embodied in the Radio Beacon directional signals, broadcast by the U. S. Lighthouse Service, take up their burden of safeguarding lives at sea—and with their aid ships come safely into the busiest harbors of the world. Since its establishment by congress in 1789, the Lighthouse Service has been keenly aware of its responsibilities and jealous of its trust. Century old traditions of unfailing performance are at stake, and every piece of equipment purchased is scrutinized with the urgency of this service in mind. Apparatus must conform to the most rigid of specifications, it must be of the highest order of accuracy obtainable.

On storm swept lightships riding the furies of the gale at sea, in wave lashed lighthouses trembling in the teeth of hurricane winds, when nature obscures and nullifies all other aids to navigation, the Radio Beacon signals *must* go out. The primary clocks which synchronize them, the time interval program clocks that start and stop them with unfailing split second accuracy must meet the exacting demands of the Lighthouse Service. Lives are at stake, property at sea endangered and the rigors of the service know no excuse for halting, failing performance.

Wallace & Tiernan are proud that their research laboratories, the precision craftsmanship of their works were enlisted in this all important service—proud that their apparatus unfailingly meets these exacting demands.

But problems such as the development and building of these control clocks are not brought to Wallace & Tiernan without the assurance that here is an organization possessed of a background of technical and manufacturing achievement. For more than eighteen years, Wallace & Tiernan have been active in the invention and building of scientific apparatus controlling critical stages in production processes of major American industries.

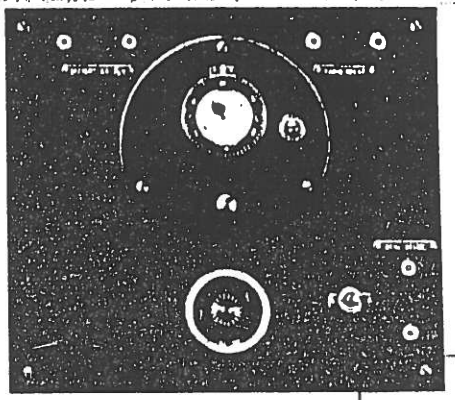
The bread you eat, the water you drink, the clothes you wear, the paper you

write on, the electric light you read by, have, in all probability encountered W&T apparatus and processes in the course of their manufacture. Eighty per cent of all the country's drinking water is sterilized with W&T apparatus. Flashing beacons for marine, highway and airway uses are products of W&T. In the fields of Public Health and Public Safety throughout the world, W&T apparatus daily safeguards 200,000,000 lives and its reputation for dependability is an international by-word in these fields.

In the building of control apparatus for these processes and for this equipment, timing and circuit closing devices have been an important element. The engineering principles evolved were such that it soon became evident they were applicable to any time keeping device. Accordingly, about seven years ago W&T research laboratories undertook the development of a self-contained electric clock, operated independently of central station power.

Numerous models were developed and after three years, one model was perfected and named the "WALLACE ELECTRIC" clock. Then began an exhaustive test program. As many as thirty models were placed under laboratory test and observation, subjected to every conceivable break-down test, operated at high speed to give them the equivalent of fifty years—a lifetime—of actual wear. When these tests had been successfully met two thousand clocks were built and sold in a limited test area. Sold to individuals, restaurants, offices, stores, hotels, hospitals, and other public buildings in a restricted territory these were checked regularly over a period of two years. Inspectors noted behavior under varied operating conditions—of heat and cold and dampness. Owners' opinions were asked and recorded. Results were astounding.

Not only were owners pleased with the clock, they boasted to their friends about it. So unusual was public response that without advertising or promotion of any kind except the unsolicited praise of owners, the "WALLACE ELECTRIC" has established a widespread reputation for performance in this test territory.

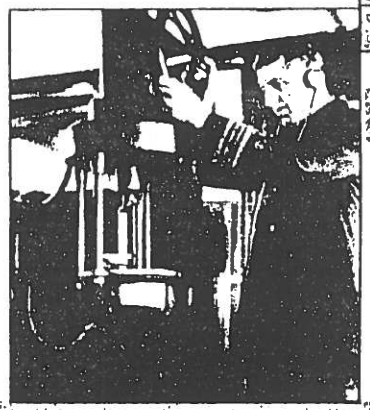


Absolute accuracy and dependable synchronization are necessary to permit operation of all stations in one group on the same wave length and prevent confusion from overlapping signals.

*

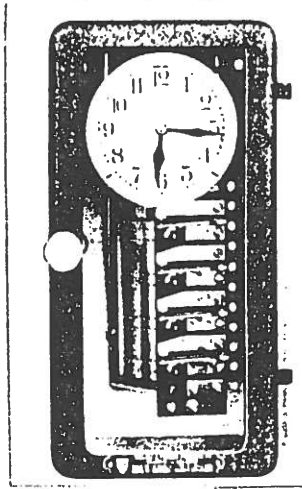
Before the development of the W&T PRIMARY CONTROL CLOCK it was necessary to operate stations at different frequencies. Navigators experienced considerable difficulty in tuning receiving sets from one frequency to another in the limited time of each station's operation. Perfect synchronization of all stations with W&T primary clocks now makes it possible for all stations in one group to operate on the same wave length.

*



RADIO BEACON COMPASS ABOARD SHIP

By rotating a loop antenna the navigator determines the direction from which signals are coming. Definite codes identify these stations. After locating several stations the navigator plots directional lines on suitable charts and determines the ship's position as at the intersection of these lines.



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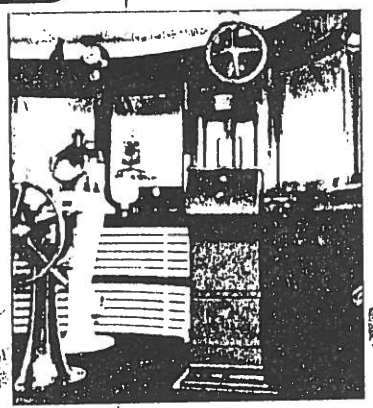
W&T SECONDARY CLOCK

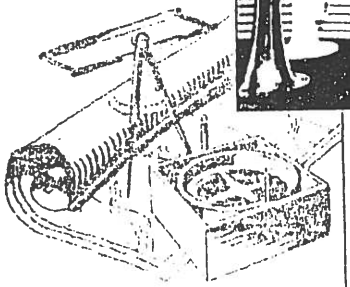
A time interval control device that automatically starts generating equipment, then automatically cuts in various units necessary to broadcast Directional Radio Beacons. After a definite signal program has been carried out this control clock cuts out each unit finally closing down the generating unit.

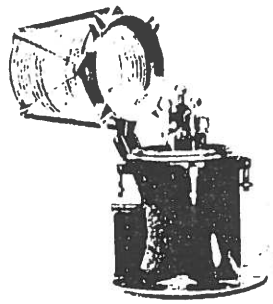
*

Most ships are now equipped with RADIO COMPASSES like this one shown on Bridge of Modern Liner.



W&T FLASHING MARINE BEACONS as furnished to U. S. Lighthouse Service. The time control mechanism controls the flash by current interruptions. Though one lamp burns out, the lamp changer shown above automatically swings a new one into the circuit at the correct focal point. The same fundamental principles of accuracy are incorporated in the Wallace Electric Clock.





Sample clocks were placed in forty-two reputable jewelry stores for testing. At the end of several months 38 of the 42 jewelers ordered clocks for their customers. No advertising was used to create a public demand for the "WALLACE ELECTRIC" clock by these jewelers, yet the clock sold rapidly. First, because these jewelers understood its advantages; and second, because every owner told his friends about its remarkable performance.

The "WALLACE ELECTRIC" cannot be compared with any other electric clock. Both in construction and operation it is a radically new development. Unlike central power operated electric clocks, it is free from current interruptions and fluctuations. It is a finely made clock mechanism: not a complicated electrical device.

It is cheaper to operate than clocks run by central station power. It is independent of wires or outlets, and can be placed anywhere. It is silent in operation. Thousands of tests have confirmed its accuracy—an average variation of 30 seconds per month.

The "WALLACE ELECTRIC" is the first clock to be engineered. To the fine art of clock making has been added the exact science of engineering.

Materials of construction were investigated. The function of each part was studied and where changes in material or design would improve the service or lengthen the life of these parts, changes were made. All gears are machine cut—the desirable shape of the gear teeth received special attention. Escapement wheel is aluminum studded with steel pins. The escapement itself is of bronze. Special alloys are used in making non-pitting, positive acting contact points. The pendulum bars are of special steel unresponsive to temperature changes. The pendulum bob is equipped with fine, micrometer adjustment making it possible to adjust for as little variation in accuracy as one-fifth of a second. Shafts are of steel, shaft bearings are highly polished steel, accurately fitted. It is to these niceties of design, this precision craftsmanship that "WALLACE ELECTRICS" owe their unfailing accuracy.

The Atlantic

Not just another kitchen or nursery clock, but something new, something different. The easily read 7" dial and chromium plated sash combine with attractive finishes in crackle blue, crackle green or white to make an unusually smart looking timepiece.

"WALLACE ELECTRICS" are not affected by changes in temperature or by moisture. Properly adjusted, their split second accuracy will be astounding to those hitherto unacquainted with their engineered, precision built movements.

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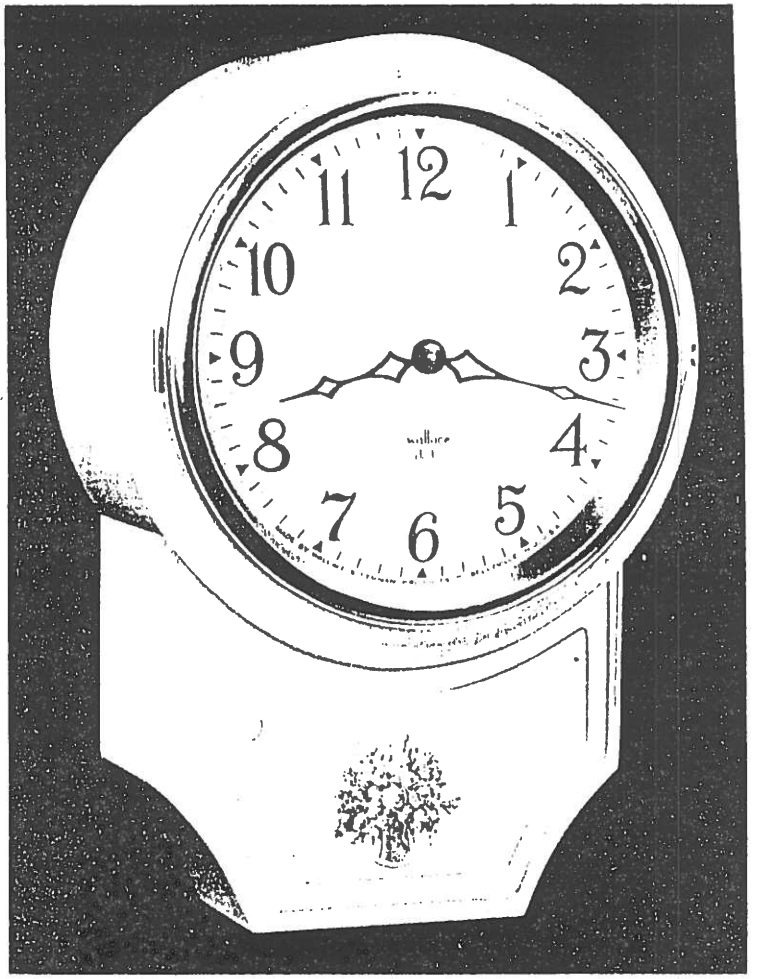

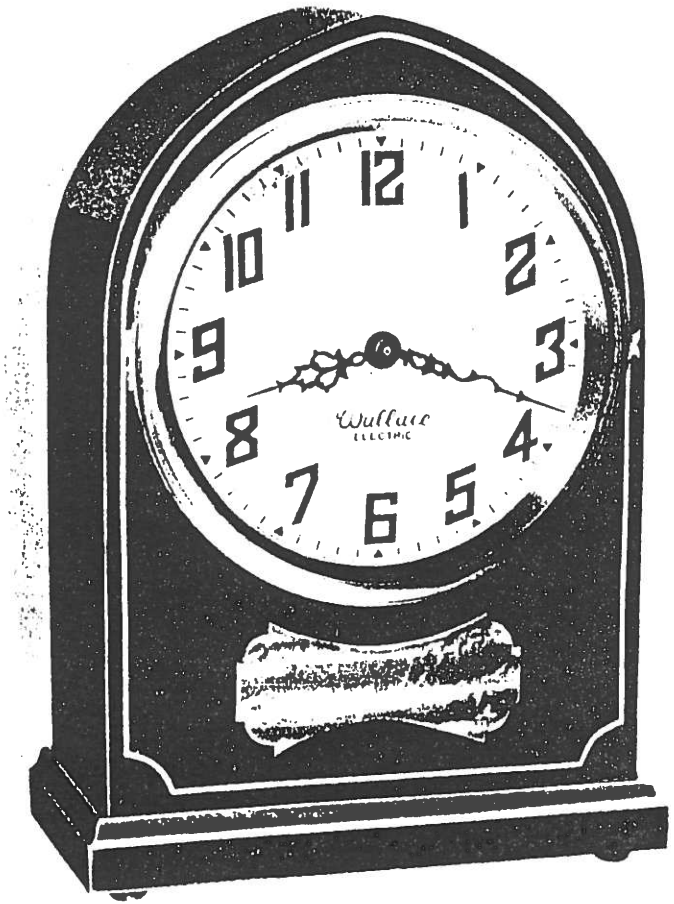

The Barnegat

Imposing yet with an atmosphere of distinction and culture, this upright mantel clock lends itself to practically any environment. Daintily decorated with lines of inlay and satin wood inlay decoration. The raised numeral 7″ dial helps to make this one of the most popular clocks in our line. Made of solid African mahogany and mahogany veneer. Dull finished and hand rubbed. 11½″ high, 8¼″ wide.

*

The Marblehead

Reproduction of an old English Bracket model, follows very closely the accepted design of this mantel type of clock. The appearance of this clock is such as to enhance any living room where a mantel or similar setting is selected. Solid African mahogany case, Marqueterie and Burl front. Dull finished and hand rubbed. Gold plated trimmings. Filigree silver finish. 6″ dial, black hands. Base 8¾″ long, 4½″ deep, 12″ high.

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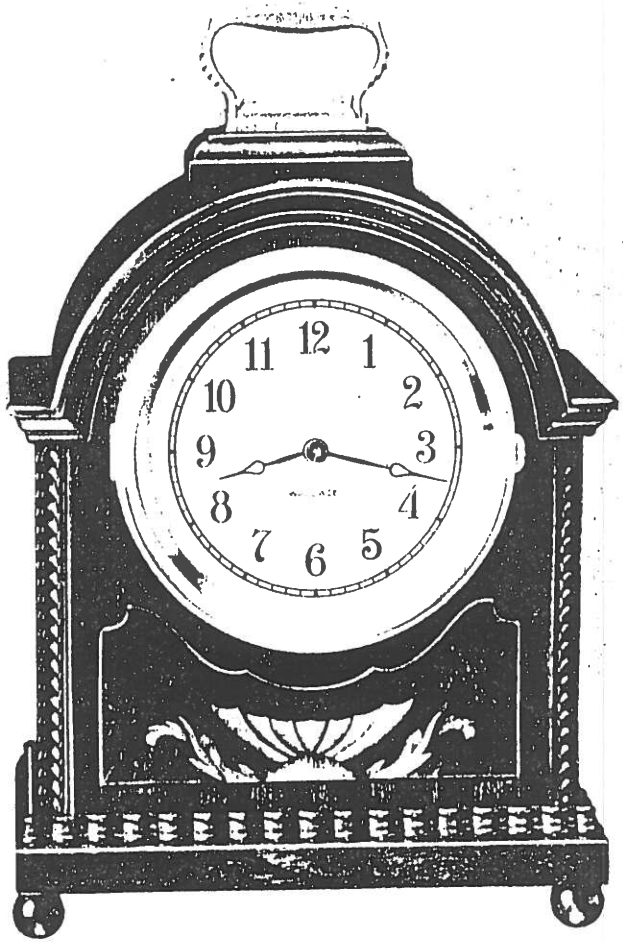

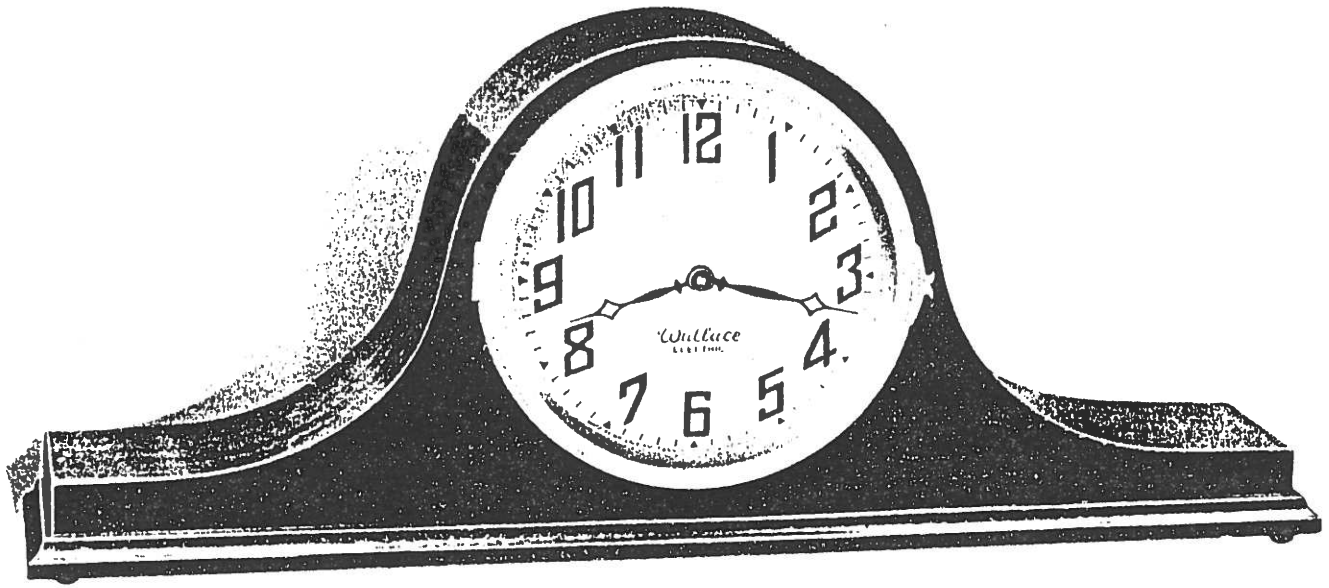

The Portsmouth

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A medium sized modest, refined tambour model—in genuine African mahogany and mahogany veneer. Its lines are very graceful. Suitable for mantel, radio or shelf. Stands 7″ high—width at base 17¼″—5½″ dial with raised scratch brush numerals. It has the same remarkable time-keeping qualities which characterize all "WALLACE ELECTRIC" Clocks.

A combination of simplicity and grace that will enhance the appearance of book case, mantel or desk. This tambour model is made of mahogany veneer and solid African mahogany, hand-rubbed finish and beautiful inlay design. It measures 22″ wide at base and stands 9¾″ high. Satin silver finished 7″ dial with raised numerals and gold plated bezel adds the touch of distinction that makes this handsome timepiece a welcome adjunct to any room. No winding—no attention—uncannily accurate.

The Yarmouth

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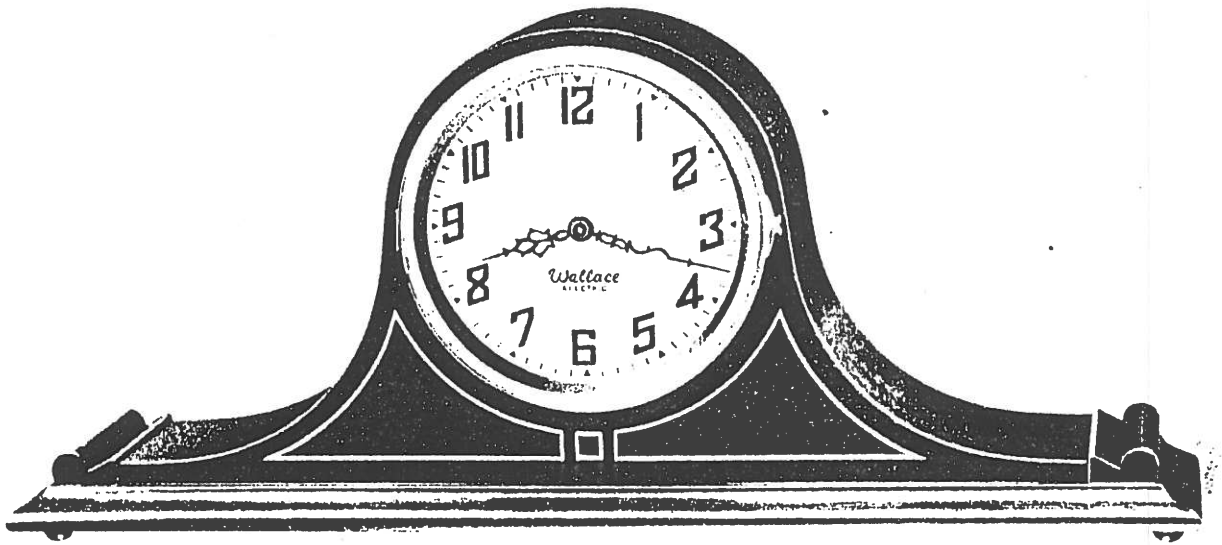

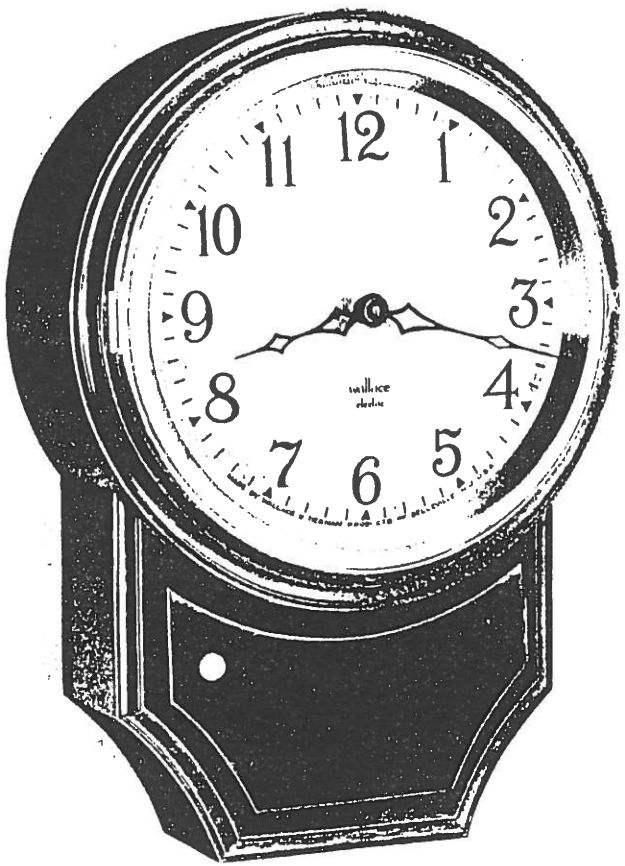

The Camden

A conventional design of exquisite taste but unlike any other model on the market. Its large 7″ circular finish silver dial and appropriate hands with flat black numerals makes it especially easy to read. A hanging ornament de luxe for library, hall, living room or small private office. Solid mahogany and mahogany veneer. Dull finished, hand rubbed, 11″ high—6¼″ wide at base.

The Gloucester

This Banjo model, although new in its general proportions, follows with artistic faith the lines of the clock so universally popular in colonial days. Desirable for apartments and rooms where mantel space is not available. Solid African mahogany case, except head which is laminated and mahogany veneer. 7″ dial is satin silver finish with raised scratch brush numerals. 32″ high, 9½″ wide, 4″ deep.

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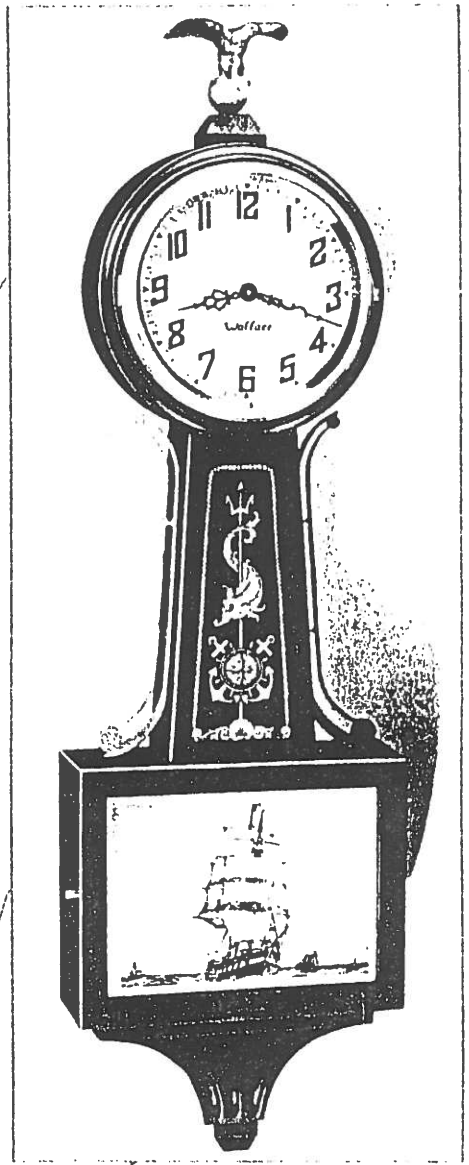
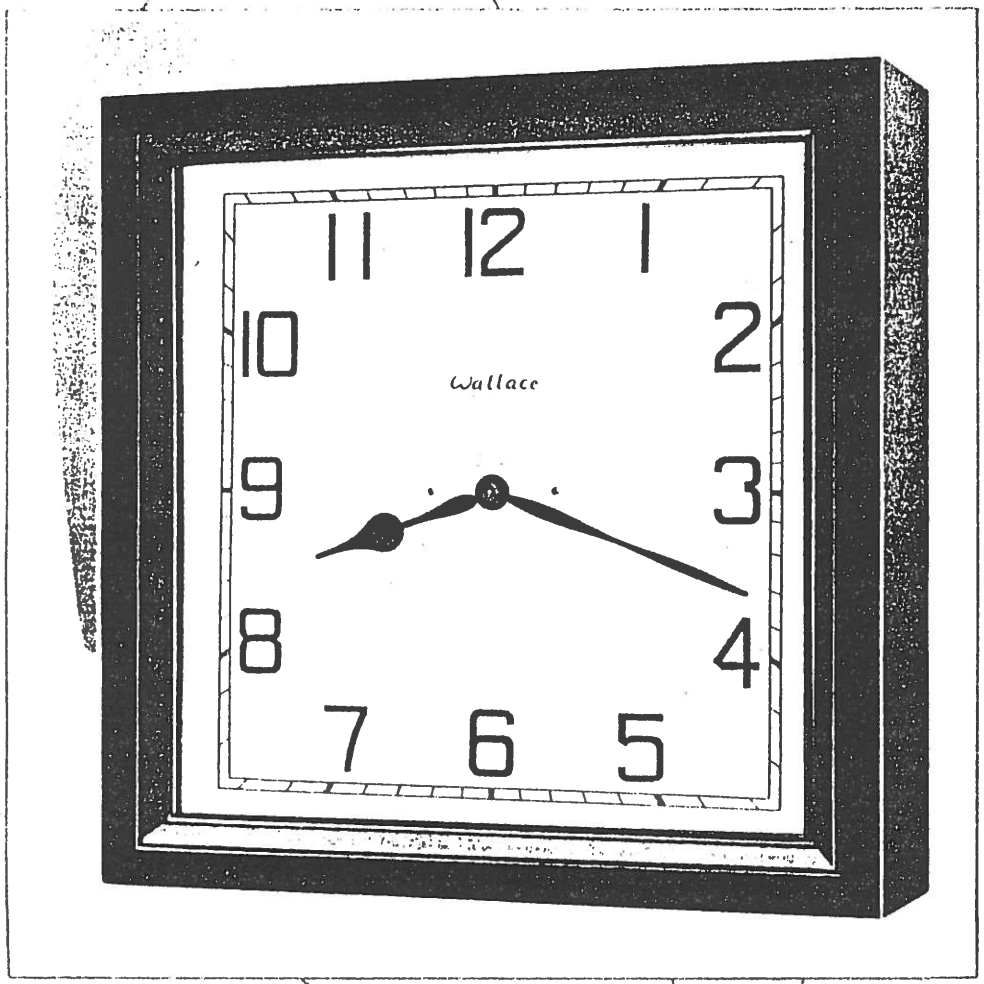




The Falmouth

This attractive wall model is characterized by its clean cut lines and maximum visibility. The case is of hardwood, mahogany finished or finished in white enamel as desired. Particularly suitable for offices, stores, factories, schools, hospitals and public buildings. White dial—jet black hands. 15″ wide, 16″ high and 3½″ deep.

*

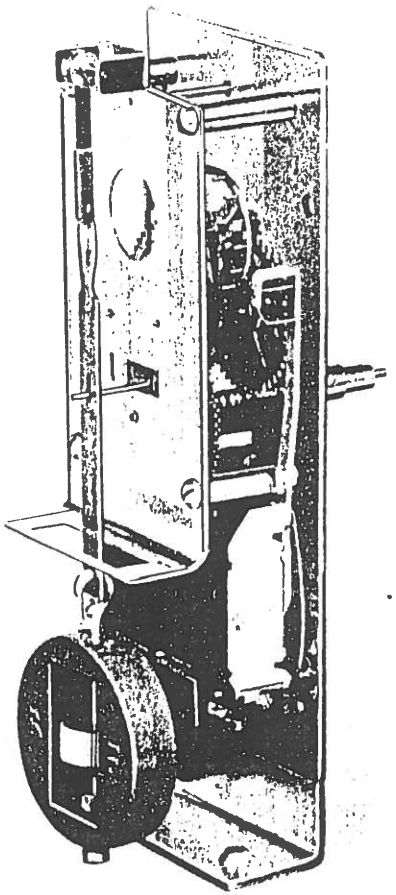
THIS is the precision built movement of all "WALLACE ELECTRICS": Engineered throughout * All gears machine cut * Bronze escapement * Non-pitting, positive acting contact points * Polished steel shafts and bearings * Micrometer adjustment of pendulum bob * Pendulum bar unresponsive to temperature changes.

* * *

Wallace Electrics

Need no winding * No wiring * No outlets * No synchronized central station power * Self contained, they can be moved anywhere * Two small flashlight batteries will operate a "WALLACE ELECTRIC" for one year or more.

* * *



International SECONDARY CLOCKS

BULLETIN No. 2

SECONDARY Clocks are used to tell the time in the various departments, offices, and rooms in public buildings, schools, banks and factories.

Secondary Clocks must reflect the accurate time-keeping qualities of the Master Clock in order to properly serve their purpose. Their correct construction is, therefore, proportionately as important as the construction of the Master Clock.

Secondary Clock mechanisms are comparatively simple to manufacture, but the fact remains that they must respond to the impulse of the Master Clock with absolute precision and at regular intervals. Any variation from this procedure will result in inaccurate time.

Polarized Movement Secondary Clocks

The Polarized Movement for secondary clocks is an exclusive International product. Its special features are that it is noiseless in operation; accurate and remarkably simple in construction. There are comparatively few parts in this movement; it operates on the principle of "direct drive" and is the most reliable and durable secondary clock manufactured.

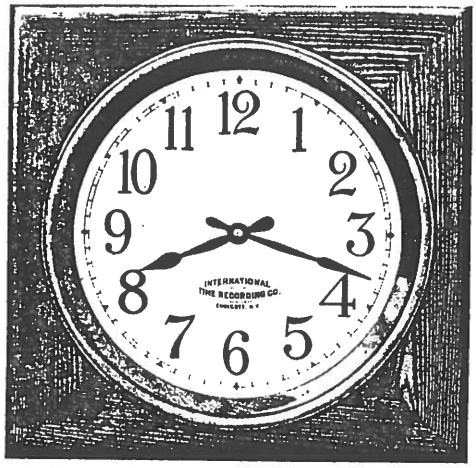
Ratchet and Pawl Secondary Movements

Our minute impulse ratchet and pawl secondary clocks are carefully and strongly built and render dependable and satisfactory service.

International Secondary Clocks are of highest quality throughout and are manufactured in a wide variety of designs, in both wood and metal cases, to meet all requirements of interior decoration and finish.

Secondary Clocks

NO. 1—Square wood cases with solid backs and hinged door fronts; protection glasses; white enameled metal Arabic dials; sloping dial rings; counter-balanced spade hands; minute interval



secondary movements; connectors and hangers. Furnished in dark golden oak, or in birch-mahogany. Furnished in special woods or finishes, if desired.

12″	dial size,	case	approximately	16″x16″x4″	deep
14″	"	"	"	19″x19″x4″	"
18″	"	"	"	24″x24″x4″	"
24″	"	"	"	32″x32″x4″	"

No. 3—Octagonal wood cases with solid backs and hinged door fronts; protection glasses, white

enameled metal Arabic dials; sloping dial rings; counter-balanced spade hands; minute interval secondary movements; connectors and hangers. Furnished in dark golden oak, or in birch-mahogany.

6″	dial size,	case	approximately	9″x 9″x4″	deep
8″	"	"	"	12″x12″x4″	"
12″	"	"	"	16″x16″x4″	"

No. 6—Round wall type spun metal cases; protection glasses; white enameled metal Arabic dials; sloping dial rings; counter-balanced spade hands; minute interval secondary movements with dust protection covers, connectors and hangers. Regularly furnished in black oxidized copper finish with buffed spots. Will be furnished in oxidized finish to match any shade of bronze or enameled to match any shade of wood at a small additional cost.

The case is made up in two parts. The back part is arranged to be firmly fastened to the wall with screws or bolts and the front part or bezel is then dropped into position on the back part. The clock

movement, dial, etc., are all assembled in the front part of the case. To get at the clock movement it is simply necessary to remove the front part.

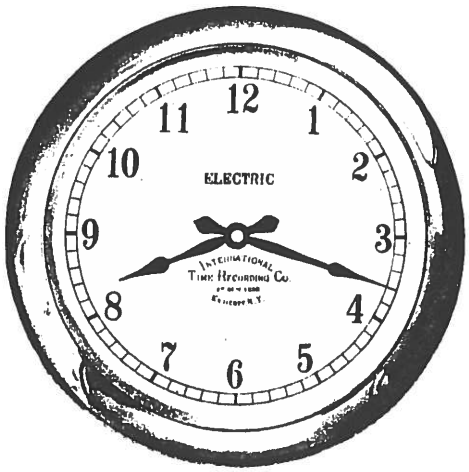
				dia.	deep
6″	dial size,	case	approximately	10″	x 3½″
8″	"	"	"	12½″	x 3½″
12″	"	"	"	16½″	x 3½″
14″	"	"	"	18½″	x 3½″
18″	"	"	"	23″	x 3½″
24″	"	"	"	30″	x 3½″

No. 7—Round flush type spun metal cases; protection glasses; white enameled metal Arabic dials; sloping dial rings; counter-balanced spade hands; minute interval secondary movements with dust

protection covers, connectors and hangers. Regularly furnished in black oxidized copper finish with buffed spots. Will be furnished in oxidized finish to match any shade of wood at a small additional cost.

The case consists simply of the front part or bezel of the clock and is arranged to be hung on two wall screws. These clocks require a wall opening approximately 7″ in diameter by 3″ deep. To inspect secondary movements it is simply necessary to remove the clock from the screws.

		dia.	deep
7″	dial size, case approximately	9½″	x 1½″
8″	" " " "	12″	x 1½″
12″	" " " "	16″	x 1½″
14″	" " " "	18″	x 1½″
18″	" " " "	21½″	x 1½″
24″	" " " "	28″	x 1½″



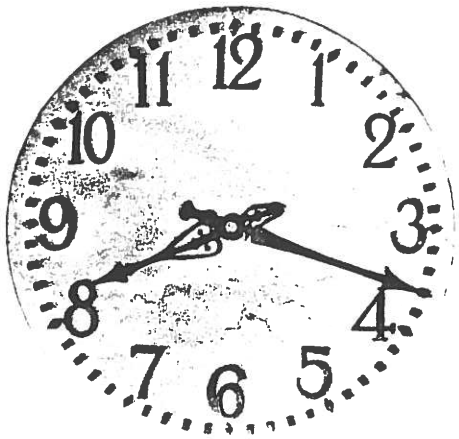
Nos. 12-16—Round cast bronze gauge type cases with screw bezels; protection glasses; silvered and etched Arabic dials; spade hands. Inside connectors and a bushed hole in back of case are regularly provided, but connectors on top or bottom of case will be furnished if so ordered. No hangers are provided, but holes are drilled in back flange for fastening to wall or switchboard. These holes can be omitted if so ordered.

These clocks can be furnished in 8″, 10″ and 12″ dial sizes as follows:

No. 12—Gloss black finish, polished bronze bezel.
No. 13—Gloss black finish, polished nickel bezel.
No. 14—Polished bronze case and bezel.
No. 15—Polished nickel case and bezel.
No. 16—Black marine (dull black) case and bezel.

Marble Dial Secondary Clocks

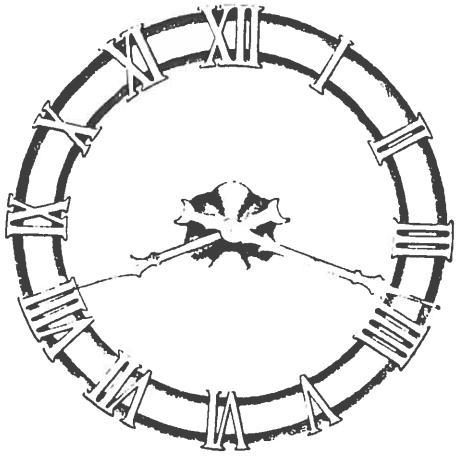
Marble dial secondary clocks are furnished with either Arabic figures or Roman numerals. These figures or numerals can be furnished either in cast bronze pinned to the dials or can be etched into the surface of the marble and filled with weatherproof black. The hands can be either fancy, as shown in the illustration, or our standard spade



design. These hands can be finished to match the raised bronze numerals or finished in black to match the etched numerals. The minute circle and diamond points can be omitted if desired.

The dials are regularly furnished to be held in place by means of screws fastened through either four or six of the diamond points. Large size dials are furnished with a removable center to permit of easy access to the secondary movement. This removable center is always outlined with a bronze ring about 8″ in diameter. The secondary movement is regularly attached to the back of the marble dial.

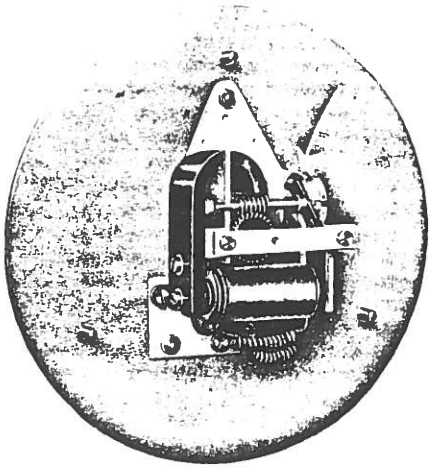
Dials can be furnished in any standard marble. If special moulding or bronze ring is desired around



the dial, this should be provided in the construction of the building.

A request for prices on marble dials should contain the following information:

Kind of marble required; diameter of the marble disc; are Arabic figures or Roman numerals to be furnished; are numerals to be of cast bronze or etched and filled in black; are hands to be standard



spade hands or fancy hands; are hands to be finished black or to match bronze numerals?

Double Dial Secondary Clocks

Double dial secondary clocks are regularly made by fastening two single dial clocks back to back and providing a suitable means of support. As this support should conform with the building trim at the location where the clock is to be used, it is essential that the support be either provided in connection with the building or a drawing of the design desired submitted in connection with requests for prices or information.

Large Clock Dials

Large clock dials and clock dials having hands exposed to the weather should be operated by our motor clock drive. This drive consists essentially of a small motor and a system of reduction gearing, all contained in a metal case approximately twelve inches high by ten inches wide and six inches deep, having a hinged door and equipped with lock and keys. The motor drive mechanism is arranged to be operated in connection with a control cabinet.

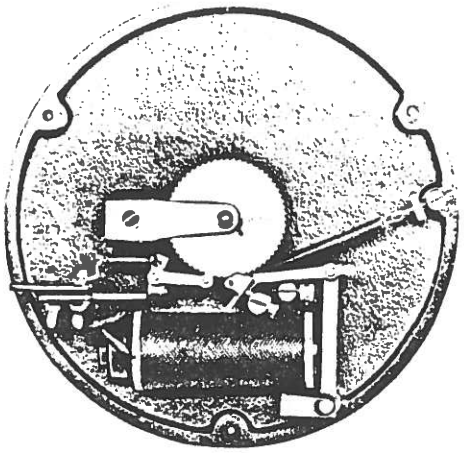
Polarized Secondary Movements

The International Polarized Secondary clock movement was designed to meet the demand for an electric clock system absolutely noiseless in operation, accurate and durable, and is the simplest mechanism ever developed for driving clock hands.

The cut opposite shows the movement exposed. The electric impulse of the master clock causes the revolving armature, indicated by arrow, to advance the clock one minute, the interlock mechanism and armature being designed to make this operation positive and noiseless.

Some of the advantages of the International Polarized Secondary movement are as follows:

1. Absolutely noiseless in operation.
2. The hands are moved forward by a progressive motion, eliminating sudden stops and vibration.
3. Simple and rugged construction.
4. Wide range permissible in the operating voltage. Movements will operate at 50% drop or 100% increase in battery voltage.
5. Variations in master clock contact duration do not affect operation of the mechanism.



Ratchet And Pawl Secondary Clock Movements

The International Ratchet and Pawl Secondary movement (illustrated above) is simple in design, accurate and durable. The movement is assembled on a heavy cast iron base, which insures its operation with the minimum amount of attention.

The whole design of this movement is such as to permit of its being installed behind a clock dial where it will operate year after year without oiling, adjusting or other attention of any kind.

International PROGRAM DEVICES

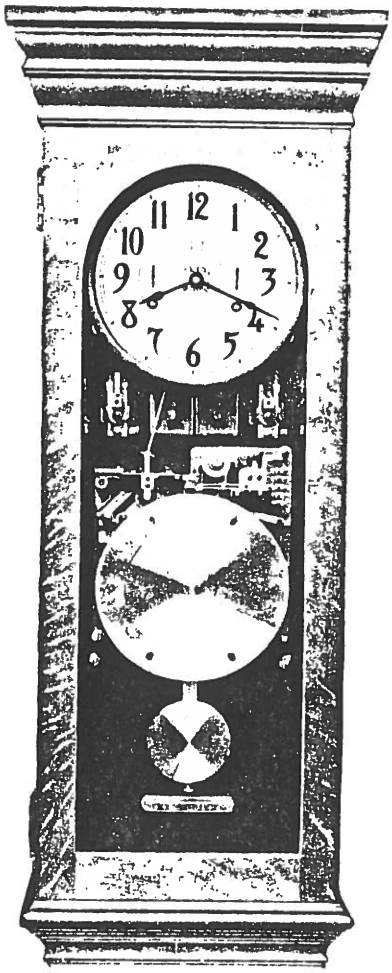
BULLETIN No. 3

PROGRAM DEVICES are used to ring bells and gongs and to sound other signals according to scheduled requirements, also to eliminate non-working periods in manufacturing operations. They are very generally used today in schools, factories, and other places, where signals are used for starting and stopping meetings, classes, operations of manufacture, etc.

We manufacture two basic types of program devices, the Universal Disc and the Wheel Type. Both of these devices are of metal construction throughout and they are exclusive International products, and are either key wound or electrically operated.

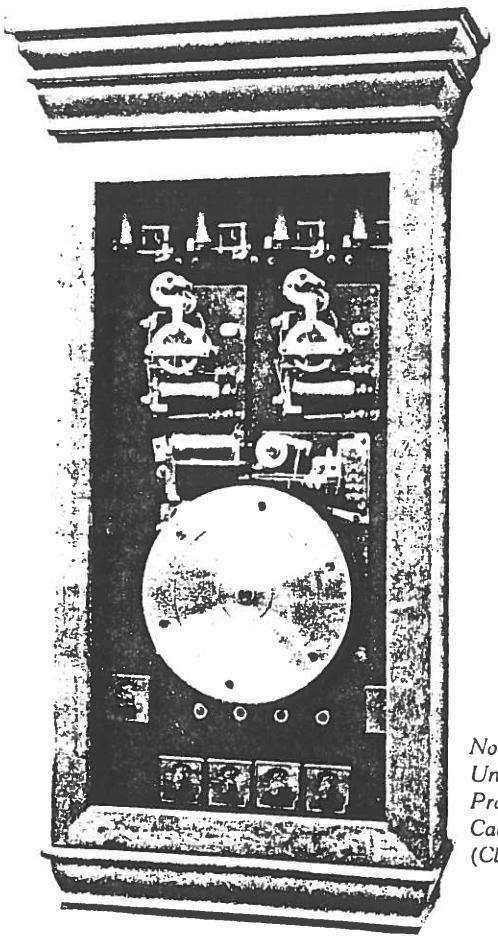
Our Universal Program Device contains special features and renders reliable service far in advance of ordinary types of program machines. Our disc principle of construction enables us to meet all requirements as to frequency of signals and the number of schedules to be handled. Any number of bells or signals can be controlled to operate according to any desired combination of schedules. The flexibility of the instrument, in these respects, is practically unlimited. Under some conditions, it may be necessary to frequently change signal schedules, and the rapidity and ease with which this can be accomplished has found great favor with our users. It is not necessary to call an electrician or mechanic, but an inexperienced person can readily adjust the machine and change the signals to any desired schedule.

Our Wheel Type Program machine is designed to meet the requirements of simple program schedules, and for this special purpose the service rendered is ample and entirely satisfactory. In both types the quality of construction of the clock movement, the program mechanism, and the case, is high grade in all details.



Universal Program Cabinets—(*Electric*)

For Schools, Colleges, Institutions, Factories, etc.



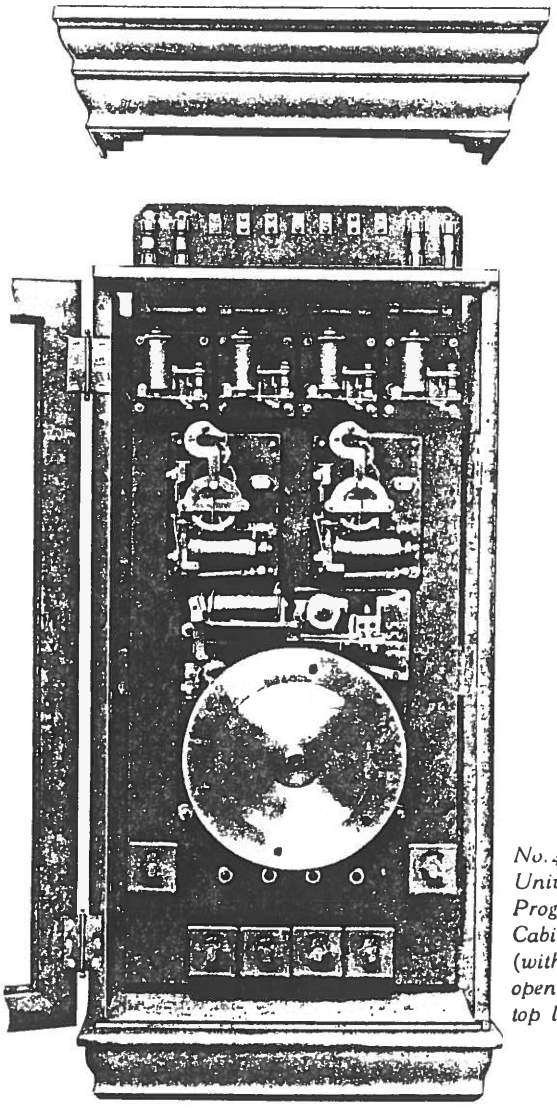
No. 4-2-12 Universal Program Cabinet (Closed)

International Multiple Connector Board

THIS line has been planned to meet the present day demand for a STANDARDIZED PROGRAM UNIT constructed in accordance with modern electrical requirements and that is flexible in use and also provides for future enlargements and changes. The basis of this line is the International Universal All Metal Minute Interval Program Machine, built of heavy metal throughout and designed to do its work powerfully and positively with absolute precision.

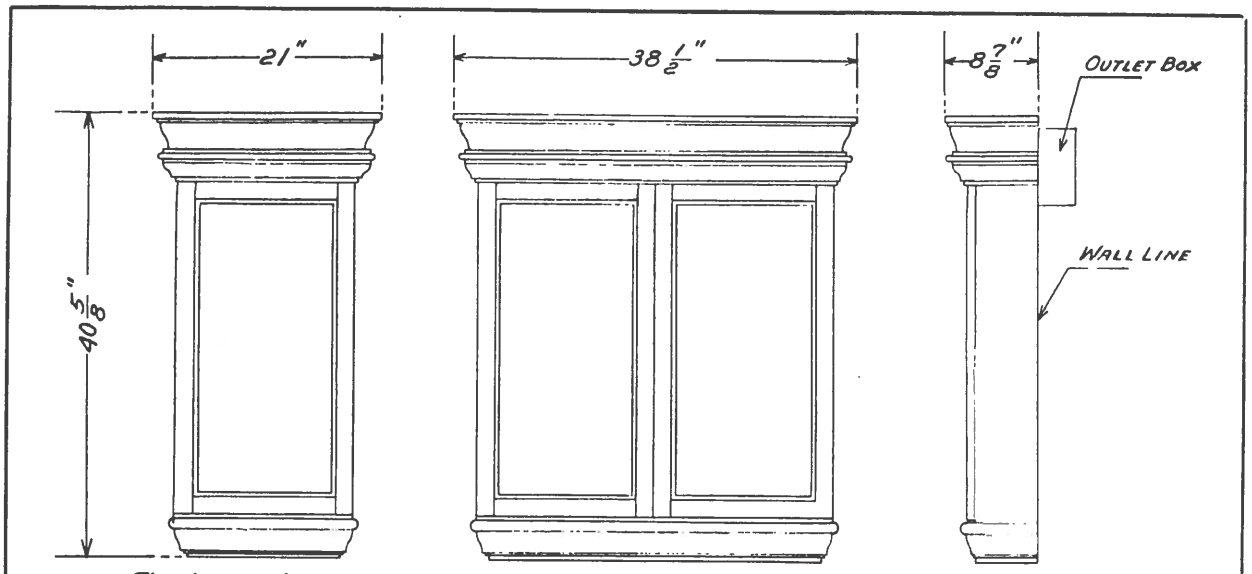
This machine consists essentially of a heavy drum made up of a series of brass discs about ten inches in diameter by one-sixteenth of an inch thick, with radial slots around their circumferences at minute interval spaces. The program schedules are made up by inserting metal clips into these slots wherever signals are wanted. An inexperienced person can readily insert these clips and make changes in the program schedules.

The electric current is not carried through or grounded on the machine. It is handled entirely by a set of contactors arranged to be closed by the metal clips carried by the drum. These contactors are made of a special non-corrosive contact metal that insures practically a dead closing of the electric circuit when the clips come into position.



No. 4-2-12 Universal Program Cabinet (with door open and top lifted)

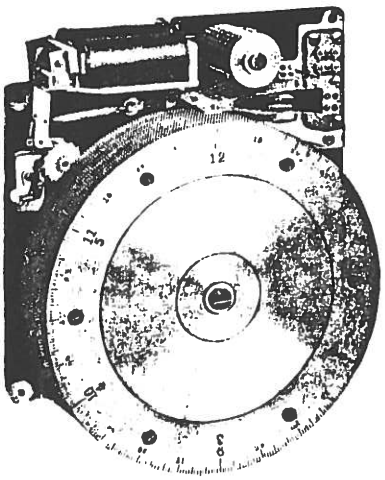
Each disc in the machine takes care of six hours of time. This means that a morning schedule of signals can be set up on one disc, an afternoon schedule on a second disc, and an evening schedule on a third disc. If signals are wanted between midnight and 6 a. m., they can be set up on a fourth disc. Each disc carries



The above are front and side views of the Universal Program Cabinet giving overall dimensions and showing the location of the outlet box

a six-hour seven-day calendar device for automatically throwing the disc in or out of operation for six-hour periods whenever desired during the seven days of the week. Special schedules can be set up on extra discs and automatically cut in whenever required.

These machines are built in two sizes, eight disc and twelve disc, the only difference between them being in the number of discs they contain. The calendar devices are set to shift at 6 a. m., 12 noon, 6 p. m. and 12 midnight. The shift is adjustable for throwing the even signals at these points into either the preceding or the following six-hour schedules. Any disc can be cut in on any six-hour period regardless of whether it is morning, afternoon or night time.

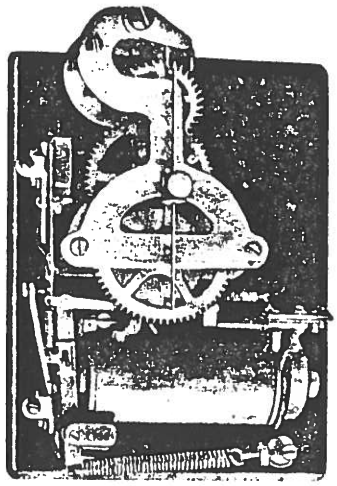


Universal All Metal Program Machine, Electric Drive Type

The cabinets in which these machines are installed are made of wood and trim to correspond with our master clock cases. The backs of these cabinets contain removable instrument panels of fibre asbestos board and the tops are removable to permit of easy access to connectors, fuses, etc. The instrument panels extend up into these removable tops and all the apparatus on the panels is back wired to the connectors at the top. This simplifies the installation of the equipment and provides for future changes.

Besides the program machine, each cabinet contains a relay for each circuit, a signal duration timing device, a multiple connector board for connecting the bell circuits to the relays, and the necessary switches, push buttons, fuses, connectors, etc., to make the cabinet a complete program controlling unit for either manual or automatic operation.

When the signal duration desired is the same on all circuits, only one timing device is required. If, however, one of the circuits controls outside gongs, a whistle, or the like, requiring a signal of ten to twenty seconds duration, this circuit must be equipped with its own timing device. Universal Program Cabinets are therefore made up with either one or two timing devices.



International Signal Timing Device

The timing devices are of the clock escapement type and are adjustable from one to twenty seconds signal duration. They close the bell circuits immediately after the minute impulse lets

go, thereby avoiding the throwing of bells onto the battery while clocks or the like are drawing current. This is a very important feature because bells often use so much current that they pull the voltage of the battery down enough to scatter the clocks. Our timing device is arranged to absolutely prevent this at all times.

For large installations and for installations where it is frequently necessary to change bells from one program schedule to another, our Cross Connecting Panel should be used. This is a small board with hinged glass door front. It consists of drilled and tapped brass strips mounted on fibre asbestos board and uses small knurled screws for shifting bell connections. No tools are required, the screws being easily shifted by the fingers. If it is desired, this board can be arranged with an individual push button for each bell. It is then called a Cross Connecting and Push Button Panel. It must be ordered separate from the program cabinet.

A multiple connector board for connecting the individual bell circuits to the relays, is regularly installed in the top of the program cabinet. Where a large number of bells are connected to one relay, it may be necessary to connect as many as two or three wires under one screw, but as these boards are used only where changes are infrequently made, this is not a hardship. A separate connector is provided across one end of the board to take care of the common return wires from the bells.

International Universal Program Cabinets are regularly made up in the following capacities:

No. 1-1-8 will ring eight different six-hour schedules on one bell circuit.

No. 1-1-12 will ring twelve different six-hour schedules on one bell circuit.

No. 2-1-8 will ring four separate six-hour schedules on each of two bell circuits with the same signal duration on each circuit.

No. 2-2-8 will ring four separate six-hour schedules on each of two bell circuits with a different signal duration on each circuit.

No. 2-1-12 will ring six separate six-hour schedules on each of two bell circuits with the same signal duration on each circuit.

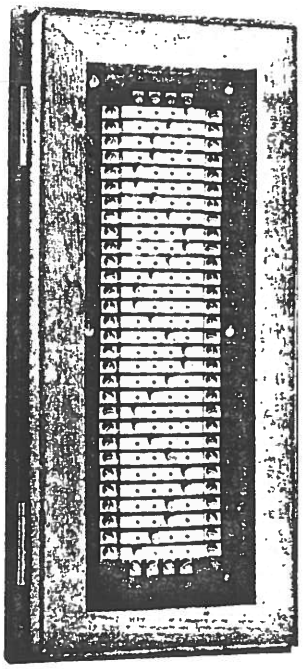
No. 2-2-12 will ring six separate six-hour schedules on each of two bell circuits with a different signal duration on each circuit.

No. 3-1-12 will ring four separate six-hour schedules on each of three bell circuits with the same signal duration on each circuit.

No. 3-2-12 will ring four separate six-hour schedules on each of three bell circuits with a special signal duration on one of the circuits.

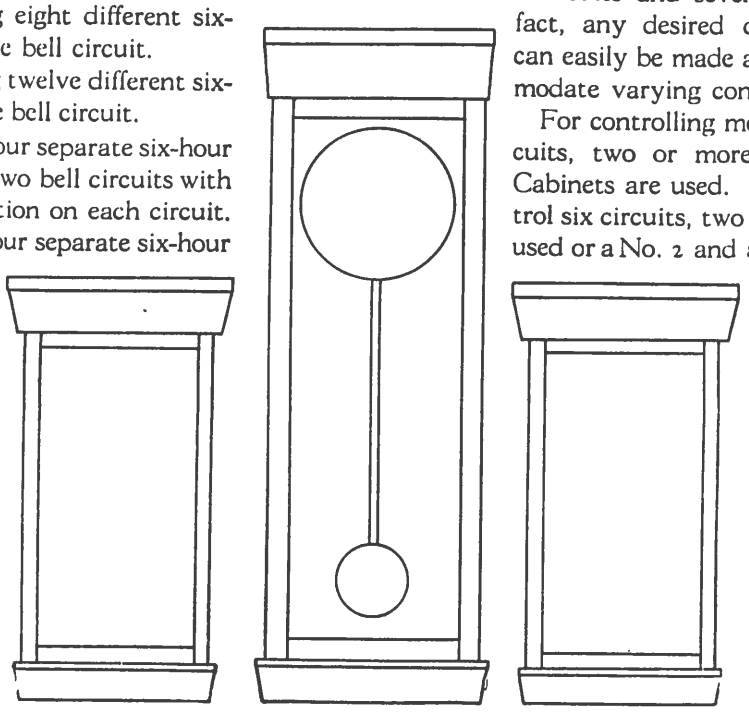
No. 4-1-12 will ring three separate six-hour schedules on each of four bell circuits with the same signal duration on each circuit.

No. 4-2-12 will ring three separate six-hour schedules on each of four bell circuits with a special signal duration on one of the circuits.



International Cross Connecting Panel

It is not necessary that the program machine discs be divided evenly between the bell circuits as given above. The connections on the machine can easily be shifted to throw more discs on to some circuits than on others. For example, a No. 2-1-12 cabinet can be set to handle five six-hour schedules on one of the circuits and seven on the other. In fact, any desired combination of discs can easily be made at any time to accommodate varying conditions.

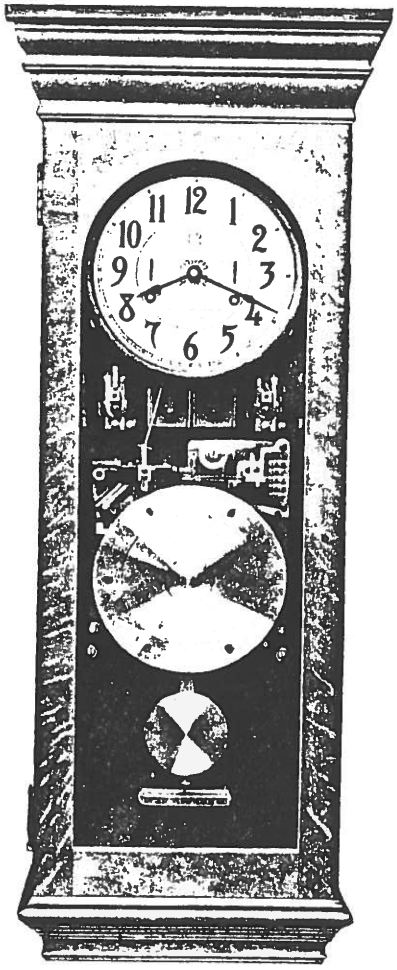


For controlling more than four bell circuits, two or more Universal Program Cabinets are used. For example, to control six circuits, two No. 3 cabinets can be used or a No. 2 and a No. 4. Such combinations will be furnished in double or triple cabinets instead of single cabinets, if so ordered.

Secondary clock control apparatus can be installed in cabinets similar to these program cabinets. This makes it possible to lay out a uniform clock and program system control.

Universal Program Clocks

(Key Wound)



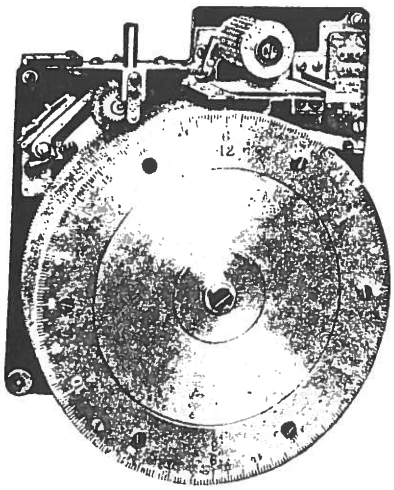
THIS program clock is designed to meet the demand for an inexpensive program control for one or two circuits that will handle complicated minute interval schedules *without the use of batteries.* The program machine is mechanically driven by a heavy double spring clock movement of the recorder type. The distribution relays are of the universal type and handle the bells directly from the commercial lighting service. If this service is alternating current, a transformer can be used to step the voltage down, if desired, to reduce the cost of bells and wiring. The clock is constructed in accordance with the Fire Underwriters' requirements for voltages not exceeding 250 volts.

This machine consists essentially of a heavy drum made up of a series of brass discs about ten inches in diameter by one-sixteenth of an inch thick, with radial slots around their circumferences at minute interval spaces. The program schedules are made up by inserting metal clips into these slots wherever signals are wanted. Even an inexperienced person can readily insert these clips and make changes in the program schedules.

The electric current is not carried through or grounded on the machine. It is handled entirely by a set of contactors arranged to be closed by the metal clips carried by the drum. These contactors are made of a special non-corrosive contact metal that insures practically a dead closing of the electric circuit when the clips come into position.

Each disc in the machine takes care of six hours of time. This means that a morning schedule of signals can be set up on one disc, an afternoon schedule on a second disc and an evening schedule on a third disc. If signals are wanted between midnight and six a. m., they can be set up on a fourth disc. Each disc carries a six-hour seven-day calendar device for automatically throwing the disc in or out of operation for six-hour periods whenever desired during the seven days of the week. Special schedules can be set up on extra discs and automatically cut in whenever required.

These machines are built in two sizes, eight disc and twelve disc, the only difference between them being in the number of discs they contain. The calendar devices are set to shift at 6 a. m., 12 noon, 6 p. m. and 12 midnight. The shift is adjustable for throwing the even signals at these points into either the preceding or the following six-hour schedules. Any disc can be cut in on any six-hour



Universal All Metal Program Machine
Clock Drive Type

period regardless of whether it is morning, afternoon or night time.

A signal duration timing device is contained in the program machine itself. It is adjustable from two to twenty seconds signal duration.

The program machine, relays, switches, push buttons, etc., are all mounted on a fibre asbestos instrument board. The circuit connectors and fuses are located in the top of the case and the wiring between the instrument board and the connectors is carried in metal conduit.

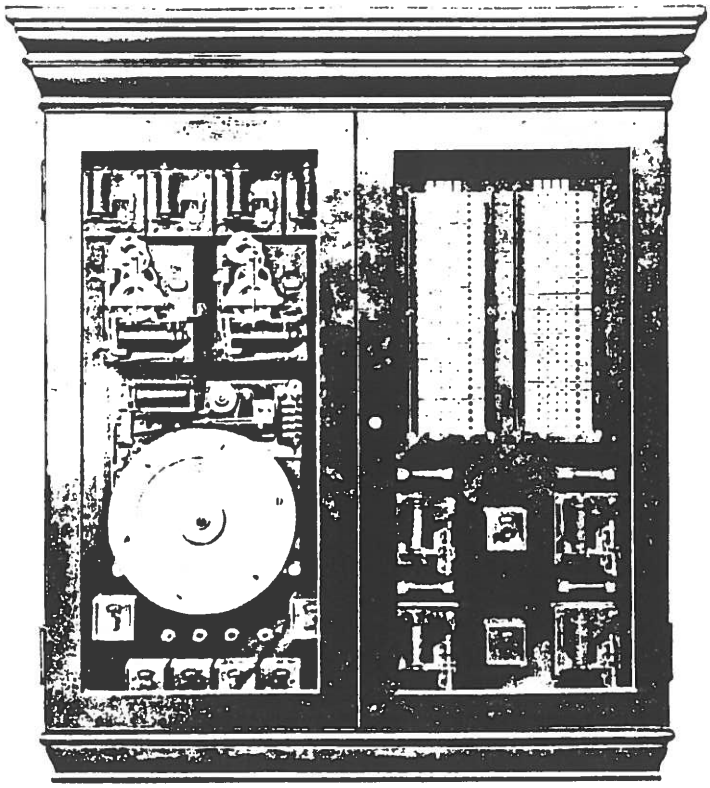
No. 1-8 will ring eight different six-hour schedules on one bell circuit.

No. 1-12 will ring twelve different six-hour schedules on one bell circuit.

No. 2-8 will ring four different six-hour schedules on each of two bell circuits.

No. 2-12 will ring six different six-hour schedules on each of two bell circuits.

It is not necessary that the program machine discs be divided evenly between the bell circuits as given above. The connections on the machine



Universal Program and Clock Distribution Cabinet. Highest grade electrically-driven program and clock control apparatus obtainable. Made up in any necessary combination

The clock movement is a heavy, double spring, eight-day, key wound recorder type with Graham dead-beat escapement and 2½-pound, 72-beat brass bob pendulum.

The case measures approximately 48" x 18½" x 9" and is furnished in dark golden quartered oak or birch-mahogany, as desired. It has a 10" silvered clock dial with black Arabic figures, minute marks, and makes a very presentable appearance. It is an excellent timepiece.

Universal Program Clocks are furnished in the following capacities:

can easily be shifted to throw more discs onto one circuit than on the other. For example, a No. 2-12 clock can be set to handle five six-hour schedules on one circuit and seven on the other. In fact, any desired combination of discs can be made at any time to accommodate varying conditions.

The movement in these program clocks can be equipped with a minute interval contact for the control of secondary clocks and the like, through our type "B" enclosed relay or one of our master relay cabinets. However, a battery must be provided for the operation of such secondary apparatus.

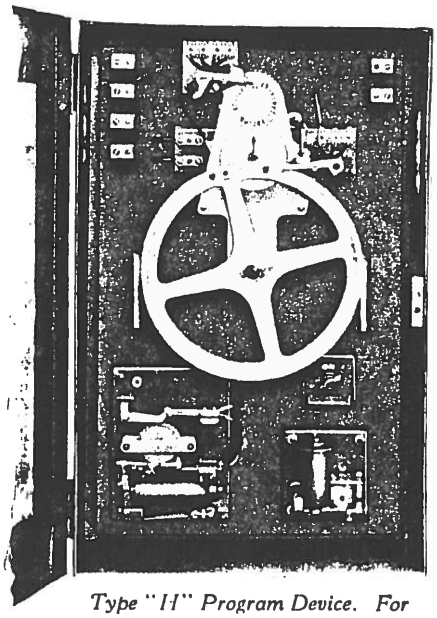
Wheel Type Program Devices

(*Electric*)

All Program Devices are contained in metal cases with hinged doors

Type "H" Program Device. For elimination of non-working hours

THIS device is fitted with a program wheel (with calendar) with two sets of contacts wired to control one "make and break" relay and one carbon relay. This wheel is adapted to permit master clock contacts to operate under the control of the program during certain parts of the day and to omit such operation during other parts of the day. It is especially adapted to the control of working schedules on job time recorders. It will permit two different schedules operating the one set of devices and will permit of any six-hour period of either or both to be omitted or not, as desired.



Type "H" Program Device. For elimination of non-working hours

Type "C" Program Device. For two-color ribbon change and elapsed time control

This program wheel is fitted with a calendar arrangement and with two sets of contacts (two circuits) wired through and controlling one carbon relay. Owing to this arrangement, a variable schedule is possible. An example will illustrate. Suppose the relay is required to close at 7:00 a. m., 12:00 noon, 1:00 p. m. and 4:58 p. m. every day but Saturday. On Saturday it is required to close at 7:00 and 11:50 a.m. and to be silent during the afternoon of Saturday and all day Sunday. This device will permit this schedule.

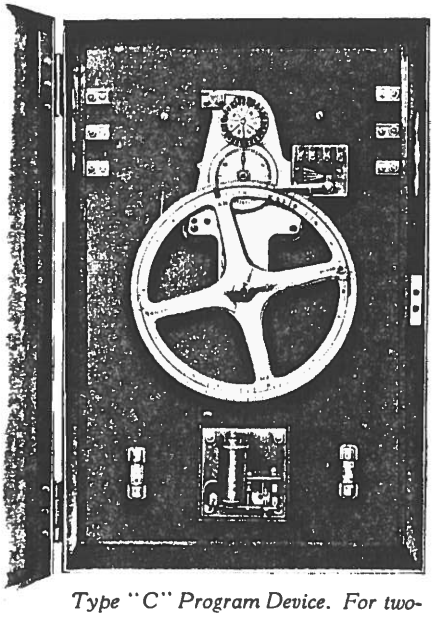
It will permit of two schedules being set on the wheel and any six-hour period of either or both of these to be omitted.

Type "L" Program Device. For operation of signals

The object of this device is simply to give a prolonged impulse (which may be altered in duration) at certain hours of the day.

This device is like Type C except for the addition of the timing relay.

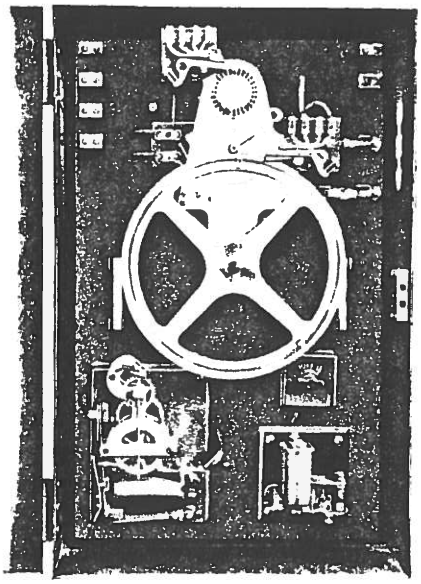
Everything said in connection with Type C applies to this device except the duration of the contact supplied by the program device to the controlled circuit.



Type "C" Program Device. For two-color ribbon change and elapsed time control

NOTE: The electric program devices here illustrated and described are representative of a complete line of such devices designed to handle any and all requirements of program schedules, most of them larger and covering more complicated schedules.

Information regarding other devices will be furnished upon request.

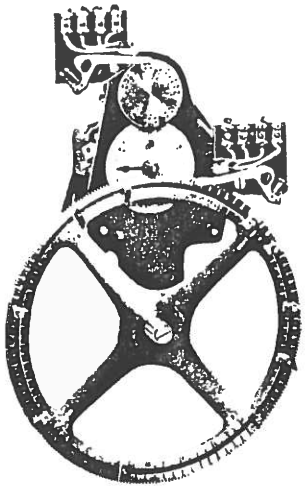


Type "L" Program Device. For operation of signals

Wheel Type Program Clocks *(Key Wound)*

THIS program clock is designed to meet the demand for a simple program control that will handle a limited number of signals on one or two circuits *without the use of batteries*. The program device is of the wheel type and is mechanically driven by a heavy double spring clock movement of the recorder type. The distribution relays are of the universal type designed to handle the bells from 11-volt alternating current from a transformer. The bells can be rung from dry cells provided the voltage does not exceed twelve volts.

The wheel type program device consists essentially of a brass wheel about ten inches in diameter with a slot turned into it near its outer edge for fastening metal lugs wherever it is desired to ring bells. Signals can be rung one minute apart, but as the



Wheel Type Program Device

lugs are heavy, the device is not adapted for use where a large number of signals are required or where frequent changes in the schedules are to be made. The International Universal Program Clock should be used in such cases.

A signal duration timing contact adjustable from one to ten seconds is provided on the clock movement. The program device carries a six-hour seven-day calendar attachment for silencing bells on Saturdays, Sundays, nights or any morning, afternoon or evening of the week.

The clock movement is a heavy, double spring 8-day, key wound recorder type with a 2½ pound 72-beat brass bob pendulum. If desired, this movement can be equipped with a minute interval contact for the control of secondary clocks and the like, through one of our type "B" enclosed relays or one of our master relay cabinets. However, a battery must be provided for the operation of any such secondary apparatus.

This program clock measures approximately 48" x 18½" x 9" and is furnished in dark golden quartered oak, or birch-mahogany, as desired. It has a 10" silvered clock dial with black Arabic numerals, minute marks and makes a very presentable appearance. It is an excellent timepiece.

Key Wound Wheel Type Program Clocks are furnished in two capacities as follows:

No. 1 will control one circuit of bells and will furnish a different schedule on Saturday from other days of the week. The schedules cover the full twenty-four hours of the day.

No. 2 will control two circuits of bells with a different schedule on each circuit. It will not furnish a Saturday schedule different from other days of the week. The schedules cover the full twenty-four hours of the day.

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THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78 NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XX, #4, DECEMBER 1994

Fellow Horologists:

This issue contains the ITR bulletins covering their AC and DC charging devices and a discussion of magnet design as regards coil and core sizes for clock solenoid use. In spite of the fact that the material dates from 1919, the theoretical concepts are just as valid today. We tend to think that technology with origins a half century old is out of date and should be replaced with the latest thinking and state-of-the-art concepts, but scientific data along with corresponding proofs, for the most part, still stand as truths in our modern, hi-tech society.

The second part of this journal really provides us with a touch of nostalgia with an insight into the personality of Shelby S. Besore, the inventor of the NATIONAL SELF-WINDING CLOCK. We include copies of his 1912 patents, the instructions for set-up, (including reference to the use of a mercury-type switch) and copies of a hand-written letter dated June 28, 1915. The letter in its original form is somewhat difficult to read, and our Chapter Historian, Dr. George Feinstein took the time to typewrite a reproduction for easier understanding. Mr.Besore it seems, ran into difficulty in realizing any financial gain from his invention, and offered to swap the clock patents for "a yaller dog"...

Since this is our final issue of the journal for 1994, it's time for dues again, still unchanged at only $10/year. We all know that costs continually increase, and with an increase in postage looming on the horizon, this may be the last year at our bargain membership price of only $10. In accord with the chapter policy, all Mart ads that have not been renewed will be removed from the next issue. Please advise if you wish to update, modify, or otherwise change your insertion. This is YOUR journal... Mart ads are free, and your participation is welcome, so use it!

Your officers and editorial team wish you a Joyous Holiday Season and many Happy Days in the New Year.

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Engineering Bulletin

No. 5 International Time Recording Co., of N. Y. ENDICOTT, N. Y. July 15, 1919

What Size Should the Electro Magnet Be?

By J. W. Bryce, Supervising Engineer

J. W. BRYCE

It is the accepted practice in mechanical and electrical work to proportion the driving shaft of a machine or a driving motor, to the size of the device to be operated or the amount of power that the device requires for its operation. This general plan should of course be followed in the construction of time recorders. No one would think of putting a clock spring in a watch and similarly the size of the magnet for driving a clock movement, or time recording device should bear some reasonable proportion to the amount of work required. It is also a fact that the larger the mass of metal to be moved or the larger amount of winding in coils, etc., the more sluggishness in the action of the device.

The question has often been raised as to whether or not the electric magnets furnished on our time recorders are of sufficient size for certain operations. Numerous tests of the pulling power of these magnets have shown that the size is amply large for present requirements.

A further question has been brought up as to whether or not the time of closure of the master clock contact is long enough. In order to get a comparison of the action of the I. T. R. magnets and others for similar purposes, tests have been conducted in the laboratory with the following result.

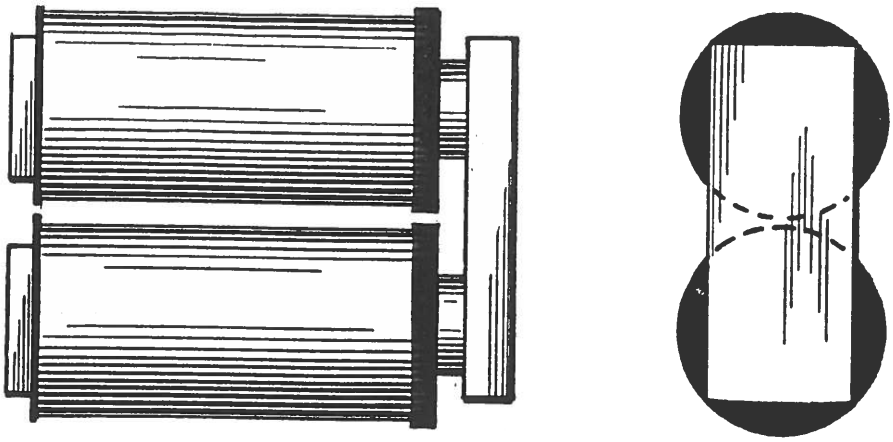


Fig. 1.

For the test an I. T. R. magnet of 95 ohms resistance designed to operate apparatus on 12 volts was used as shown by Fig. 1 and this was compared with an electro magnet of a time recording device of another make. The dimensions of the I. T. R. magnet are shown by Fig. 1 as it is full size. Its electrical characteristics were resistance 95 ohms, inductance 4.25 Henries, and for E. M. F. of 12 volts. Its electrical measurements were 52.3 ohms, inductance 3.66 Henries and for E. M. F., 10 volts. The inductance tests were made by means of alternating current and the time constant of the coils was calculated by Helmholtzs' Law. Fig. 2 is the larger magnet of another make, this is also full size.

When a contact is closed it is true that the electricity flows instantaneously in all parts of it, provided the circuit is noninductive. An electro-magnet is inductive, and when the circuit is closed current immediately starts to flow and it rapidly but gradually rises to its ohm's law value. It does not obtain its ohm's law value instantly. Other things being equal the greater the inductance, the longer it takes for the current to attain its full value. That is to say, if voltage and resistance is the same, the greater the inductance the slower the magnet. Inductance is measured in Henries just as resistance is measured in ohms.

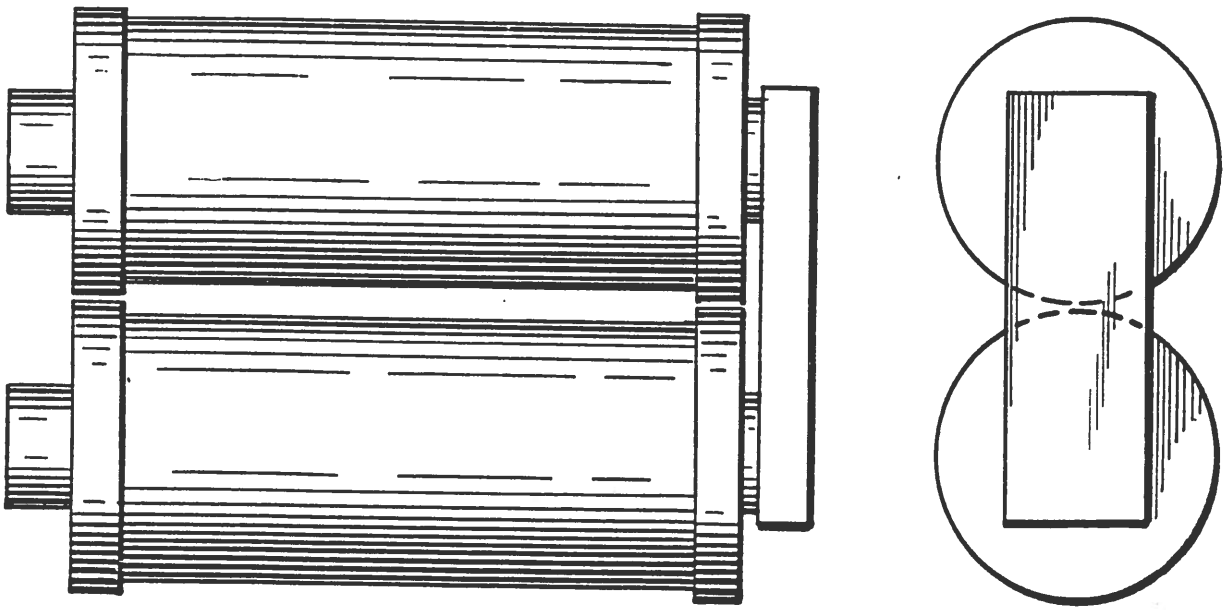


Fig. 2.

This characteristic of magnetic circuits, therefore, shows the importance of keeping down inductance if a quick acting magnet is required and its importance in relation to the other quantities involved. It is not alone necessary to have an electro-magnet but to have one properly designed for the work it is to do. Inductance cannot be done away with but it is desirable to keep it proportioned to the quantities and use magnets preferably no larger than necessary.

While it is true that time recording devices do not require very quick acting magnets, it is also true that a longer contact should be maintained to insure operation of devices where the magnets are slow acting as larger ones usually are.

The following table shows the amount of current flowing in each magnet after the closure of the circuit for each of the first 10-100 of a second and then every 5-100 until approximately full current is flowing.

Table showing rise of current in coils of magnets tested.

Time in seconds after closure of contact	Current flowing in coils of magnets, I. T. R. magnet	Current flowing in coils of magnets, larger magnet
.01	.025	.025
.02	.045	.047
.03	.063	.066
.04	.073	.082
.05	.084	.096
.06	.092	.109
.07	.099	.119
.08	.104	.129
.09	.109	.137
.10	.112	.144
.15	.121	.168
.20	.124	.179
.25	.125	.185
.30		.188

It should be noted that the current in larger magnet having to rise to a greater <u>total</u> quantity, the <u>percentage</u> of current at any interval that is given above is actually <u>less</u> than that in the smaller magnet.

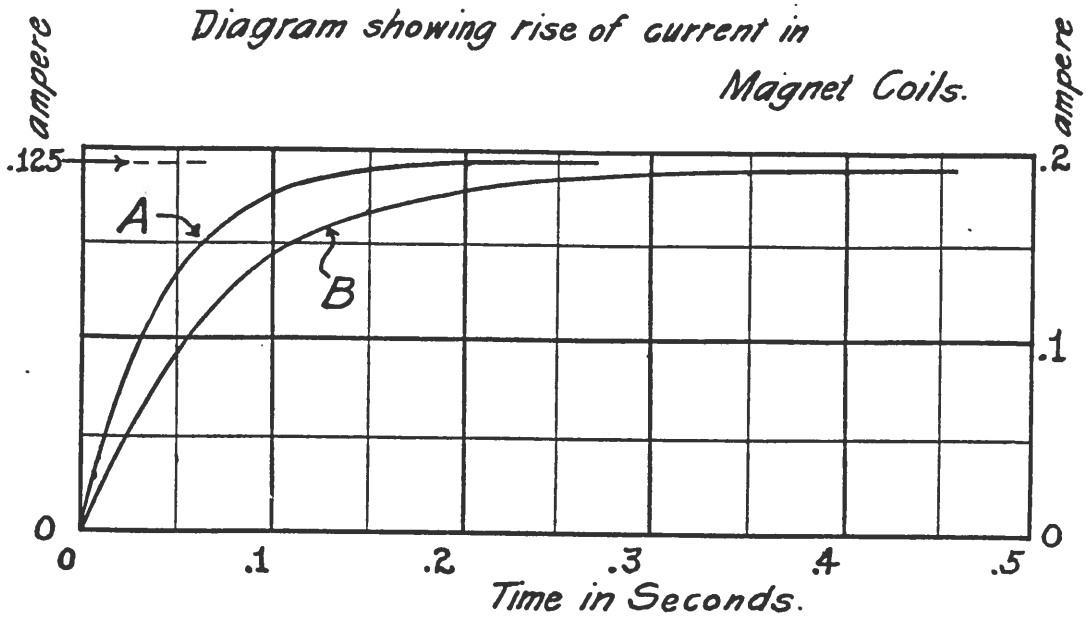


Fig. 3

The curves shown in Fig. 3 illustrates graphically the result shown in the table. "A" is the curve showing the rate of rise in the current of the I. T. R. magnet coil and "B" the rate of rise in the coil of the other magnet. From these curves it will be seen that approximately one tenth of a second after the circuit is closed the current in the I. T. R. magnet has risen almost to its Ohm's Law value and, therefore, the pulling power of the magnet has almost reached its maximum. From curve "B" it will be seen that the larger magnet takes approximately two tenths of a second to reach the same proportionate level. It will also be seen that the I. T. R. magnet is using a maximum of .126 amperes using 12 volts (1.512 watts) to operate a recorder, whereas the larger magnet of the other device requires about .191 amperes at 10 volts (1.91 watts) which is a considerably larger amount of power. It will, therefore, be seen that the I. T. R. magnet is quicker acting so that if the master clock contact is closed for a short time, the magnets have ample time to act. It is to be noted that when the circuit is closed to the magnet, in addition to the several one hundredths of a second for the current to rise to the full value, there is also the inertia of the armature and mechanism to be overcome before the armature can move up and come in position to turn the type wheel, therefore, any closure of less than five tenths of a second is apt to cause the loss of an impulse to the recorder.

Due to the construction of the I. T. R. magnets pointed out in a previous bulletin, by use of the square pole pieces and the style of the transfer used on the I. T. R. recorders it is permissable to use comparative small magnets and it permits the use of the minimum amount of current for the minimum length of time. Minimum current means the minimum sparking on relay points. Minimum time current is on means, minimum consumption in ampere hours of the battery and, therefore, smaller battery necessary for a given amount of apparatus. Of course magnets may be made too small for their work and when they are reduced in size to a point where the loss of space due to insulation etc., becomes too great, it will take more current to operate, than it would the larger magnets so the proper size for these magnets has to be determined by calculation and a number of experiments conducted to check up these calculations.

The specimen magnets tested were selected at random and used simply to illustrate the axiom that the larger and more sluggish the magnet the longer the contact necessary to properly energize it and to illustrate that the contacts of I. T. R. master clock when properly set(giving a contact of approximately 1 second) is amply long to permit the type of magnet used to operate.

Engineering Bulletin

No. 6 *International Time Recording Co., of N. Y.* ENDICOTT, N. Y. August 1, 1919

International Automatic Charging Devices

(For Direct Current)

By J. W. Bryce, Supervising Engineer

For the successful operation of electric time recording systems, it is imperative that a storage battery be used as the source of electric energy because of the necessity for maintainance of electric potential on the system at all times. It is of course necessary that the battery be maintained in a charged condition. This may be accomplished by periodically connecting the battery to an electric light line for example, by means of switches controlled manually or the charging may be done automatically.

The advantages of the automatic method are that its tendency is to keep a more even potential on the clock lines and that the battery need have no attention other than seeing that it has water supplied to it from time to time.

Many attempts have been made to "float" the battery on the charging line but there are objections to doing this where a charging line of say 110 volts is used and is charging a battery of say 12 volts. The feature that makes it undesirable; rises from the fact that a ground may occur on both the charging lines and on the clock lines in a way that will throw the higher voltage on the clock circuits.

This condition is illustrated in Fig. 3 where a charging line is shown connected to a low voltage battery.

Whether a battery is "floated" or is charged by hand, the condition outlined in Fig. 3, is present and a little study will show that if the charging line happens to be grounded at "A" and by any accident a clock line gets grounded at "B" the resistance "C" is "shorted" and full line voltage will appear on the clock lines. Similarly if the battery should be disconnected accidently or otherwise. the clocks instantly get the current from the line through the resistance "C". It will be seen, therefore, that if the line is, say around 250 volts or even 120, a dangerous condition may be presented.

To guard against a condition such as outlined above the International Automatic Charging Device type "A" has been designed. By the use of this device a charging current very small in amount is continuously flowing into the battery at all times, except when the master clock operates the master relay to deliver an impulse to the clock system. At this instant by an arrangement of relays the battery is transferred from the charging circuit to the clock circuits and remains so until the master relay opens, when it is automatically restored to the charging line should there be current thereon.

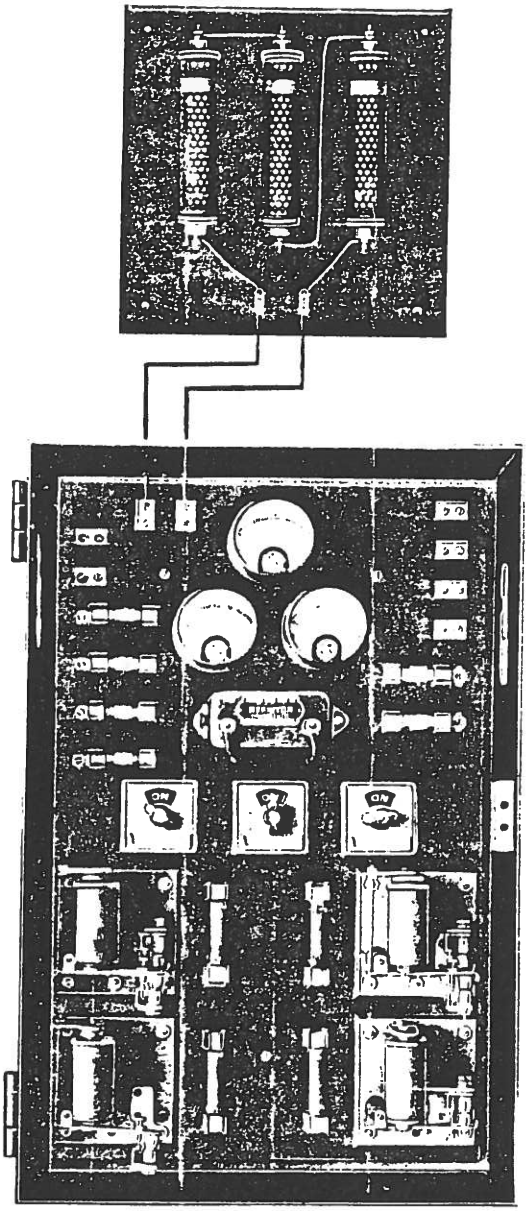


Fig. 1.

In the cuts Fig. 1 is a photograph of the charging board, with the door of the steel enclosing cabinet open. This view gives a general idea of the various relays, switches, voltmeter, ammeter, etc.

Fig. 2 is a diagram showing the connection of the various relays and will explain the theory on which the devices operate.

Fig. 3 is cut showing the common form of connection of a so-called "floating" battery.

Referring more particularly to Fig. 2 which has been arranged particularly to explain the action of the device and all unnecessary details and parts have been omitted for the sake of clearness.

In the figure, 1 and 2 are to be connected to the source of charging current. When sufficient potential (voltage) is applied to these wires, current will flow through the coil 3, wire 5, coil 4, of the transfer relays, wire 6, armature 30, wire 7, wire 2, and back to line.

This will attract the armatures 28, 29 of the transfer relays and current will flow through wire 11, adjustable resistance 17, armature 28, wire 12, through the battery and return to line through wire 8, armature 29, wire 7, and wire 2.

Thus it will be seen, a charging current is continuously flowing through the battery as long as

current is on the lighting or charging circuit. The adjustable resistance 17 is provided, to keep this current down to a very small amount because the object of the device is to simply replace the ampere hours that the clock system has taken from the battery. As the clock system withdraws the current only for approximately one second once every minute and as the charging current is "on" all the rest of the minute it is apparent that the charging current if continuous, will be charging the battery for all the rest of the minute. That is, current will be supplied to the battery for 59 times the length of time it is being withdrawn.

The purpose of the arrangement in addition to those already set forth in this article, is the complete insulation of the charging lines from the clock circuits.

When the master clock completes the circuit through its minute circuit closer, a current flows from the battery through the wire 21, master relay coils 22, wire 23, master clock circuit closer contacts 24, wire 25, coils of line relay 26, wire 27 and back to battery. This energizes the line relay 26 and it attracts its armature 30, which opens the line circuit through transfer relay coils 3 and 4 causing the armatures 28, 29 to drop. This transfers the battery from the charging lines, to the clock lines. It should be noted that should there be no current on the charging lines the battery remains constantly on the clock battery feed lines because relays 3 and 4 are de-energized.

At the same time master relay 22, is energized because it is in series, with the line relay 26 and it attracts its armature 31 and closes a circuit which permits current to flow from the positive terminal of battery through wire 12, armature 28, wire 10, wire 18, relay armature 31, wire 19, to terminal 16, to recorders, secondary relays, or any other time controlled device and return to terminal 15 and by wire 20, wire 9, armature 29, and wire 8, back to battery.

While the above circuits are being established, the battery is also thrown on the battery feed terminals 13, 14 and by which the system is supplied, if of such size as to need the use of secondary relays for distribution of current.

Ordinarily, where the amount of apparatus is small and where it may be operated by one master relay directly, the apparatus may be directly connected across the terminals 15, 16.

The features that we want to emphasize are:

1. Complete insulation of clock system (outside of the master clock contact circuit) from the charging lines.
2. Even potential on battery terminals due to low rate of charge.
3. Only one set of battery needed.
4. Distribution of charging over many hours, permits very small resistance tubes to be used and

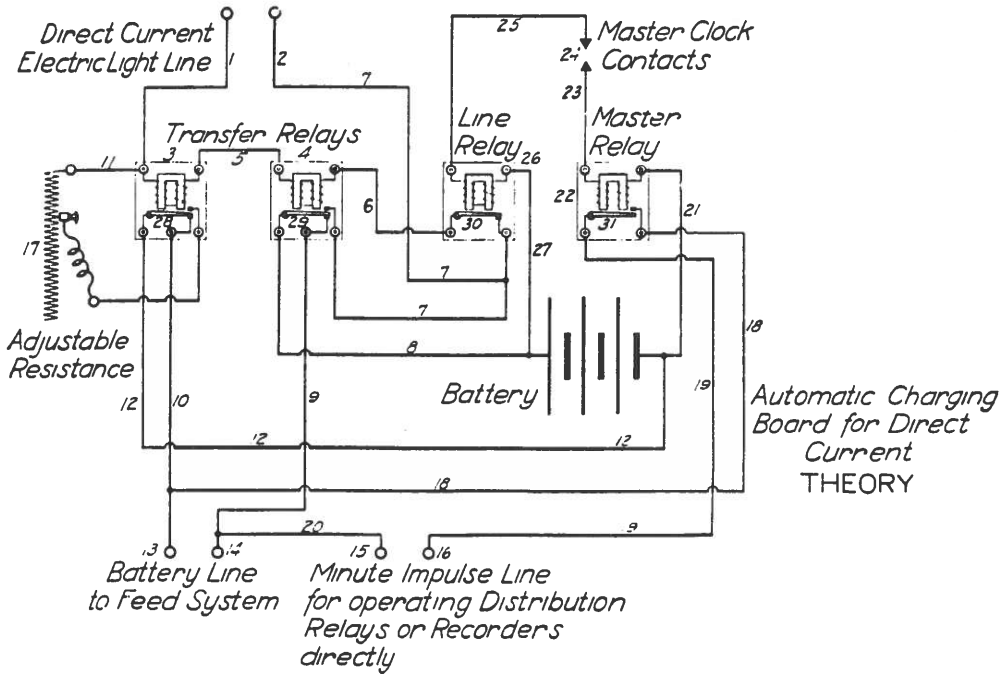


Fig. 2

distributes the heat generated over a long period, thus doing away with what is often objectionable heat.

5. Does not injure batteries because they are never permitted to run down. The battery is always fully charged. As a matter of fact on the small batteries that are used on clock systems, this device would be desirable even if it shortened the life of the battery because the supervision of the charging for a short time is more costly than that of the entire battery.

6. Saves money and prevents interruption of service due to failure on some one's part to remember to charge the battery and in general assures that the battery will not be over or under charged to a dangerous degree.

7. No master relay is needed as there is a master relay contained on this panel. This panel can directly control as many time recorders as our standard master relay cabinet.

To figure the charging rate necessary to keep the battery fully charged, it is necessary to know, (a) how many hours per week the charging current is available; (b) what is the current taken by the clock system at each minute impulse. In short what is necessary to figure is, how many ampere hours is required by the system per week, so as to adjust the charging rate to put more ampere hours INTO the battery than are taken OUT of it.

In order to make the method by which this is figured more clear, an example is given below.

Assume that we have a system that requires 3 amperes at each impulse for its operation (voltage is immaterial).

Assume that current is available all the time for charging.

The ampere hours per week required by the system are figured on the basis of 1440 minute impulses per day, each of one second duration. This is 1440 seconds per day or in round numbers one-half hour per day. Therefore, 3 amperes for one-half hour per day will be 1½ ampere hours per day. As no battery is 100 per cent efficient it will be necessary to put more current into the battery than we take out. Suppose we, therefore, assume the battery to be only 50 per cent efficient, so as to take care of any irregularities in current supply, etc. In this case, therefore, we will have to supply 3 ampere hours to the battery to replace the energy used. For 7 days for the week this will be 21 ampere hours. As current is on for 24 hours per day, it is on 7x24=168 hours per week. Therefore, the current rate required for charging will be 24÷168=.143 ampere.

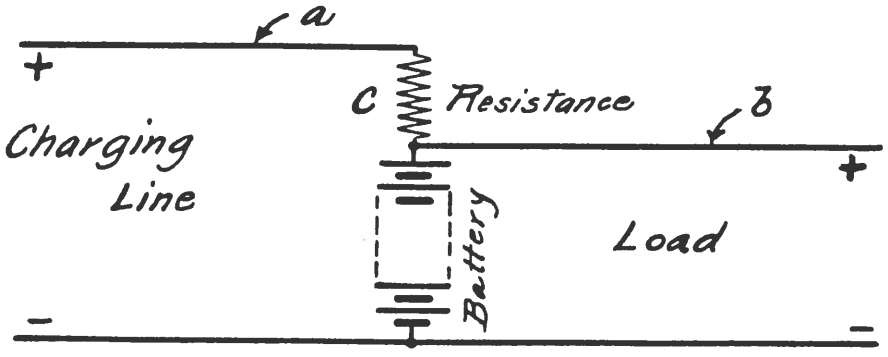
The resistance shown in Fig. 2 will, therefore, be adjusted to permit 143 Milliamperes to flow as a charging current through the battery.

It will, of course, be understood if any substantial change is made in the amount of the apparatus used, etc., the charging rate will have to be adjusted to suit. Similarly, if bells, etc., are connected their use, if frequent, must be taken into consideration.

In the example given above, let us assume the charging current is only available say 60 hours per week. Then the charging rate required will be 21÷60=.350 ampere or a little more than a third of an ampere.

For alternating current, a different type of charging board has been designed.

Questions with regard to insulation, etc., are somewhat different in that case and such automatic charging will be described in detail in a later bulletin.



Scheme of connections of so-called "Floating" Battery.

Fig. 3

Engineering Bulletin

No. 7 International Time Recording Co., of N. Y. ENDICOTT, N. Y. August 15, 1919

International Automatic Charging Devices

(For Alternating Current)

By J. W. Bryce, Supervising Engineer

J. W. BRYCE

These devices are designated to use Tungar rectifiers and are arranged with a program device and suitable relays, so that at certain predetermined times the charging current is automatically thrown on the battery, by the action of the clock system itself. It is apparent that on an electric impulse time system, this may readily be done as the amount of current (amperes) drawn out of the battery at each impulse is quite accurately known and it is merely necessary to arrange to put back into the battery more ampere hours than is drawn out of it, to keep the battery fully charged.

In the figures, Fig. 1, is a diagram showing the circuits of the small size Tungar Rectifier.

Fig. 2, is a diagram of the arrangement of the automatic charging device with all unnecessary parts such as ammeter, voltmeter, and mechanical parts omitted for the sake of clearness.

Fig. 3, is a photograph of the general appearance of an automatic charging board of this general description.

The arrangement of apparatus and wiring shown in Fig. 2, is not exactly as it is arranged in the actual apparatus. This figure has been rearranged particularly with a view to explain the action of the device. The exact wiring diagram accompanies the apparatus.

Insulation between the charging line and the lower voltage battery and clock lines is obtained by means of the transformer instead of by the transfer relays shown in connection with the direct current charging device described in Bulletin No. 6.

In Fig. 2, the wire 1, conducts alternating current from the A. C. line to one terminal of the primary winding 21, of a transformer through a fuse 23, to wire 6, relay armature 5 and through wire 2 back to line.

The battery 18 for the time system is connected to the terminals 16 and 17. A program wheel (mechanism, etc., not shown) at certain specified times closes the contact 8 for one second through master clock contact not shown at some particular minute. Current then flows from battery 18, through wire 9, contacts 8, wire 10, coils of relay 4, wire 12, wire 11 and back to battery. Coils 4 constitute part of the mechanism of a "make and break relay." This is a relay which alternately makes and breaks the contacts controlled by it, that is to say, when energized the first time it **makes** its contacts (in this case contacts 7) and at the next impulse or when energized the second time it **breaks** them.

In this instance let us assume it makes or closes contacts 7. Current now flows from battery 18, to terminal 15, wire 27, relay coils 3, wire 13, contacts 7, wire 11 to terminal 17 and back to battery.

This energizes relay 3 and causes it to attract its armature 5 and completes the primary circuit to the transformer.

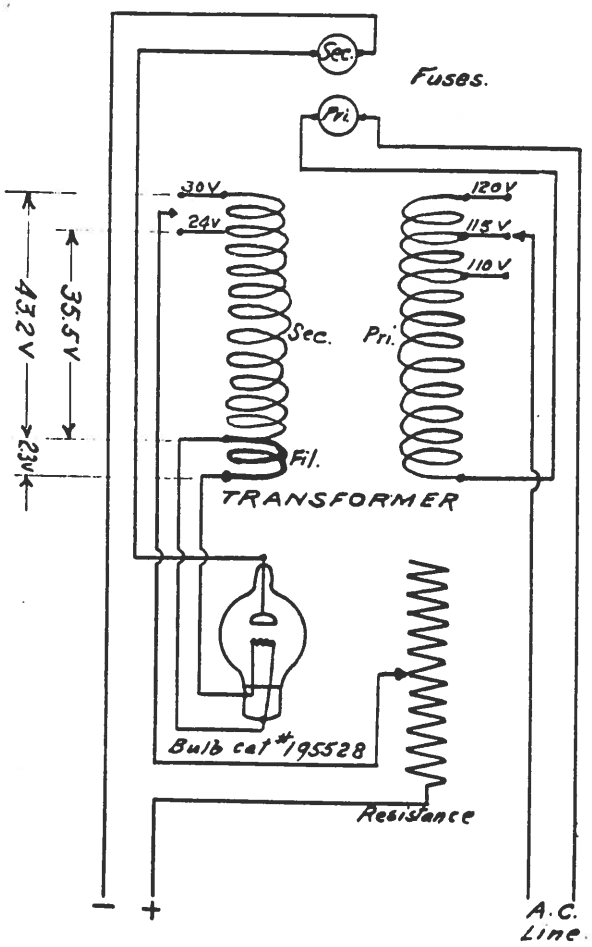

Sec.
Fuses.
Pri.
30V
24v
120V
115V
110V
43.2V
35.5V
23v
Sec.
Pri.
Fil.
TRANSFORMER
Bulb cat #195528
Resistance
A.C.
Line

Fig. 1

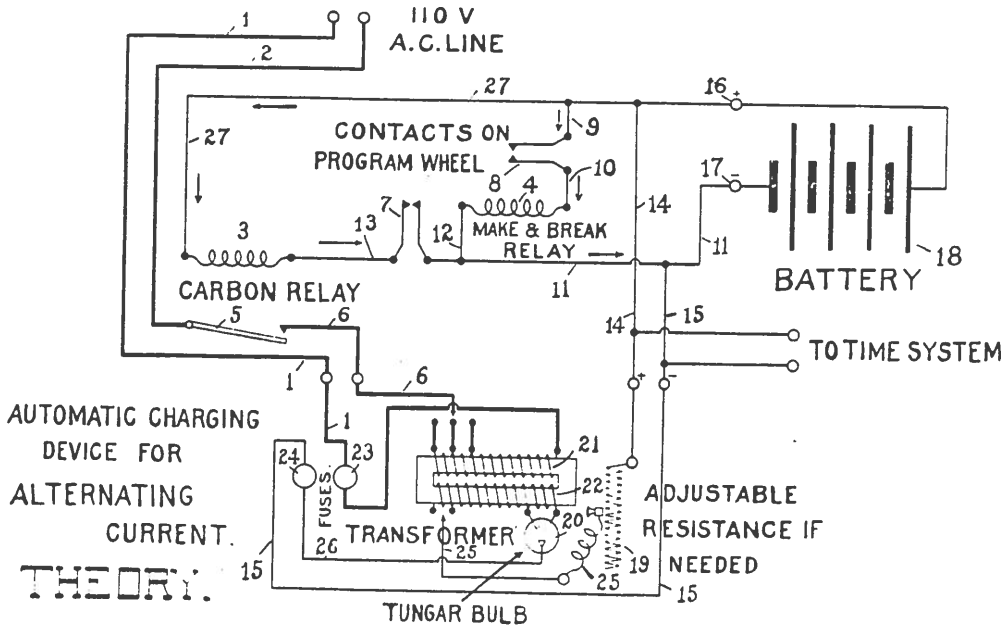

110 V
A.C. LINE
CONTACTS ON
PROGRAM WHEEL
MAKE & BREAK
RELAY
CARBON RELAY
BATTERY
TO TIME SYSTEM
AUTOMATIC CHARGING
DEVICE FOR
ALTERNATING
CURRENT.
THEORY.
FUSES
TRANSFORMER
ADJUSTABLE
RESISTANCE IF
NEEDED
TUNGAR BULB

Fig. 2

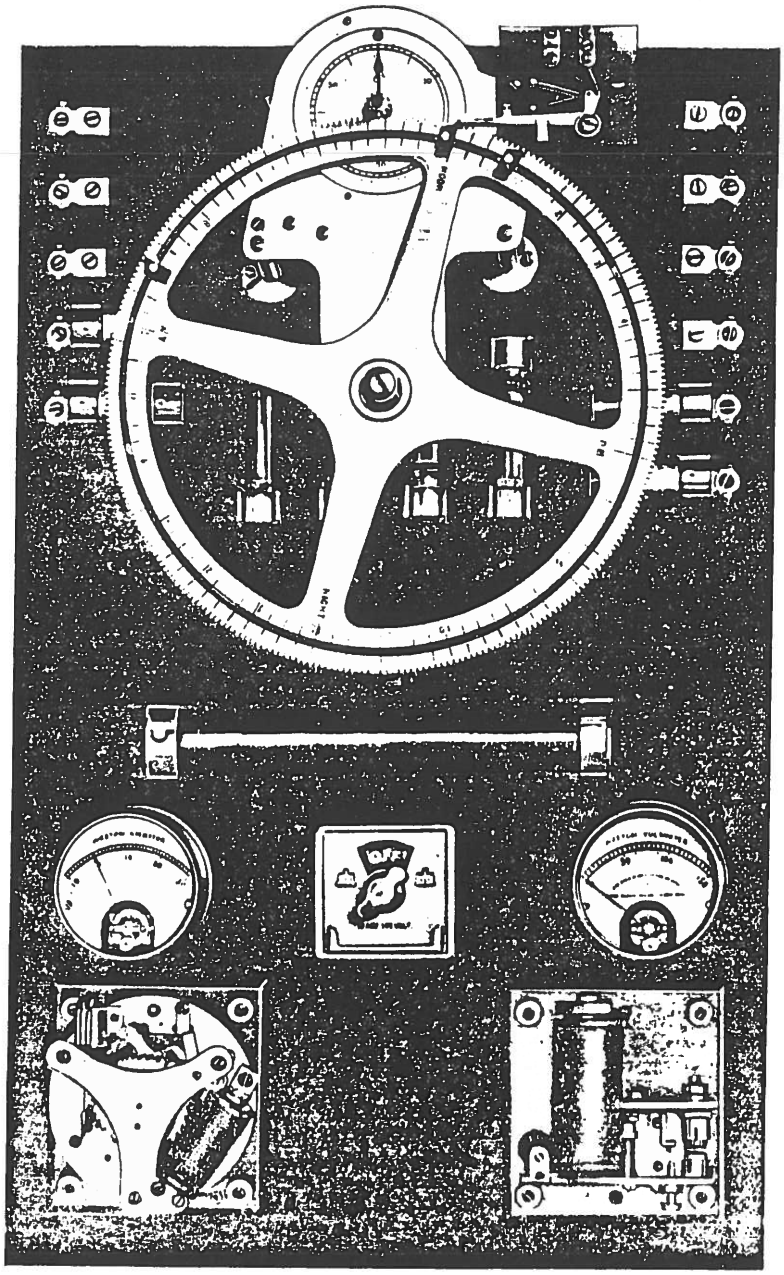


Fig. 3

Connected to the secondary of the transformer is a Tungar bulb 20, the filament of which is illuminated by connection to the end coils of the secondary of the transformer as shown. This bulb acts as an electric valve and only permits pulsations of current to flow in one direction.

An alternating current as is well known, flows for a very brief time first in one direction and then in a directly opposite direction. With 60 cycle current which is the most used, this occurs 60 times per second, that is, there are 60 complete cycles per second. This is known as the frequency.

It will readily be seen that as it is necessary to keep current flowing in one direction to charge a storage battery, such current is unsuitable. It is necessary to discard or reverse all of the impulses or waves coming in the wrong direction. The Tungar bulb as illustrated does this by holding back all the waves coming in the wrong direction.

There is an arrangement by which with two Tungar rectifiers, the entire current(both waves) may be utilized, but that is not usually necessary.

A uni-directional but pulsating current is, therefore, set up in the secondary circuit and the current being of higher pressure (voltage) than the battery, current flows from the secondary of the transformer

through wire 25, adjustable resistance 19(if needed) wire 14, to terminal 16 and into the battery and through wire 11, wire 15, fuse 24, wire 26 to the terminal of the Tungar bulb and so completes the circuit through the secondary of the transformer.

The adjustable resistance 19 is inserted to hold this charging current down to any suitable amount. Taps are provided on both the primary and secondary of these transformers to assist in the regulation to secure suitable output. Three taps are usually provided on the primary for 120, 115 and 110 volts respectively and similarly two or more are provided on the secondary for connections to different voltage systems. However, this adjustment is small and sometimes external regulation is necessary.

In Fig. 1, is illustrated diagrammatically, the connections for the small Tungar rectifier rated at up to 30 volts. This is really suitable for 12 volt systems and while the rectifier will deliver 2 1-2 amperes at that rating it will be found that the amperage will fall off, where a larger number of cells need be charged and where the voltage gets up to say 25 to 30 volts. In that case the remedy is to use a larger rectifier.

When the program wheel has advanced to a position where it again closes the contacts 8, (which may be several hours later) relay 4 opens contacts 7 and de-energizes the coils of relay 3 and releases armature 5, thus de-energizing the Tungar rectifier and stopping the charge. No reverse current relay is required between the rectifier and the battery as the bulb is an effectual insulator when cold.

To determine how to set the device, it is necessary to know how many ampere hours per week are taken by the clock system and to so set the blocks on the program wheel as to switch on the rectifier a sufficient number of hours each day to replace these ampere hours plus about 100 percent to take care of possible interruption to the A. C. Supply and to allow for the loss in the battery, etc. The current may be switched on at any hours that are convenient and as many times per day or per week as may be decided as suitable to the particular requirements.

To make this statement clearer let us take as an example, an equipment requiring 2 amperes at each minute impulse for its operation. This will take, allowing for an efficiency of 50 percent for the battery, 2 ampere hours, per day or 14 ampere hours per week. If the battery requires a charging rate say of 4 amperes it will require a 4 ampere charging rate for 3.5 hours per week. This will be for say half an hour per day. This half hour, may of course, be any half hour of the day that is convenient. If for any reason a lesser charging rate is desired it may be arranged to charge the battery for a longer period.

The Tungar rectifiers are ordinarily made to operate on 60 cycle current and on single phase current. Where polyphase currents are encountered the rectifiers may be operated from one of the phases.

For use on other frequencies than 60 cycles, rectifiers are made with suitable winding for the parricular frequency.

Below are listed rectifiers regularly recommended for use on electric time recorder systems.

For 12 volt operation, which will take care of up to approximately 22 volts on charging.

General Electric Catalog No. 198886 Rectifier. This has an adjustable resistance to control charging rate.

The above rectifier may be connected to charge 24 volt batteries but will do so at a reduced rate.

The above rectifier uses Tungar bulb Catolog No. 1995528 and used for charging rates up to 2.5 amperes.

For use on 24 volt equipment with an outside series resistance and for 48 volt equipment:
General Electric Catalog No. 189048, which uses bulb No. 189049.
For use with batteries requiring a charging rate of at least 4 amperes:
Catalog No. 193191 60 Cycle 110 volt.
5 ampere—7 1-2 -–15 volt and uses bulb No. 189049.
This rectifier also has insulated secondary.

For use on higher than 12 volt systems and for batteries requiring up to 6 ampere charging rate, use any of the following:

No. 179492 for 60 cycle current. No. 198648 for 40-50 cycle current. No. 199545 for 25-30 cycle current. No. 206794 for 125-133 cycle current.	110 volt

All of the above use No. 189049 bulb and are equipped with regulating resistance but are of the autotransformer type and are not insulated from the charging line, therefore, special care must be taken of the insulation of the clock lines.

The General Electric Company have published bulletins No. 43961 dated Sept. 1918 and another No. Y-1096 which gives more detailed information regarding the various rectifiers and while some of the above are specially designed for the needs of this class of work, the information in those bulletins may be of interest and value.

Ridgefarm Ill June 28 1915

Dear Mr. Lawrence,

After so long a time I am shipping you your big clock. Am not farming this year so had a chance to unpack the stuff I got from you and am now trying to get rid of it. I have disposed of all of the organs but two. They were the hardest property to handle I ever got hold of. I can't even give these two away. Your clock has been running nicely now for over a month, and I believe it will run now for years without causing any trouble. I will try to instruct you how to have it put to going in case it does fail. I would like to swap my patent off for a yaller dog. Some fellow could get a barrel of money for it but I'm afraid I never will get anything. I went to Detroit a few weeks ago to try to sell it to parties there that seemed to be interested but haven't done any good as yet. I have had these clocks running now for six years and that is good proof that they will keep going.

Hang clock on wall. Release pendulum hanger by removing the parts holding it secure.

Hang pendulum ball and fasten to pendulum hanger with the screw attached. Put battery on top of case and connect up to wires on top of case.

If it has not been roughly handled and parts become loose it ought to click right off. If for any cause it does refuse to run, examine the hands, etc. and follow instructions inclosed.

I am also sending you the two trombones that were not mated.

Family is well as common this summer. Prospects for good crops are good. Are you open for any kind of a land trade. I am dealing some this summer in Indiana and Ohio farms and have a few Illinois farms that I might trade you for your stock.

Hoping you are all OK I am yours truly,

Shelly S. Besore

(over)

Have you a good farm that you would trade for good stock of merchandise in Ridgefarm. Have two fine propositions here for trade.

Instructions.

Remove string that holds pendulum wire. Hang clock on wall and place the batteries on top of case. Connect wire A to carbon or center pole and wire B to zinc or outside pole. Hang pendulum ball and clock is ready to run.

If clock hangs plum it will tick even and regular and can be held in place by driving small nail in wall on each side of case. Mantle clocks should be placed on a stationary level fixture. Regulate by raising or lowering pendulum ball same as other clocks.

To watch the operations of the clock, remove the hands and dial and if closer examination is desired disconnect wires from inside of case and slip the board out on which the movement is fastened and let it run without pendulum ball. Always remove pendulum ball when handling the clock or moving it about. In removing the hands be careful not to bend them so as to prevent their passing when put back on. (over)

See Fig. 1

Circuit breaker 9 and winding lever 7 are now in position to cause clock to wind itself by coming together at 8 the circuit to battery is opened the electric current energizes the magnet which attracts the armature 19 while the roller 17 bears against winding lever 7 pushing it upward winding the spring 6 while at the same time the parts 7 and 9 are automatically separated closing the circuit to the battery, the magnet losing its electric energy releases the armature 19 and drops back into position while the winding lever 7 is held up by a ratchet and can move downward only as the clock runs and unwinds the spring.

Fig. 2 shows position of winding lever 7 just after clock has wound.

Be careful not to get the circuit breaker 9 bent out of shape or position as this is the essential part and without it being in proper position the clock can not wind.

Three dry cells are necessary to operate clock and when exhausted must be replaced with new ones.

S. S. Besore

Ridgefarm Ill Janr 28 19[illegible]

Dear Mr Laurence

After a long a time I am shipping you your Eg Clock. Am not farming this year So had a chance to unpack the stuff I got from you and am now trying to get rid of it. I have disposed of all of the organs but two. They are the hardest property to handle I ever got hold of. I cant even give these two away. Your Clock has been running nicely hard for over a Month and I believe it will run now for years without causing any trouble. I will try to instruct you how to keep it put to going in case it does fail. I would like to swap my Setter pup for a yaller dog. Some fellow could get a bird dog for it but I am afraid I never will get any thing. I went to Detroit a few weeks ago to try to sell it to parties there but seemed to be interested but havent done any so yet. I have had these clocks running now for six years and that is good proof that they will keep going.

Hang Clock on wall release pendulum hanger by removing the parts holding it secure. Hang pendulum ball and fasten to pendulum hanger with the screw attached. Put battery on top of coil and connect up to wires on top of coil.

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I am also sending you the two Trombones that I was not mated

Family is well as common this Summer. Prospects for good crops are good. Are you open for any kind of a land trade If am driving some this Summer in Indiana and Ohio farms and have a few Illinois farms that I might trade you for your Stock.

Hoping you are all O.K. I am Yours truly.

Shelby L Moore

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Regulate by raising or lowering pendulum ball same as other clocks.

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over

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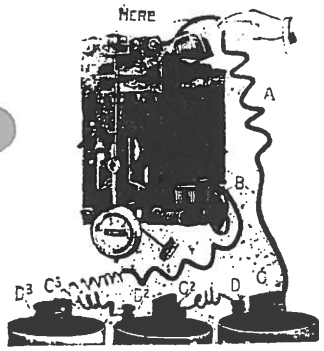


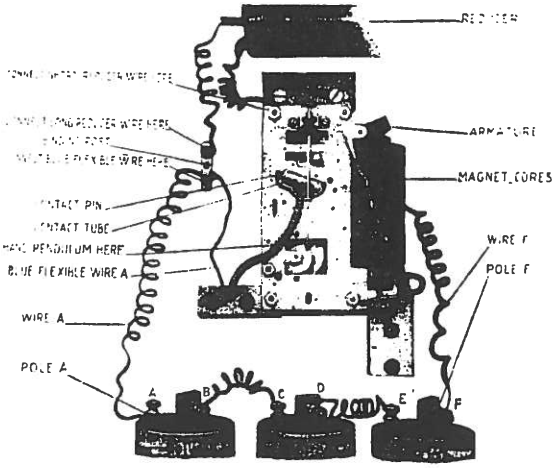
Automatic Switch Circuit Breaker.

Finger points to Armature.
A Contact wire. B Magnet wire.

DIRECTIONS

FOR

Installing and Caring for NATIONAL SELF-WINDING CLOCKS



Mercurial Tube Contact

Have the clock in a plumb position; hang pendulum ball and connect the battery, being careful to make proper connections. Connect battery carbon to zinc, and not carbon to carbon or zinc to zinc. Center pole is the carbon pole. Connect contact wire with carbon pole and magnet wire with zinc pole.

Set the clock by moving the hands forward or backward to the proper figures.

Regulate the clock by the wheel in the dial or the nut under pendulum ball. If too slow, raise the ball, if too fast lower it.

Striking Clocks. In order to make the clock strike any number of times in succession, it will be necessary to wind the striking spring by hand. This is done by pressing the armature down upon the magnets a few times.

If clock should refuse to run examine the hands to see if they are caught or rub the dial or glass, and see if the clock will tick. If not there is some part of the movement caught or the spring is not wound.

Note. A small spring runs the clock and an electric current winds the spring. Read the following carefully.

The clock is automatically wound by an electric current from the battery contained within the case. The winding lever which constitutes a member of the circuit closing device is mounted on the arbor is gradually carried downward as the spring unwinds. The circuit breaker is secured to but insulated from the armature lever, the end of which extends upward and curved inward, just in front of the roller on the armature lever, and directly in the path of the winding lever, the projecting end of which strikes against the upper edge of the turned part of the circuit breaker just prior to the complete unwinding of the spring closing the circuit to the battery. The current energizes the two coils which constitute the electro-magnet and the armature is instantly attracted to it. The armature being journaled into the clock, the lower half is converted into a lever, the roller on which, bearing against the edge of the winding lever quickly carries it upward and winds the spring. At the same time the projecting end of the winding lever is forced over the surface of the circuit breaker and as it is carried upward the circuit is broken and the magnet releases the armature and it drops back into the initial position.

Important Notice. The circuit breaker may accidentally become bent or jarred against the armature lever or roller and close the circuit or oil or dirt may accummulate on the surface of the winding lever or circuit breaker and cause a short circuit of the battery which will soon destroy them. Should any trouble of this nature arise the armature will stick to the magnet and the clock will stop. The battery must be disconnected immediately and the contact surfaces examined. The armature can be easily removed by loosening the top pillar post nut, and the parts easily cleaned with brush or cloth and benzine. These parts should be thoroughly cleaned at least once a year.

Defective Reducers or Mercurial Contact tubes in clocks with old style Mercurial Contact, also cause the armature to stick and should be removed. The office of the reducer is to take up the excess current but its use is not essential.

The clock should be cleaned once a year in order to get best results. Handle it the same as any ordinary clock and after making necessary repairs it is advisable to allow the movement to run a few days when it can be watched to see that it is properly connected and adjusted.

Thoroughly familiarize yourself with the clock and in case of any trouble you can quickly locate and remedy it without any inconvenience or expense. The clock is extremely simple and easy to operate but be sure it is correctly connected and adjusted. Old style movements taken in exchange for new models at any time or repairs furnished upon request. Fresh batteries always on hand and furnished at 60c per set.

OUR GUARANTEE. Should any part of the movement with ordinary usage become disabled or worn out within three years, we will, upon application and return of the part, replace free of charge.

S. S. BESORE,
Manufacturer,
URBANA, ILLINOIS.

S. S. BESORE.

SELF WINDING CLOCK.

APPLICATION FILED JUNE 22, 1910.

1,032,108. **Patented July 9, 1912.**

Fig. 1.

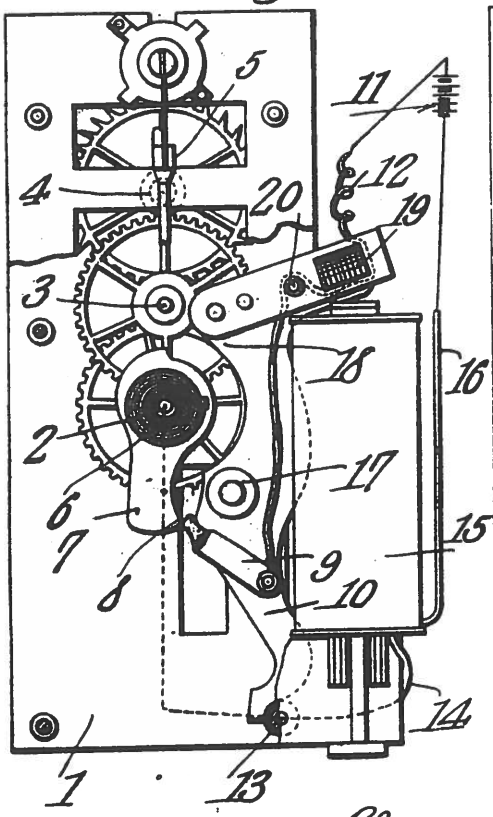


Fig. 2.

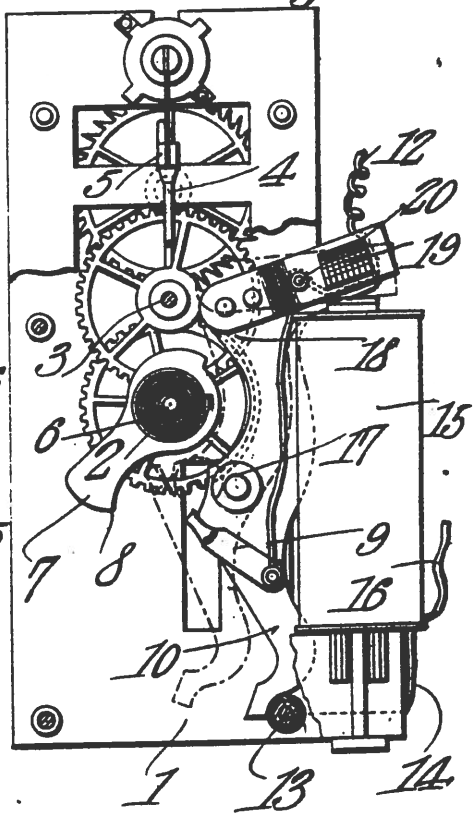


Fig. 3.

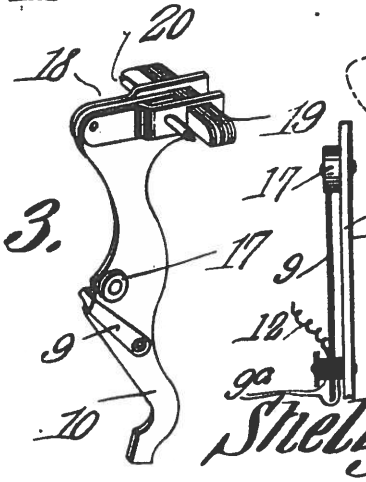


Fig. 4.

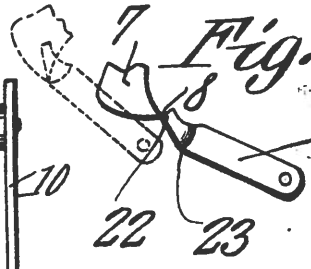


Fig. 5.

Inventor

Shelby S. Besore.

Witnesses

E. G. Clement

R. H. Bishop

By C. A. Snow & Co.

Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

SHELBY S. BESORE, OF URBANA, ILLINOIS.

SELF-WINDING CLOCK.

1,032,108. Specification of Letters Patent. Patented July 9, 1912.

Application filed June 22, 1910. Serial No. 568,337.

To all whom it may concern:

Be it known that I, SHELBY S. BESORE, a citizen of the United States, residing at Urbana, in the county of Champaign and State of Illinois, have invented a new and useful Self-Winding Clock, of which the following is a specification.

This invention relates to self-winding clocks, and has particular reference to the means for making and breaking an electric circuit in order to actuate the winding arbor and thereby wind the main spring so that the operation of the clock will continue.

The invention consists in certain novel features of the device illustrated in the accompanying drawings, which will be hereinafter first fully described and then particularly pointed out in the appended claim.

In the drawings,—Figure 1 is an elevation of a clock train showing my improved winding mechanism in position with the contacts just about to close the circuit. Fig. 2 is a similar view showing the contacts separated in full lines with the lever or key attached to the winding shaft raised and showing the raised position of the armature in dotted lines. Fig. 3 is a detail perspective view of the armature. Fig. 4 is a diagrammatic view illustrating the relative movement of the contacts. Fig. 5 is a detail view of a part of the mechanism.

The clock frame 1 may be of any desired or suitable construction, and in the drawings the nearer plate of the frame is broken away so as to more clearly disclose the construction of the parts constituting my present invention. The winding arbor 2 is journaled in and extends between the side plates of the frame and is connected by suitable gearing with the intermediate arbor 3 and the escapement arbor 4, the pendulum rod 5 being driven from the escapement arbor in the usual manner.

Mounted upon the winding arbor 2 in any convenient manner so as to be driven by the same and connected with the main spring 6 is a lever arm or key 7 which projects radially from the shaft and constitutes one of the circuit-closing members and also the spring winding member. The member 7 is provided at its lower end with a finger or projection 8 which is adapted to impinge against the upper end of a contact strip 9 which is secured to but insulated at 9^a Fig. 5 from, the armature lever 10, and is connected with a battery 11 by a conductor 12, as shown. This contact 9 is constructed of a piece of sheet metal and has its upper end bent inward so as to project over the edge of the armature lever 10 into the path of movement of the lever 7 so that as the spring unwinds, the said lever 7 will swing downward and ride upon the projecting end of the contact member 9 and thereby close the circuit to the battery, the lever having a grounded connection through the clock frame with a post 13 on the side thereof, which is connected by a conductor 14 through an electro-magnet 15 from which a conductor 16 extends to the battery, as will be readily understood. The armature lever 10 carries a roller 17 just above the contact member 9, and is provided at its upper end with an outwardly projecting arm 18 which extends between the side plates of the frame and carries the armature proper 19, the said arm 18 being pivotally mounted in the clock frame by means of pivot pins 20, as will be readily understood. The armature 19 is disposed directly over the electro-magnet 15 and will be attracted thereby when the magnet is energized, as will occur when the point 8 of the lever arm 7 strikes against and rides upon the projecting end of the contact strip 9.

The operation of the device will be readily understood. As the spring 6 unwinds, the lever or arm 7 will be carried downward so that it will strike against the upper end of the contact 9 just prior to the complete unwinding of the spring. Immediately upon the point 8 and the contact member 9 coming together, the circuit will be closed through the battery and the electro-magnet will be energized so as to attract the armature 19 and thereby swing the armature lever 10 into the position shown in dotted lines in Fig. 2. The upward and inward movement of the armature lever will cause the end 8 of the lever 7 to rise upon the end of the contact member 9 and the roller 17 will bear against the edge of the lever 7 so that the said lever 7 will be quickly thrown backward and upward so as to wind the spring, and the impetus of the lever 7 will carry it beyond the limit of movement of the armature lever so as to break the circuit and permit the armature and its lever to return to their initial positions. The movement of the key or winding lever and the armature lever will be readily understood on reference to Fig. 4. The point or tip 8 of the key strikes against

the extreme end 22 of the contact strip 9 and as armature lever swings upward the point of the key rides downward over the concave seat formed at the end of the contact strip 9 and leaves the same at the shoulder 23, the latter serving to keep the contact clean.

The device is extremely simple in its construction and is efficient for the intended purpose. The circuit being closed at the upper extremity of the contact strip there will be no spark and consequently no corrosion of the parts at that point. The friction between the moving parts serves to keep the surfaces bright and clean so that a perfect contact will be assured at all times. The only spark will be formed at the shoulder 23 where the contact is broken and the discoloration at this point will be overcome by the movement of the parts away from each other. The length of the armature lever is such that the lower end of the lever, when the circuit is broken, will rest against one of the transverse fastening bolts of the clock frame so that it cannot swing outward to such an extent as to carry the contact 9 out of the path of movement of the lever 7, while the said lever 7 is a thin flat plate which will not add appreciably to the load put on the main spring. As the contact strip 9 returns instantly to its former position after the spring is wound there is no friction exerted by the winding devices to hinder the running of the clock.

Having thus described my invention, what I claim is:—

The combination with a clock frame, an electro-magnet, and an armature for the magnet supported by the clock frame, of a winding arbor mounted in the frame, a main spring attached to the arbor, a winding lever attached to the main spring and mounted on the winding arbor and having a projection on one edge at its lower end, a lever depending from the armature, a contact strip secured to the armature lever but insulated therefrom and projecting into the path of movement of the winding lever and arranged to have a wiping engagement therewith, a roller carried by the armature lever to contact with the winding lever, and electrical connections whereby when the winding lever engages the contact strip, the armature lever will be vibrated to impart a reverse movement to the winding lever and thereby rewind the main spring.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

SHELBY S. BESORE.

Witnesses:
CHAS. A. BONGART,
G. H. BAKER.

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CHAPTER #78 NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

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The ELECTRICAL HOROLOGY SOCIETY, Chapter 78 was formed in 1972 to provide a means whereby members of the NAWCC who have a primary interest in Electrical and Electro-mechanical clocks would have a means to meet and communicate with other members with similar interests. Due to the non-geographic nature of the group, the cohesiveness of the chapter depends upon two factors. One is the JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY, published quarterly with an annual content of approximately 100 pages of material. This includes a FREE MART which lists items for sale, parts needed, and other services of interest to members. Additionally, technical articles, original items and articles, and reprints of important material, and questions and answers are included. The information is intended to provide a mixture of historical as well as technical information, thereby offering something for everyone. Secondly, the encouragement of branch chapters to provide local facilities for meetings provides a forum for the exchange of information as well as an opportunity to socialize with kindred souls. Meetings are also scheduled at various Regional meetings and the NAWCC National Convention, whenever the programs provide an opportunity for Chapter 78 members to get together... these may include programs on subjects of interest along with informal questions and answers.

Any NAWCC member in good standing is eligible for Chapter 78 membership. The fiscal year begins in January, and a member joining at any time after January 1st will receive all of the Journals for that year, with membership expiring at the end of December. There are no provisions for less than full year memberships, and membership in Chapter 78 is separate from branch chapter dues and memberships.

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