THE JOURNAL OF THE

ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78 NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXII #1, MARCH 1996

Fellow Horologists:

This issue, the first of 1996 contains the final installment of the ITR Enginnering Bulletin series. Additionally, we have included a reprint of the McClintock Instruction book detailing the set-up and wiring information, provided by David Lee. Apologies for the clarity of the material. but we are dealing with copies of copies, with the corresponding deterioration of quality.

An interesting question was asked by one of our members with an informative reply by John McGrory, our resident expert on synchronous motor clocks. We have had inquiries about this clock in the past, and John has now provided us with an explicit and detailed response, reprinted herein.

You will note that our MART section has had its annual update... If you wish an ad continued or would like to have one included, please advise. Remember, it's YOUR Mart.

For those members who have not paid their 1996 dues, be advised that this will be your final journal and your name will be deleted from the roster. You will know if you are delinquent IF A NOTICE IS ATTACHED TO THIS PAGE, otherwise, you are in good standing.

Chapter 78 is involved in a number of activities, and it seems appropriate to outline them, and offer the membership the opportunity to participate where practical;

1. When one of our original members, Joe Singer passed away last year, his widow, Liz, offered his collection of Self-Winding material to the NAWCC museum. The officers of Great Lakes Chapter #6 and EHS #78, with the approval of the Executive Director, Tom Bartels, decided to create an operative system, to be installed in the Educational Center building, which would include an appropriate plaque designating the donor and those chapters involved in the installation. We are now preparing the specifications for the installation, with the actual work scheduled to begin in the late Spring or early Summer. Chapter #6 has donated $500 to underwrite the cost of the project with #78 volunteering the balance, expected to be minimal.

2. Robert Mills, an EHS #78 member in Great Britain, has translated Henry Belmont's book, La Bulle Clock, from the original French into an English version of 65 pages. Included is historical as well as technical and repair information, well written and easily understood. We have ordered a supply of these books for distribution to our membership, expected around mid-year. The chapter cannot easily cover the cost, which approaches the annual dues paid by each member, and as a result, we ask for a VOLUNTARY contribution of $7.00 per member, to be paid on receipt of the book.

3. The Eastern States Regional Meeting to be held in late August in Syracuse, will host an exhibit with the theme "Electrical Horology ... New York State Manufacturers". Chapter #78 has agreed to manage the exhibit and provide, through the cooperation of its attending members, clocks and peripherals for this program.

(Continued on Next Page)

(Continued from Page 1)

We expect to place an emphasis on the Self-Winding Clock Company, and have a working synchronizing system in operation, and also expect to display the multitude of movements which demonstrate the progression from the early Type-A to the final version, Type-F mechanism.

We need additional clocks by Self-Winding and other New York makers; Poole, Barr, Tiffany, New York Standard Watch Company and others. Also needed are a few volunteers to assist with set-up and the program.

If you can assist with clocks or set-up and program, please advise BEFORE the end of April so plans can be finalized. Arrangements for table space needed along with sizes and types of supports for hanging clocks have to be made well in advance, as will the details of clocks exhibited for a proposed catalog. Recognition will be given to all those participating, of course. For ease in replying, you can FAX Marty Swetsky at his office during business hours at (718) 375-2796, or call toll-free at (800) 221-0424, or write to Harvey Schmidt, Secretary, at his address, 75-80 179th Street, Flushing, NY 11366.

Material scheduled for publication in future1996 journals will include observatory clock data covering REIFLER and SCHORTT... a fascinating insight into precision timekeeping!

Good reading ahead... enjoy this issue.

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

IN MEMORIAM

It is with deep regret that we advise our members of the death of HENRY B. FRIED, of Larchmont, on March 10th, 1996.

Henry was a Star Fellow of NAWCC and a Fellow of AWI, a charter member of EHS #78, and belonged to many chapters of NAWCC. In addition, he was the author and illustrator of more than 15 books and pamphlets, as well as hundreds of published articles. Henry was a born teacher - he taught and lectured at meetings as well as other groups dedicated to horology and antiques, was a consultant for Random House and Merriam-Webster, and was a worldwide industry consultant for some of the most prestigious watch and clock manufacturers both here and abroad.

A Past President of The New York City Horological Society and New York State Watchmakers Association, as well as Vice-President of the Horological Institute of America, he was the first American to be awarded the British Horological Institute's Silver Medal. The clocktower of the new World Headquarters of AWI in Harrison, Ohio was dedicated in his honor.

With his friendly smile, ready wit and willingness to share his wealth of knowledge, he was welcomed everywhere he went! Henry B. Fried will be sorely missed by all who knew him. He was a most remarkable person, who will not be forgotten and we offer our deepest condolences to his family.

Engineering Bulletin

No. 18 International Time Recording Co., of N. Y. ENDICOTT, N. Y. February 1, 1920

Tables For Wiring For Electric Time Systems

By J. W. Bryce, Supervising Engineer

J. W. BRYCE

Tables are presented in this bulletin which it is felt will be of value in determining voltage and wiring for various electric clock systems (of the impulse type) without recourse to the trouble of using formulas and figuring.

The figures given in all cases are the **maximum** allowable and it should be kept in mind that the figures are for the distances from the **battery** to the recorders and if there is other apparatus on the main or feeder wires to the time systems, due allowance should be made for this, either in estimating distance or in the selection of the size of wire to be used.

It is the practice of the I. T. R. Co., to make all electrical apparatus operate on a voltage 20 per cent below its normal rating. For example:

6 Volt apparatus is tested to operate at 4.8 volts
12 Volt apparatus is tested to operate at 9.6 volts
24 Volt apparatus is tested to operate at 19.2 volts
48 Volt apparatus is tested to operate at 38.4 volts

The figures in the tables allow for a drop of 10 per cent in the wiring. The additional 10 per cent is to allow for a slight drop at the battery or in other connections and for safety.

It has been the practice of some electricians to compensate for line drop by adding extra cells to the battery. This is pernicious practice. The circuit or circuits should be designed to transmit the required current without undue loss.

The reason for this is that if a system is laid out correctly all apparatus will be substantially the same voltage, whereas, if a battery of higher voltage than necessary is used and too small wire, the recorders or clocks nearest the battery must get too much current in order to have the distant recorders operate at all.

Perhaps an example will illustrate better than a lengthy general description. Suppose we have 5 electric drive recorders close to battery and 5 more located a thousand feet away. Assume that in order to keep down initial expense of battery it is decided to use a twelve volt system and that No. 12 wire is used.

MAXIMUM ALLOWABLE DISTANCES

FOR WIRING FOR 6 VOLT SYSTEM

Based on a voltage drop of 10% (0.6 volt) with different sizes of wires and varying ampere consumption of current flow

Table A — Circuit using #10 Wire

Current in Amperes,	.20	.40	.60	.80	1.0	1.2	1.4	1.6	1.8	2.0
Ft. of wire in Circuit	3,000.	1500.	1000.	750.	600.	500.	428.	375	333.	300.
Ft. from Battery to Recorders	1,500.	750.	500.	375.	300.	250.	214.	188.	166.	150.

Table B — Circuit using #12 Wire

Current in Amperes,	.20	.40	.60	.80	1.0	1.2	1.4	1.6	1.8	2.0
Ft. of wire in circuit	1888.	944.	629.	472.	378.	315.	269.	236.	210.	189.
Ft. from Battery to Recorders,	944.	472.	315.	236.	189.	157.	135.	118.	105.	94.

Table C — Circuit using #14 Wire

Current in Amperes.	.20	.40	.60	.80	1.0	1.2	1.4	1.6	1.8	2.0
Ft. of wire in Circuit	1187.	594.	396.	297.	237.	198.	169.	148.	132.	119.
Ft. from Battery to Recorders	594.	297.	198.	148.	119.	99.	85.	74.	66.	59.

Table D — Circuit using #16 Wire

Current in Amperes,	.20	.40	.60	.80	1.0	1.2	1.4	1.6	1.8	2.0
Ft. of wire in Circuit	746.	373.	248	186.	149.	124.	106.	93.	82.	74.
Ft. from Battery to Recorders	373.	186.	124.	93.	74.	62.	53.	46.	41.	37.

MAXIMUM ALLOWABLE RESISTANCE IN CIRCUIT

FOR 6 VOLT SYSTEM

Based on a voltage drop of 10% (0.6 volt) with varying ampere consumption

Table E

Current in Amperes,	.20	.40	.60	.80	1.0	1.2	1.4	1.6	1.8	2.0
Allowable Resist., Ohms.	3.0	1.5	1.0	.75	.60	.50	.428	.375	.333	.300

Number 12 wire has a resistance of 1.6 ohms per thousand feet approximately(See Engineering Bulletin No. 15). Five 12 volt recorders require 5 x .126 or .630 ampere for their operation. The voltage drop would therefore be 2 x 1.6 ohms x .630 amps. = 2.01 volts, which is too great for safety. It should not exceed 1.2 volts as a maximum. Now assume that to compensate for this we raise the normal voltage of the system to say 16 volts(not at all an uncommon occurance).

The resistance of the distant recorder circuit will be 95 ÷ 5 = 19 ohms plus the line 3.2 ohms 19 + 3.2 = 22.2 ohms. The current flowing will be 16 ÷ 22.2 = 0.72 amperes of which 1-5 will flow through each distant recorder or .144 ampere and the voltage across each of these recorders will be 95 x .144 = 13.68 volts whereas the recorders close to the battery will get 16 volts. The above voltage(16) is assumed to be nominal or working voltage and there will be a much greater difference when the battery is under charge.

It is permissible to use a couple of extra end cells to raise the voltage in any given case but the

MAXIMUM ALLOWABLE DISTANCES

FOR WIRING FOR 12 VOLT SYSTEM

Based on a voltage drop of 10% (1.2 volts) and from one to ten electric drive recorders, and with different sizes of wire

Table F — Circuit using #10 Wire.

No of Recorders	1	2	3	4	5	6	7	8	9	10
Amp Current	.126	.252	.378	.504	.630	.756	.882	1.008	1.134	1.260
Ft. of wire in circuit	9500.	4750.	3170.	2380.	1900.	1590.	1360.	1190.	1058.	1000
Ft from Battery to Recorder	4750	2375	1585	1190.	950.	795.	680.	595.	529.	500.

Table G — Circuit using #12 Wire.

No. of Recorders	1	2	3	4	5	6	7	8	9	10
Amp. Current	.126	.252	.378	.504	.630	.756	.882	1.008	1.134.	1.260.
Ft. of wire in circuit	5978.	2989.	1994.	1497.	1195.	1000.	856.	748.	667.	629.
Ft. from Battery to Recorders	2989.	1494.	997.	749.	598.	500.	428.	374.	333.	314.

Table H — Circuit using #14 Wire

No. of Recorders	1	2	3	4	5	6	7	8	9	10
Amp. Current	.126	.252	.378	.504	.630	.756	.882	1.008	1.134	1.260
Ft. of wire in circuit	3760.	1880.	1254.	942.	752.	629.	537.	471.	419.	396.
Ft. from Battery to Recorders	1880.	940.	627.	471.	376.	314.	268.	236.	210.	198.

MAXIMUM ALLOWABLE RESISTANCE IN CIRCUIT

FOR 12 VOLT SYSTEM

Based on a voltage drop of 10% (1.2 volts) with from one to ten electric drive recorders

Table K

No. of Recorders	1	2	3	4	5	6	7	8	9	10
Allowable Resistance, Ohms	9.5	4.75	3.17	2.38	1.90	1.59	1.36	1.19	1.06	1.00

writer wants to point out that it is a thing that should not be carried to excess. The proper plan is to use wire large enough so there is no undue loss of voltage and if this cannot be done without making the wires too large, install a system of **higher voltage**. A study of the tables will show how increasing the voltage of the system, increases its radius of useful action.

It is to be noted that where say 10 Edison Storage Cells(12 Volts) or 6 lead cells(12 volts) are installed, unless the allowable distance with the apparatus selected comes well within the limits shown in the tables it is desirable to add one or two cells to the battery but no more. It is preferable to increase the size of wire or go to a 24 volt system.

It is further to be noted that if the battery is to be quite fully discharged with ten Edison Storage Cells the voltage will fall to nearly 10 volts (with 10 Cells) and to about the same with 6 lead cells. Therefore, battery should be selected with sufficient capacity so it will not be discharged to such a low point.

MAXIMUM ALLOWABLE DISTANCES

FOR WIRING FOR 24 VOLT SYSTEM

Based on a voltage drop of 10% (2.4 volts) and from one to ten electric drive recorders, and with different sizes of wire

Taole L — Circuit using #10 Wire

No. of Recorders	1	2	3	4	5	6	7	8	9	10
Ampere, current,	.096	.192	.288	.384	.480	.576	.672	.768	.864	.960
Ft of wire in circuit	25000.	12500.	8333.	6250.	5000.	4132.	3571.	3125.	2777.	2500.
Ft from Battery to Recorders	12500.	6250.	4166.	3125.	2500.	2066.	1785.	1562.	1388.	1250.

Table M — Circuit using #12 Wire

No. of Recorders.	1	2	3	4	5	6	7	8	9	10
Ampere, current,	.096	.192	.288	.384	.480	.576	.672	.768	.864	.960
Ft of wire in circuit	15733.	7866.	5242.	3933.	3146.	2599.	2246.	1966.	1743.	1573.
Ft. from Battery to Recorders	7866.	3933.	2621.	1966.	1573.	1299.	1123.	983.	871.	786.

Table N — Circuit using #14 Wire.

No of Recorders	1	2	3	4	5	6	7	8	9	10
Ampere, current,	.096	.192	.288	.384	.480	.576	.672	.768	.864	.960
Ft of wire in circuit	9894.	4947.	3296.	2473.	1979.	1634.	1413.	1236.	1096.	989.
Ft. from Battery to Recorders	4947.	2473.	1648.	1236.	989.	817.	706.	618.	548.	494.

MAXIMUM ALLOWABLE RESISTANCE IN CIRCUIT

FOR 24 VOLT SYSTEM

Based on a voltage drop of 10% (2.4 volts) with from one to ten electric drive recorders

Table O

No. of Recorders.	1	2	3	4	5	6	7	8	9	10
Allowable Resistance, Ohms.	25.	12.5	8.33	6.25	5.00	4.13	3.57	3.13	2.78	2.50

When current is drawn from any battery(storage or primary) there is a slight loss of voltage across the terminals of the battery and this effect becomes especially marked if too small capacity of battery is used.

The ampere consumption of the system should therefore be added up and the battery makers table consulted to see that the battery cells are large enough to supply the current required.

To illustrate the use of the accompanying tables let us refer again to the example mentioned earlier in the article, i. e., an illustration of 10 electric drive recorders to operate on a 12 volt system with recorders close to the battery and five of them one thousand feet away.

Referring to table F under the fifth column we find that we can have 1900 feet in circuit or the recorders can be 950 feet away from the battery with No. 10 wire. This comes so close to our estimate of 100 feet the system would probably work but it would be safe to add a couple of cells to the battery in this case. It would be better to use a 24 volt system however. You would have a much safer proposition and one that would allow of expansion at the distant point.

MAXIMUM ALLOWABLE DISTANCES

FOR WIRING FOR 48 VOLT SYSTEM

Based on a voltage drop of 10% (4.8 volts) and from one to ten electric drive recorders, and with different sizes of wire

Table P — Circuit using #10 Wire

No. of Recorders,	1	2	3	4	5	6	7	8	9	10
Ampere, Current,	.048	.096	.144	.192	.240	.288	.336	.384	.432	.480
Ft. of wire in circuit	100,000.	50,000.	33,333.	25,000.	20,000.	16,666.	14,280.	12,500.	11,111.	10,000.
Ft. from Battery to Recorders.	50,000.	25,000.	16,666.	12,500.	10,000.	8,333.	7,140.	6,250.	5,555.	5,000.

Table Q — Circuit using #12 Wire.

No of Recorders,	1	2	3	4	5	6	7	8	9	10
Ampere, Current,	.048	.096	.144	.192	.240	.288	.336	.384	.432	.480
Ft. of wire in circuit	62,932.	31,466.	20,977.	15,733.	12,586.	10,488.	8,987.	7,866.	6,992.	6,293.
Ft. from Battery to Recorders.	31,466.	15,733.	10,489.	7,866	6,293.	5,244.	4,493.	3,933.	3,496.	3,146.

Table R — Circuit using #14 Wire.

No. of Recorders.	1	2	3	4	5	6	7	8	9	10
Ampere, current,	.048	.096	.144	.192	.240	.288	.336	.384	.432	.480
Ft. of wire in circuit	39,579.	19,789.	13,193.	9,895.	7,916.	6,596.	5,652.	4,947.	4,397.	3,958.
Ft. from Battery to Recorders.	19,789.	9,895.	6,597.	4,947.	3,958.	3,298.	2,826.	2,474.	2,199.	1,979.

MAXIMUM ALLOWABLE RESISTANCE IN CIRCUIT

FOR 48 VOLT SYSTEM

Based on a voltage drop of 10% (4.8 volts) with from one to ten electric drive recorders

Table S

No. of Recorders	1	2	3	4	5	6	7	8	9	10
Allowable Resistance, Ohms	100.	50.0	33.33	25.00	20.00	16.66	14.28	12.50	11.11	10.00

Reference to the table M will show this. In column 5 we see that the recorders, could be distant nearly 1600 feet from the battery even with No. 12 wire whereas No. 10 would be required with a 12 volt system.

As the recorders are to be only a thousand feet away, it is obvious that 50 per cent more equipment could be added at this distant point on a 24 volt system and the No. 12 wire used.

As a general rule it is recommended that not more than 10 electric drive recorders be put on any one circuit. The reason for this is that it keeps the spark on the relay points down to reasonable proportions and makes a more flexible and practical system of distribution of current to recorders.

Any apparatus may be connected on the circuit and the allowable distance by reference to the proper table and under the heading giving the amount of current consumed, may be found.

It is to be noted that in the tables, a heading "feet of wire in circuit" is given and the amount opposite the heading "Feet from battery to recorders." This is because there are two wires for the circuit, the outgoing and the return wire.

Engineering Bulletin

No. 19 International Time Recording Co., of N. Y. ENDICOTT, N. Y. February 15, 1920

On the Selection of Motor Generator Sets For Electrical Clock Systems

By J. W. Bryce, Supervising Engineer

As previously stated in Engineering Bulletins and other publications on electric impulse clock systems, it is necessary that a source of direct current be available for their operation. As this current has to be available 100 per cent of the time, the most practical and satisfactory source of current is that derived from storage cells.

Where direct current lighting circuits are in use, it is an easy matter to charge these batteries through suitable resistance units. Where alternating current only is available for charging purposes, it becomes necessary to introduce some sort of means for changing the alternating current to direct current or making it uni-directional.

There are five different types of rectifiers in common use.

1 The Reed type of rectifier using a vibrating armature which operates in step with the current wave and serves to operate contact points, whereby the impulses in one direction are automatically reversed to agree with the impulses in the opposite direction so that a uni-directional current is secured of a somewhat vibrating nature.

2—The Mercury Arc Rectifier which is a device suitable for charging comparatively large batteries, is too expensive to install and maintain for a small battery as used on the average clock system.

3—Chemical Rectifiers which consist of metal plates immersed in a solution which acts as an electric valve to choke back the impulses going in the wrong direction.

4— The Tungar Rectifier or hot bulb type of rectifier depends for its action on the valve action obtained by a special bulb containing a filament kept hot by the current and which has suitable electrodes to lead the current to the battery to be charged.

5—Motor Generator sets which consist of an alternating current motor, the shaft of which is directly connected to the shaft of a direct current dynamo.

Practical experience has shown that the types of rectifiers most suitable for use on clock systems are the last two types—i. e., the Tungar Rectifier and Motor Generator set. Descriptions of all the above rectifiers may be found in electrical text books.

It would be practically impossible in a bulletin of this size to cover all the conditions and all the types of generators that may be encountered and this description therefore will be limited to cover those types of devices listed in our price book.

The first step in the selection of the motor generator is to ascertain how many cells of battery are to be charged and the voltage of the cells. To charge Edison Storage cells at the rate given in the Edison catalog, requires a maximum of 1.8 volts per cell and for lead cells there should be an allowance made of about 2.5 volts per cell.

Referring to the table given below, opposite the type of cell is given the ampere hour capacity, together with the discharge rates for different numbers of hours and also the normal charging rate.

CAPACITIES, ETC., OF EDISON BATTERIES

Type of cell	Rated ampere hour capacity	Discharge rates for 8 hours	Discharge rates for 5 hours	Normal charging rate for 7 hours
B-I-H	18.75	2.25	3.75	3.75
B-2-H	37.50	3.75	7.50	7.50
B-4-H	75.00	9.50	15.00	15.00

Average discharge voltage per cell — 1.24 volts.

CAPACITIES, ETC., OF LEAD STORAGE BATTERIES

Type of cell	Rated ampere hour capacity	Discharge rates for 8 hours	Discharge rates for 5 hours	Normal charging rates
CT	11.3	1.4	1.9	1.5
PT	22.3	2.8	4.1	3.0
ET	34.	4.2	6.2	4.5
D-5	38.	4.75	6.8	5.
D-7	57.	7.1	10.0	7.5
E5	75	9.4	13.4	10.0

Average discharge voltage per cell — 2 volts.

To determine the size of generator to use, multiply the number of cells by the maximum volts per cell and multiply this by the charging rate in amperes as given in the table for the size of cell that is going to be used. The product of this is the number of watts of energy required to charge the battery. The watt is the unit of power and is equal to the product of the volt times the ampere. 746 watts equal one horsepower.

Now referring to the table of motor generators given below(or to page 104-A of the price book), under the column headed "Watts", select a generator that will give somewhat more than the number of watts just determined as described above. This will give you the size of generator required and opposite the number of watts the type number will be found.

You will note that the tables given below(and on page 104-A) are divided into two sets, those for single phase motors and those for two and three phase motors. If the current used is of 60 cycle frequency, the size and price may be taken directly from these tables. If 25, 40, or 50 cycle apparatus is required, it will be necessary to modify the rates in accordance with the note given to the foot of the tables.

MOTOR GENERATOR SETS

Type B-R with Oil Ring Bearings.

Motor windings 110 or 200 volts, 60 cycle, Single Phase.

Type	Watts	Volts	Weight Net	Pounds Pkd.
B2-R1	85	7 to 125	66	96
B2-R2	120	7 to 125	72	102
B3-R2	150	8 to 125	78	108
B4-R3	240	8 to 125	95	145
B5-R4	300	10 to 125	110	160
B3-R2	150	220 to 500		
B4-R3	200	220 to 500		
B5-R4	250	220 to 500		

Motor Windings 110 or 200 volts, 60 Cycle, 2 or 3 Phase.

Type	Watts	Volts	Weight Net	Pounds Pkd.
B2-R1	100	7 to 125	64	94
B2-R2	150	7 to 125	70	100
B3-R2	180	7 to 125	76	106
B4-R3	280	8 to 125	83	143
B5-R4	360	12 to 125	108	158
B55-L3	450	18 to 125	175	230
B3-R2	150	250 to 500		
B4-R3	200	250 to 500		
B5-R4	300	250 to 500		
B55-L3	400	250 to 500		

25 Cycle motor windings, list plus 10 per cent.

40 and 50 Cycle motor windings, list plus 5 per cent.

Ratings—Sets with 25 and 50 cycle motors will deliver only 80 per cent of corresponding 60 cycle sets. Sets with 40 cycle motors only 66 per cent.

Thus, in making out an order for such a motor generator you should specify the voltage that the motor is to operate on; whether it is single, two or three phase; the frequency—that is, 25, 40, 50 or 60 cycles, and the number of cells of battery to be charged. The voltage given in the tables as applied to the generator end of the set will be properly adjusted by the maker of the set if he is told how many cells of battery are to be charged so that all you have to do is to furnish the data as to the kind of current and the voltage of the current the motor is to operate on and the type number, which is also the watts capacity of the set.

If voltages higher than 220 are used, a transformer should be furnished. Occasionally plants are encountered where 440 volts or more are in use and this may readily be stepped down by a suitable transformer to a voltage adapted to operate the motor end of the motor generator set.

No. 20 *International Time Recording Co., of N. Y.* ENDICOTT, N. Y. February 1, 1921
Revised to October 18, 1922

Electric Time Recording Systems

Impulse Type

By E. F. Geiger

OUR various types of time recording devices are all arranged for electrical operation in cases where it is desirable to obtain automatic and uniform results from several units installed on the same premises. In substituting electric power for spring power in our various devices, no change is made in the results obtained from individual units. Therefore, sell your customer on the various recorders, stamps, clocks, etc., as meet with his requirements, on the basis of their individual performance. Proceed with a sale according to the following schedule:

1st. Recording Units

a. Card recorders, dial recorders, autograph and cost recorders.

b. Time stamps and secondary clocks.

c. Color change devices and time elimination devices.

d. Program devices.

2nd. Controlling Unit

a. Master clock, type A, B, C, or D.

b. Type B relay inclosed for connection to a system not our own make.

3rd. Battery

a. Edison or lead plate storage battery.

Charging board, A, B-MG, B-TR, C, D, E-TR, E-MG, or F-MG.

Tungar rectifier or motor-generator set.

b. Edison Primary Battery.

For 6 volt system use 10 cells.

For 12 volt system, shipped after March 1, 1921, use 15 cells.

For 12 volt system, shipped prior to March 1, 1921, use 20 cells.

c. Dry cells.

For 6 volt system use 4 cells in series.

For 12 volt system use 8 cells in series.

Not recommended except for very small installations. See Engineering Bulletin No. 1.

4th. Distribution Relays

a. Master relay cabinet, type "A" charging board or type "A" Master Clock.

b. Distribution cabinets (2 relays each).

c. Current reversing device for polarized clocks.

5th. Electric Wiring

The Controlling Unit

This should be one of our master clocks or its equivalent, such as will meet with the requirements of your customer as to dependability and time keeping qualities. The type "A" master clock is made for 6 volt and 12 volt primary battery systems only.

The Battery

To determine the kind, voltage, and capacity of the battery required, proceed as follows:

Find out what the approximate distance will be from the battery to the farthest recorder or clock. Take this distance and referring to Table No. 1 select the voltage required by one of the three sizes of wire commonly used in electrical wiring. As a rule, select the voltage that will allow you to use the smaller wire. Twenty-four volts is our standard for average sized installations. If the system is extensive, the voltage of the battery may be kept down to 48 volts by using one of the larger size wires.

Having selected the voltage, make a list of the recorders, stamps, clocks, etc., that are to go into the system, and referring to Table No. 2 find the total consumption in amperes of the system at the voltage selected. Take this total and referring to Table No. 3 under "Allowable Discharge" find what battery cells are large enough to furnish the required current. Also, by dividing the battery voltage you selected by the "Working Voltage" per cell, as given in the same table, you can determine the number of cells required to make up the battery.

Edison storage cells have long life and cannot be injured by overcharging, over-discharging, or standing idle. They come in sealed steel containers fully assembled in wooden racks with handles. They do not give off corrosive fumes while being charged.

Electric Storage Battery Company's cells are of the lead plate type. They are set up in glass jars with glass covers and are shipped unassembled with the electrolyte in jugs.

Charging Apparatus

For charging the storage battery from the electric lighting service one of our special charging devices is to be preferred. If the lighting service is alternating current only, select either a type B, E, or F. If the service is direct current, either all or part of the time, select either a type A, C, or D.

Type A is fully automatic. It consists essentially of two transfer relays, so arranged as to normally float the battery on the charging line. The relays are actuated once each minute by the master Clock so as to throw the battery off the charging line and on to the clock circuits for the duration of the contact. This action of the relays makes it unnecessary to use a master relay cabinet with this charging device. It can be used on a charging line that at times carries alternating current. The clock circuits are at all times insulated from the charging line. For use with small and medium sized systems requiring not more than 5 amperes of current regardless of voltage.

Type C is fully automatic. It is used where it is desired to float a 110 volt battery on 110 volt D. C. service. It contains a reverse current cut-out that lets current flow into the battery from the charging source, but will not let current flow out when the voltage of the charging source falls below normal.

Type D is non-automatic. It requires a duplicate set of batteries so that one set may be charged while the other set is being used. The only attention it requires is that of throwing over the switches about once a week. The charging rate can be varied anywhere from about ⅛ of an ampere to about 3 amperes by means of a rheostat.

Type B is fully automatic. It can be used on lines carrying only alternating current. To rectify the alternating current, either a Tungar rectifier or a motor-generator set must be supplied. The latter should be 85 watt or 120 watt in capacity. The Tungar rectifier should be selected according to the charging current and voltage of the battery and should have a charging rate up to 2½ amperes. The type "B" panel is called type "B-MG" or type "B-TR" according to which of the above rectifying units is used.

Type E is a non-automatic panel for charging a single set of cells from a motor-generator set or a Tungar rectifier and is accordingly called either a type "E-MG" or a type "E-TR." The Tungar rectifier should be selected according to the charging current and the battery voltage and should have a charging rate up to 6 amperes, except for a 12 volt battery the 2½ ampere rate may be used. To find the size of the motor-generator set required, multiply the voltage of the battery by the allowable discharge. This will

give you the watts required. For example, a 24 volt battery of B-2-II Edison cells would require approximately a 24×7, or 168-watt machine.

Type F panel is the same as type E, except that it is equipped to charge a duplicate set of batteries. It is made up for use with a motor-generator set only and is designated as type F-MG.

Distribution Relays

Take the current consumption of the system as found in determining the size of the battery cell required, and divide it by the carrying capacity of the type B relay, as given in Table No. 4. This will give the number of relays required. The master relay cabinet contains one relay and each distribution cabinet contains two relays. Where a type A master or type A automatic charging device is used, it takes the place of the master relay cabinet and counts as one relay. From the above you can determine the number of distribution cabinets required in addition to the master relay or its equivalent. If the system is to contain polarized clocks, the circuits that contain such clocks must be equipped with a Current Reversing Device.

The Electrical Wiring

The wiring should be furnished by your customer. Tell him our Engineering Department will furnish diagrams and specification upon receipt of plans showing the location of the various units.

In general there should be as many circuits as there are relays. There may be more to meet the wiring conditions. Two or more circuits may be attached to one relay provided their total current consumption does not exceed the carrying capacity of the relay. The size of wire in each circuit can be determined from the battery voltage and the distance from the battery to the last unit on the circuit, by reference to Table No. 1.

Between the battery and the distribution cabinets use a single pair of wires equivalent in circular mils to the sum of the circular mils in the distribution circuits. Table No. 5 gives the circular mil cross-sectional area of the commonly used wires.

(See Tables on following page)

TABLE No. 1
BATTERY VOLTAGE REQUIRED

SIZE OF WIRE	DISTANCE IN FEET FROM BATTERY TO FARTHEST RECORDER OR CLOCK											
	0 to 25 ft.	25 to 50 ft.	50 to 75 ft.	75 to 100 ft.	100 to 150 ft.	150 to 200 ft.	200 to 300 ft.	300 to 600 ft.	600 to 1000 ft.	1000 to 2000 ft.	2000 to 3000 ft.	3000 to 5000 ft.
No. 14	6	12	12	12	24	24	24	48	48	110	110	110
No. 12	6	6	12	12	12	24	24	24	48	48	110	110
No. 10	6	6	6	12	12	12	24	24	48	48	48	110

The above table is based on 10% line loss when carrying currents as given under carrying capacity of Type "B" Relay in table No. 4. Smaller currents will require proportionately smaller voltage.

TABLE No. 2
CURRENT CONSUMPTION IN AMPERES OF I. T. R. UNITS

NAME OF UNIT	6 VOLTS	12 VOLTS	24 VOLTS	48 VOLTS	110 VOLTS
Recorders, Electric Drive Card	.27	.14	.07	.04	.02
Recorders, Job Time, or Cost	.27	.14	.07	.04	.02
Recorders, Electric Escape	.15	.07	.07*	.07*	.07*
Time Stamps, International	1.50	.75	.40	.21	.09
Secondary Clocks, Ratchet and Pawl	.17	.08	.04	.02	.02*
Secondary Clocks, Polarized	.030	.015	.008	.008*	.008*
Program Machine	.15	.07	.07*	.07*	.07*
Relay, Type " B "	.05	.03	.03*	.03*	.03*
Make and Break Device and Timing Relay	.50	.25	.13	.065	.038
Current Reversing Device	.50	.25	.13	.065	.038
Master Clocks, Type " A "	.38	.19			
Master Clocks, Types "B" and "C"	.38	.19	.10	.05	.03

**External Resistance Used*

TABLE No. 3
ALLOWABLE DISCHARGE THAT MAY BE TAKEN FROM BATTERIES WHEN USED ON I. T. R. MINUTE IMPULSE SYSTEMS

KIND	CAPACITY	WORKING VOLTAGE	Allowable Discharge
Edison Storage Battery			
Type B - 1 - H	18 ampere hrs.	1.2 volts	3.5 amperes
" B - 2 - H	36 " "	1.2 "	7. "
" B - 4 - H	72 " "	1.2 "	14. "
" B - 6 - H	108 " "	1.2 "	21. "
Electric Storage Battery Co.			
Type C - T	12 ampere hrs.	2. volts	1.5 amperes
" P - T	24 " "	2. "	3.0 "
" E - T	36 " "	2. "	4.5 "
" E - 5 plate	80 " "	2. "	10. "
" E - 7 plate	120 " "	2. "	15. "
Primary Battery			
Edison No. 252	250 ampere hrs.	.6 volts	1.5 amperes
Dry Cells	20 " "	1.5 "	.25 "

TABLE No. 4
CARRYING CAPACITY OF TYPE "B" RELAYS

At 6 Volts 5. Amperes

" 12 " 2.5 "

" 24 " 1.25 "

" 48 " .75 "

" 110 " .5 "

TABLE No. 5
RESISTANCE AND CROSS SECTIONAL AREA OF COPPER WIRE

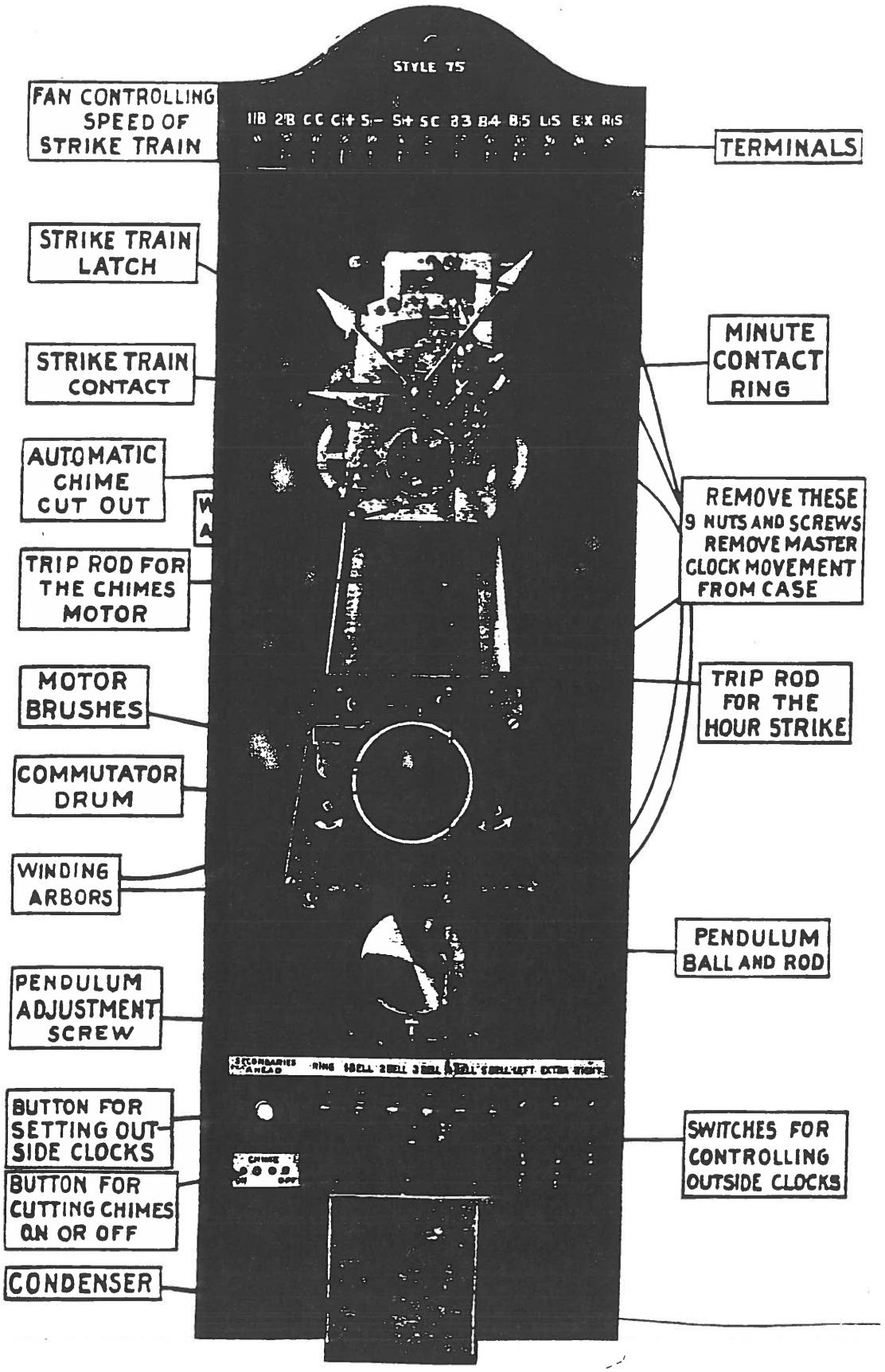
B. & S. Gauge	Feet per Ohm	Circular Mils
No. 14	397	4107
No. 12	631	6530
No. 10	1003	10380
No. 8	1595	16510
No. 6	2535	26250
No. 4	4030	40740

INSTRUCTION BOOK

Electrical Tubular Chime and Clock Systems

—TEMPUS FUGIT—

O. B. McCLINTOCK COMPANY
MINNEAPOLIS, MINNESOTA


STYLE 75
FAN CONTROLLING SPEED OF STRIKE TRAIN
TERMINALS
STRIKE TRAIN LATCH
STRIKE TRAIN CONTACT
MINUTE CONTACT RING
AUTOMATIC CHIME CUT OUT
REMOVE THESE 9 NUTS AND SCREWS REMOVE MASTER CLOCK MOVEMENT FROM CASE
TRIP ROD FOR THE CHIMES MOTOR
MOTOR BRUSHES
TRIP ROD FOR THE HOUR STRIKE
COMMUTATOR DRUM
WINDING ARBORS
PENDULUM BALL AND ROD
PENDULUM ADJUSTMENT SCREW
BUTTON FOR SETTING OUT SIDE CLOCKS
SWITCHES FOR CONTROLLING OUTSIDE CLOCKS
BUTTON FOR CUTTING CHIMES ON OR OFF
CONDENSER

MASTER CLOCK

1. The Master Clock consists of—The Clock Movement at the top, and the Chimes Motor below it, both on the cast frame. (See cut).

2. The entire Clock and Chime system depends on the Clock Movement at the top for proper operation. NOTE: For correct understanding of the following instructions, examine the cut on the first page and the Master Clock and equipment as installed in your Bank.

GENERAL OPERATION

3. Minute Contact Ring. This is the famous McClintock Mercury Ring. In this glass ring is made the electrical contact which sends the outside clocks forward each minute. Because of its construction the platinum points are in a vacuum which means no corrosion--a common fault with ordinary electrical contacts.

This particular Contact is used in railroad signal work where thousands of lives depend upon its operation year after year. This is a McClintock Patent and is not used on any other electrical clock system.

The Minute Contact Ring rocks to the right once each minute and is pulled back by the small weight fastened to the brass arm. Each time it rocks, an electrical contact is formed inside the glass ring. This momentary contact allows the battery to send the outside clocks ahead one minute.

4. The Trip Rod for the Chimes Motor is pulled up by a cam in the Clock Movement each quarter hour. The Commutator Drum is thus released and turns to the right, ringing the chimes, then stops automatically until again tripped by the Clock movement.

5. The Trip Rod for the Hour Strike is pulled down by a cam behind the Commutator Drum just after the full sixteen chimes have been struck at the hour period. This lifts up the Strike Train Latch (Index Pointer) releasing the Strike Train. Each complete revolution of the small disc on the front of Strike Train causes the pin to touch Strike Train Contact Brush tolling the hour bell. The number of strokes is governed by the Strike Train Latch in connection with index wheel.

6. The Automatic Chime Cut Out consists of a notched cam operating two contact fingers. When upper finger rides in part of cam that is notched out and colored black the fingers are out of contact and on *Night Space*. Ringing of Chimes is cut out and remains so until upper finger is pressed down into contact with lower finger by brass colored part of cam. This is Day Space. The chimes cut out is arranged to ring the chimes from 7:00 A. M. to 10:00 P. M.

When setting or starting the clock movement, don't forget the Chimes Cut Out, or you may have this 12 hours off, which will ring the chimes at night and shut them off in the daytime.

It is necessary that the contact fingers be clean and make a firm contact, or the chimes will miss.

TO WIND CLOCK MOVEMENT

7. Once each week, wind the two springs to the RIGHT until the two red lines join. The right hand spring runs the clock, and the left hand spring runs the strike mechanism.

TO WIND CHIMES MOTOR

8. Once each week, wind the two springs to the LEFT until you come to a stop. The chimes motor runs the chimes and starts the hour strike.

TO REGULATE CLOCK MOVEMENT

9. To speed up the Clock Movement, turn the Pendulum Adjustment Screw to the RIGHT. To slow down the Clock Movement, turn the Pendulum Adjustment Screw to the LEFT. One full turn should make a difference of two minutes per day. We recommend turning screw just a trifle each time until properly regulated.

TO SET CLOCK MOVEMENT

10. To Set Movement ahead, turn the minute (long hand) Hand to the RIGHT. As you pass each quarter hour position, the Commutator Drum will start. Wait till it stops before passing the next quarter hour period.

To Set the Clock Movement back, Stop the pendulum. Then start it again when the Clock registers the right time.

TO RE-SET HOUR STRIKE

11. Pull DOWN gently on Trip Rod for the Hour Strike, and release your hold. The Hour Strike will advance one hour. Repeat until the Hour Strike is in time with the Clock.

TO RE-SET CHIMES MOTOR

12. Pull UP gently on Trip Rod for the Chimes Motor, and release your hold. The Chimes Motor will advance to the next position. Repeat operation until motor is set to chime properly. If drum does not rotate, move Master Clock minute hand back gently until it does, then after re-setting Chimes Motor set minute hand on correct time.

HOUR STRIKE

13. If the Hour Strike does not operate as well as you think it should, see that the clock spring is not run down. Examine the Strike Train Contact. If it is burned or dirty, polish with "OO" sand paper. If worn, send for a new one. If the fan does not turn freely, oil the fan pivots.

CHIMES

14. If the Chimes do not operate properly, Make examinations in Order listed.
See that Chimes Motor Springs are wound up. (See Paragraph 8)
See that Chimes Motor is in time with Clock Movement. (See Paragraph 12)
Examine Automatic Chimes cutout. It may be 12 hours off. (See Paragraph 6)
See that Chimes "ON" button is "ON".
Test Battery. (See instructions for care of O. B. Battery and charger).
Examine fuses in battery case.
Examine Commutator Drum to see that it advances properly.
Examine Motor Brushes and small Contact Springs on Commutator Drum.

SECONDARY OR OUTSIDE CLOCKS

15. The movement of these clocks is accomplished by the rocking of the minute contact ring.

There are two platinum wires inside the glass ring. When the ring rocks, the mercury in the glass flows over the platinum points, completing the circuits and energizing the magnets within the secondary clocks. The secondaries will advance one minute from each contact.

16. When these rings become damaged, they turn dark or cloudy inside and small particles of carbon will build up on top of the mercury, which in time will cause the Secondaries to miss or gain, and to eventually stop.

17. If they did stop from this cause, the push button would not move them. If the ring should become damaged as described above, a permanent contact would be formed in this ring which would exhaust the Clock battery quickly.

TO SET SECONDARY OR OUTSIDE CLOCKS

18. PUSH BUTTON IN MASTER CLOCK marked "Secondaries Ahead," is for setting the Secondary Clocks ahead, and each time it is pushed and released, it will advance the hands of the Secondary or Outside Clocks one minute. If all the Switches in the Master Clock, marked "Right, Left, Extra, or 1, 2, 3, 4," are left in while the Button is being pushed, all the Clocks will advance simultaneously.

19. If one Clock is behind the rest, it will be necessary to pull out all the Switches except the one which controls that particular Clock you wish to advance. When you have advanced that particular Clock to the same time as the others, put in all the Switches. By pushing the Button the required number of times, all the Clocks can be advanced to conform with the time shown on the Master Clock.

20. If all secondaries do not operate exactly as they should:

If any or all secondaries lose time: Test battery (See Battery Instructions).

Examine hands to see if they touch each other, or touch the dial or touch the Glass Cover.

Examine Minute Contact Ring. (See Paragraphs 1 and 2) If ring rocks sluggishly, have local jeweler oil pivots with watch oil.

If any or all secondaries gain time: Examine Minute Contact Ring. (See Paragraphs 1 and 2).

The weight on the ring might have moved, allowing the ring to rock too violently, thus causing a second contact occasionally.

If the above examination does not disclose the trouble, one or more of the secondary movements may be worn, and need replacing. Send for new one. (See following instructions for replacing.)

TO INSTALL SECONDARY OR OUTSIDE CLOCK MOVEMENTS

21. TO INSTALL NEW SECONDARY OR OUTSIDE CLOCK, first remove screw that goes through the outside door of Chime Case, and swing the door open. Next remove the hands. These hands are on a squared center staff and to take off, must be pulled straight out. Do not attempt to turn these hands either forward or backward, or you will injure the Secondary Clock. Next take off the small clip at the top dial, and lift out dial. Next disconnect the two wires leading from the Secondary at the point of connection, about eighteen inches from the movement, and take off the three nuts that are on the bolts passing through the cast standard, and pull out the Secondary.

22. REPLACE NEW SECONDARY in a like manner. You cannot get the hour hand on wrong, but the minute or long hand must be put on so that it will point straight up from the small notch you will find on the squared end of the center staff of the Secondary. This is easily found, and it must be understood that if this hand is not placed in this position, the hour and minute hands will not register correctly. Hour hand must be pushed on as far as it will go to prevent binding with minute hand.

OUTSIDE CHIME ENCLOSURE

23. The working parts of this Enclosure are all controlled by the Master or Inside Clock.

24. The action of the Hammers is caused by the contact fingers passing over the Contacts on the Commutator Drum inside the Master Clock.

25. The action of the Secondary Clocks is caused by the rocking of the Glass Ring in the upper part of Master or inside Clock Movement.

"OB" BATTERY AND CHARGER

26. Do not confuse the "OB" Battery with the ordinary Storage Battery. Follow closely the simple instructions we give you.

27. CAUTION—Acid solution is not, and cannot be, used in the Battery. *It will cause trouble.*

Hydrometer must not be used to test either Battery or Rectifier Cell.

Ammeter must never be used in testing.

Do not let anyone attempt to make *repairs on battery*.

We will send new one when necessary.

CARE OF BATTERY

28. Add *Distilled water* to each cell of Battery, regularly at such intervals as will insure complete saturation of the sponges at all times. Use as much water as the rubber sponge, found at the top of each cell, will take up. No other attention is necessary. The Battery will not sulphate, nor the plates buckle. Nor will an overcharge or a complete discharge injure it.

TO TEST BATTERY

29. If you wish to test the battery, use a *voltmeter* only, by connecting across the positive and negative terminals of the battery. Each cell should test two volts or the entire battery should test 12 volts when fully charged.

THE CHARGER

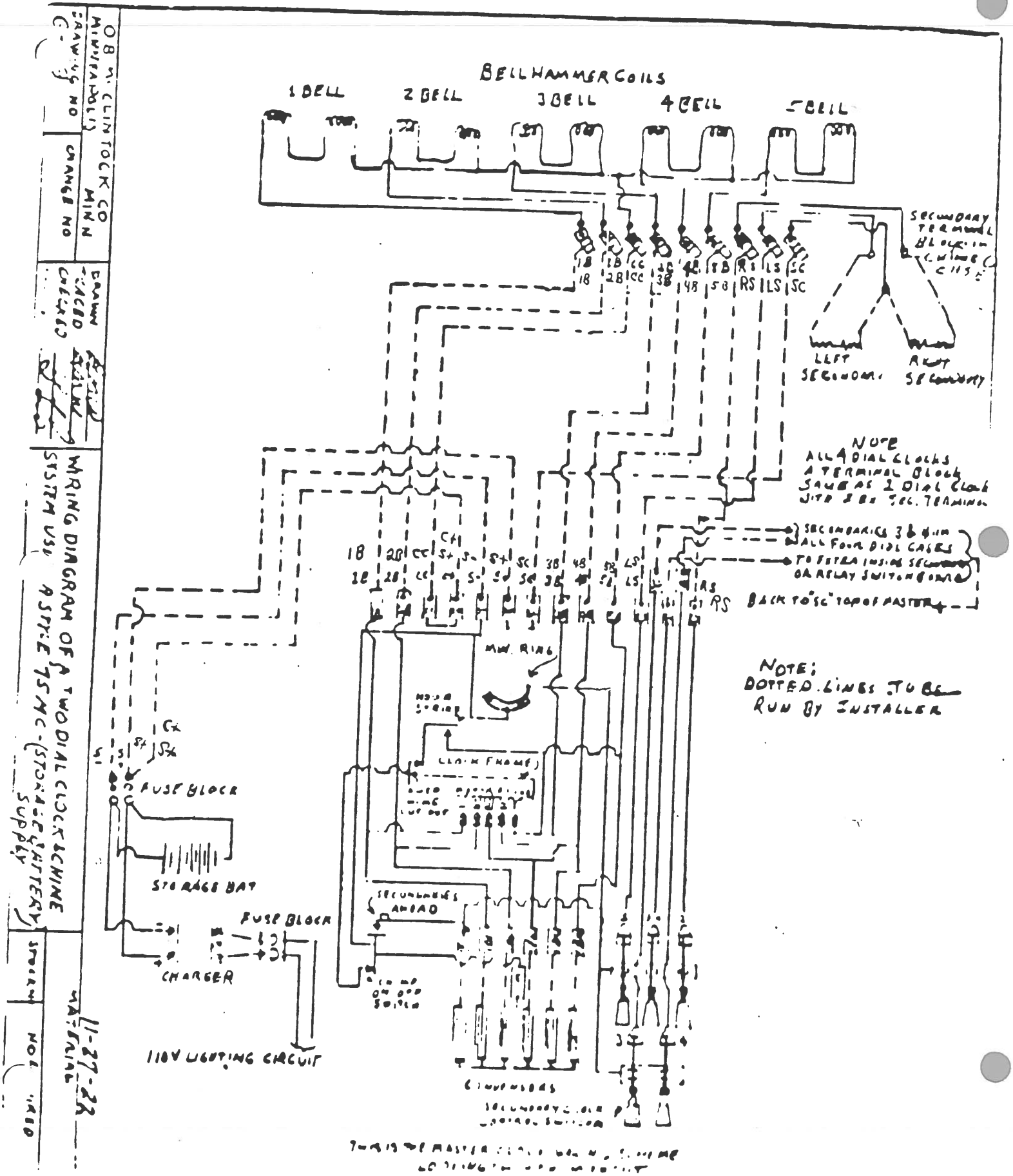
30. There is a water level mark 1½" below the top of the rectifier cell cover. The electrolite solution should be kept at this level by adding *distilled water*. The cups around electrodes where they come through the cell cover, should be filled with petrolatum. No other attention is necessary.

FUSES

31. Ordinary screw plug ten ampere fuses are used in the fuse blocks in battery case.

32. When wiring or writing give all information possible.

MASTER CLOCK WIRING SCHEME



OB N. CLINTOCK CO
MINNEAPOLIS
DRAWING NO
CHANGE NO
MIN
DRAWN
TRACED
CHECKED
WIRING DIAGRAM OF A TWO DIAL CLOCK MACHINE
A STYLE 75 MC - (STORAGE BATTERY SUPPLY)
SYSTEM USE
STORAGE
NOT USED
11-27-22
MATERIAL

INSTRUCTIONS FOR OPERATING CHIME CLOCK POWER UNIT.

The unit consists of two compartments. One contains the instrument and equipment necessary to the power unit feature. This is the first compartment with a Bakelite panel on which the instruments are mounted. The other, or back compartment, contains nine dry cells producing fourteen volts. These cells are connected in series to terminals leading from the front compartment or power unit. Carbon and zinc connections must be made to the correct terminals. A wiring diagram is pasted to the cover over the battery compartment. This cover is held in place by screws so that it can be removed handily to expose the batteries for renewal. This is the only compartment necessary to be opened.

- - - - - - - - - - -

The power unit is to be connected to 110 volt, 60 cycle city lighting circuit. A cord, with attachment plugs, is provided for this purpose. Be sure that the connection to the lighting circuit is a permanent one and not capable of being accidentally turned off.

The proper setting, for the milliammeter on the panel, is fifteen for a four dial Clock and twelve for a two dial clock. The rheostat knob underneath the meter is used for this setting.

When first installed the milliammeter reading will vary during the first twenty-four hours. This is due to the warming up of the transformer and rectifier. The setting must then be adjusted to the proper flow and will remain steady thereafter.

On the right side of the panel is a volt meter with a red mark on the dial at a central position. This indicates the voltage of the dry cells. Should the needle move to the right of this red mark, it would mean that the setting of the milliammeter is too high. Adjust this setting two degrees lower. If the needle moves to the left, then a higher setting of two degrees should be given. Watch the volt meter needle each time the clocks are wound and correct the setting of the milliammeter if a variation occurs.

There is a toggle switch on the panel which, in the "off" position, cuts the dry battery circuit from the power unit. This switch should always be on unless an interruption occurs in the electric light circuit. Then the switch should be turned to the "off" position and the clocks will operate from the dry cells without any flow from the power unit. Be sure to turn the switch to "on" as soon as electric power circuit is restored.

A radical deflection of the volt meter needle towards the left would indicate a defective cell. The individual cells should be tested then, and the dead or defective ones replaced.

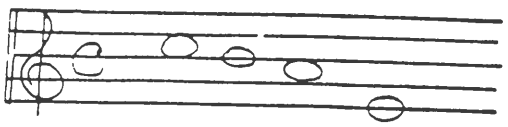
O. B. McClintock Company.

DLJ/CS.
9/30/44.

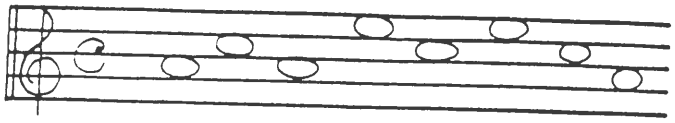
D. L. Jones.
Engineering-Service Dept.

E J B
6/1/32
E J B

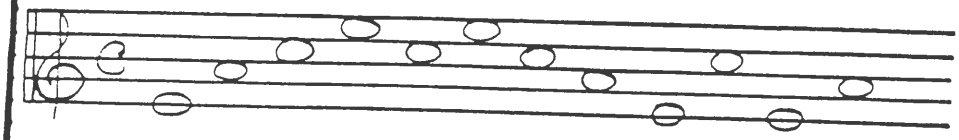
O. B. McCLINTOCK CO. CHIMES



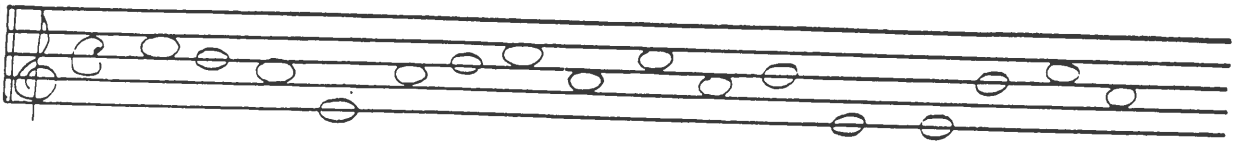
Quarter Hour Cathedral Peal Westminster



Half Hour Reveille Peal Wellington



Three Quarter Hour Whittington



Hour
Westminster

Clock Description

The case is walnut, measures 3 ft 10 in. high by 17½ in. wide by 10¼ in. wide and weighs 70 lbs.

The movement is No. 2455, Model 85E, Seth Thomas Custom, and electric strike plate No. 2362B. Time movement is 8 by 5 in. and it has two time springs ½ in. in width. Chime movement is 8½ in. by 7 in. and it has two springs 1 in. in width. Steel frame for movement is 21 in. in length. Weight of movements and frame is 21 lbs.

The transformer to take the place of batteries is mounted in recess in the top of the case; spark eliminator is in the lower case. Weight is 8 lbs.

There are five chime tubes, 2 in. in diameter, and they measure in length from 4 ft. 8 in. down to 3 ft 2½ in. Magnet and hammer rack measure 26 3/8 in.; chime rack 26 3/8 in.; and 50 ft. heavy insulated wire cable. The complete chime assembly weights 101 lbs.

The case for the chime assembly was made in Cincinnati and is solid cherry wood with plexiglass front and back.

The combined weight of the master clock and chimes is over 200 lbs.

During the June 24 meeting in Cincinnati at the AWI Museum, attended by over ninety members and their spouses, a number of people commented that the chimes did not "sound" right, so let us explain the unusual chiming sequence. Note the chime chart, shown—quarter hour, Cathedral Peal Westminster; half hour, Reveille Peal Wellington; three-quarter hour, Whittington; hour, Westminster. With this explanation we hope those present now feel relieved to know the Curator did not make an error in setting up the chimes; they were made that way.

The clock was overhauled and rebuilt by O.R. Hagans who is Curator of the AWI Museum.

We hope that among our readers there are those who can furnish more information regarding the O.B. McClintock Clock Co. to help us make a more complete historical file on this company. Send information to Curator, AWI Museum, 6930 E. Girard Avenue, Denver, CO 80224. □

Description of clock on display at AWI Museum:
(Orville Hagens in Nov. 1977 Horological Times)

OUR Electrical Tubular Chime And Clock System consists of

Five Tubular Bells, perfectly tuned, and from four to six feet long, enclosed in a Massive Brass, Copper and Steel Enclosure approximately nine feet long, three feet wide and fifteen inches deep.

The Enclosure is finished in Verde antique and oxodized copper, giving a fine green bronze effect.

The Enclosure contains in addition to the Bells, the two big Signs and two Clock Dials.

The letters are cut in copper and have a background of pearl glass. displaying a beautiful white sign at all times.

The two Clock Dials are thirty inches in diameter and are of pearl white glass with Arabic Numerals.

A beautiful twelve inch Dial Master Clock on a Marble base sixteen inches wide and forty-two inches long is installed in the office or lobby of your building and controls the clocks and chimes.

This Master Clock and the Secondary Clocks are controlled by the patented McClintock Mercury Contact Ring.

We furnish the battery to operate the entire system.

The Bells peal every quarter hour.

At the quarter hour---four bells---Cathedral peal of the Westminister Chime.

At the half hour---eight bells---Reveille peal of the Wellington Chime.

At the three quarters hour---twelve bells---full Whittington Chime.

At the even hour---Sixteen bells---full Westminister Chime---followed by the hour strike.

In no other way can your money be spent for so much advertising---such dignified---persistent permanent advertising.

Our chimes appeal to every man, woman and child in your community.

Our clocks are a public utility.

This is the only system of its kind in the world.

EXCLUSIVE advertising gains in value every day.

We sell but one system in each city or town.

McClintock-Loomis Company

INCORPORATED

Minneapolis, Minnesota

NATIONAL CITY BANK
CAPITAL $100.000.
SURPLUS $225.000

Oct. 7th, 1912.

McClintock & Loomis Co.,

Minneapolis, Minn.

Gentlemen:

The Clock System which you recently placed on our Bank building has exceeded our expectations in every way.

We have received many comments from friends, which are very complimentary.

The harmony of the chimes-the convenience to the public of the time of day and night, is highly appreciated by the community.

We think it a very attractive advertising medium.

Yours very truly,

Thomas D. Catlin
President.

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THE FIRST NATIONAL BANK
WARREN, PENNA.

November 13th, 1912.

The McClintock-Loomis Co.,

Minneapolis, Minn.

Gentlemen:-

We wish to express our thorough appreciation of the Electrical Tubular Chime System which you recently installed for us. The operation of the entire system is most perfect and from the general expressions of public approval and appreciation, both upon the street and through the newspapers, we are satisfied that it is an advertising factor of exceptional merit.

We wish particularly to speak of the most satisfactory manner in which the system was installed.

Taken all in all, it is a most perfect working mechanical and electrical device, an ornament to our building and an attractive addition to the electrical displays of the streets of our city

Yours very truly,

C. J. Caraccio Cashier.

Mr. Harvey Schmidt
Electrical Horology Society
75-80 179th St
Flushing, NY 11366

Dear Mr. Schmidt:

Enclosed please find a $10 check for annual membership dues.

I read with interest about your group in the NAWCC October 1995 bulletin. Usually I pass over reading about other chapters but I must confess I am motivated by a perplexing problem that I am having with an "New Haven/Westinghouse" banjo clock.

This clock has an anchor escapement with no pendulum. There is a motor that turns a fiber gear one full revolution which then butts up against a stop. The escapement verge has a thin wire rod hanging from it, which I think is pulled towards the magnetic field around the motor. I believe that the escape wheel action then pushes the verge away from the magnetic field.

The problem that I face is, I don't understand the purpose of the motor. Is it supposed to, wind the spring mechanism periodically, run continuously, why does it make one revolution then stop, etc, etc?

Is there anyone in your group who could enlighten me or possibly, is there information available for this clock? Unfortunately the only information about the clock is on the dial which merely says "New Haven/Westinghouse".

Sincerely

205 DeeDee Drive PO Box 98
Glen Gardner NJ 08826
3 November 1995

Harvey Schmidt asked me to answer your letter of 15 October as I repair these types of clocks on a regular basis since my retirement from the RCA/GE engineering staff.The only information I ever saw on this unique clock was a one paragraph description in a 1931 trade journal,with no explanation as to how it worked.

Basically your clock is powered by a Westinghouse synchronous motor which not only drives the hands but continually winds two spring barrels mounted in tandem which operate the chime and strike mechanism.The unique feature,however,is a third spring activated by a pointer in a slot in the dial.This slot has graduated markings from 0 to 3 minutes and incorporates the mechanism which puzzles you.It might appear that the "verge"and escape wheel would be involved in the time keeping,however,such is not the case.Because AC power distribution at the time this clock was designed and manufactured was subject to frequent power outages some means of maintaining confidence in the timekeeping accuracy of line operated clocks was needed.The telechron company provided a magnetically operated flag which displayed red as a warning to check the time.Many clocks were not self starting,therefore when they lost power they would have to be restarted and reset.

The New Haven/Westinghouse was a combination of manual and self starting and worked as follows:To initially start the clock first move the pointer on the dial to any position other than zero which does two things,1)moves the arm away from the fiber wheel and 2)winds a spring to power the mechanism.The verge has a soft iron wire attached which is positioned near the motor field and when the power is on will hold the verge steady.Without power the verge is free to oscillate and allow the escape wheel and the rest of the train to move thus positioning the arm to contact the fiber wheel preventing the clock from restarting.As long as the time of power outage does not exceed the time indicated by the pointer the clock will restart when power is restored.

The clock owner was given a choice of how far off or slow the clock is keeping time when still running.
If you have all the parts you may restore as original or disable it for the clock will run just fine without it.

If you have any questions you may drop me a note or call; 908 537 4575.

Regards,

John A McGrory NAWCC# 76289

— MART —

All MART Ads are FREE. Send copy to the attention of the Editor:
Harvey Schmidt, 75-80 179th St., Flushing, NY 11366. Limit 3 lines.

WANTED: **HOROLOGICAL LITERATURE**, Repair info, Catalogs, etc. for the Journal **PORTESCAP**Secticon Clock or Movement. Antique Watch & Clockmaker's Tools & Machinery.
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Richard McCahan, P.O. Box 1296,Center Harbor, NH 03226. (603) 253-4110

TIFFANY Double Contact Movement Only (Have case, dial, pendulum)
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Ken Erlenbusch, 124 N. Avena Avenue, Lodi, CA 95240 (?916) 369-5833

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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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THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78

NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXII #2, JUNE 1996

Fellow Horologists:

Your copy of the English translation of LA BULLE CLOCK is enclosed along with this cover letter and our MART pages as issue #2 of 1996. As previously requested, a voluntary $7.00 contribution would be appreciated to assist in covering the cost of this important publication. The Bulle clock was probably the most popular battery-electric clock on the continent, enjoying acceptance for more than a quarter century, rivaling our Tiffany Never-Wind for top honors in sales. It has been said that total production exceeded 300,000 units which explains why one appears now and again at our meetings, so far from home.

Plans for the Eastern States Regional Meeting exhibit, which include volunteers for set-up and program assistance along with material donors are moving slowly. In order to create an interesting display and exhibit, we need more material and a few more good men. If we want to take pride in the eventual success of this project we cannot shirk the early efforts required. If you plan to attend this meeting, held in Syracuse in late August, please consider active participation. You will gain the personal satisfaction by having been a part of a worthwhile effort along with having assisted Chapter 78 in its growth and accomplishments. It is anticipated that all active participants will receive a certificate in acknowledgement of their contribution and involvement.

You can contact our Secretary-Treasurer, Harvey Schmidt at 78-80 179th St., Flushing, NY 11366, or Martin Swetsky, President at his office, Toll-free at 800-221-0424. An information sheet is enclosed for your convenience in describing your exhibit entries. Your earliest reply will be appreciated, as plans for the display facilities and clock descriptions must be completed as early as possible, especially if we are to produce a catalog of the exhibit to be distributed to the attendees.

You might have noticed the change in the letterhead with its new EHS logo featuring the NAWCC sundial. The officers and directors of Chapter 78 thought it appropriate to adapt the sundial to electricity by adding the battery and making the composite the official logo of our chapter.

Your comments and suggestions (and criticisms) are always welcome and encouraged. Enjoy the Bulle book... Good reading inside...

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

— MART —

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PUL-SYN-ETIC (pg. 93, 150 Yrs. E. H.) excellent condition, all original & runs $750 **CHROMATIC** (very similar) dirty case, no pend. $250. **MAGNETA** (pg. 89, 150 Yrs. E. H.) case needs refinishing, Howard motion works $450. All 3 for $1200 + shipping
John Perrigo, 5431 Crestview Dr. Hixson, TN 37343, (423) 875-0453 late evenings.

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

1996 EASTERN STATES REGIONAL DISPLAY INFORMATION SHEET
EXHIBIT SPONSOR: ELECTRICAL HOROLOGY SOCIETY #78

PLEASE FILL OUT THE INFORMATION BELOW
FOR EACH CLOCK THAT YOU OFFER FOR THE DISPLAY

Name_____

Address_____

City & State_____**Zip**_____

Telephone (days)_____ **Evenings**_____

1) Item Description (Make, Model, Distinguishing features, Portions not original)

_____

_____

_____

If the entry is a wall hanging clock, please provide overall dimensions and distance from clock bottom to hanging bracket. This is needed in order to provide table uprights with proper hook location for support of the clock. Thank you for your cooperation.

Overall Height_____ **Width**_____ **Distance to Bracket**_____

2) Item Description (Make, Model, Distinguishing features, Portions not original)

_____

_____

_____

If the entry is a wall hanging clock, please provide overall dimensions and distance from clock bottom to hanging bracket. This is needed in order to provide table uprights with proper hook location for support of the clock. Thank you for your cooperation.

Overall Height_____ **Width**_____**Distance to Bracket**_____

NOTE: IF NECESSARY, PLEASE USE SEPARATE SHEET TO EITHER EXPAND INFORMATION, OR TO ADD OTHER ITEMS. THANK YOU

THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78
NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXII #3, OCTOBER 1996

Fellow Horologists:

The Eastern States Regional is now history and the exhibit which was planned and managed by Chapter 78 members was a huge success. The theme, Electrical Horology, NY State Makers, was sufficiently interesting, with an overwhelming number of contributions, many displayed in operation, played to standing room audiences. Two guided tours, with theoretical and historical explanations provided additional interest for the visitors. The entire presentation was videotaped for inclusion in the NAWCC lending library, and we are led to believe that copies of the videos will be available for sale in the near future. Thanks to the participants for a job well-done and especially to Jeff Holz for his Self-Winding display that stole the show!

The Bulle translation was a complete sell-out, and unless a sufficient number of additional copies are required, it is not likely that the reprints would be available again soon. The requested minimum order is 200 copies which is a bit more than our current membership can justify.

The remaining project on this year's schedule is the installation of an operative Self-Winding master-slave system in the educational building at the NAWCC headquarters. The Joe Singer material, donated by his wife Liz, is being evaluated for a system design, by our V.P., Bill Ellison. More on this as information becomes available.

We indicated that your criticisms were welcome, as always, regarding the Journal content, and we received an interesting letter from member Mel Kaye, printed herein along with our response. Additionally, an anonymous communication about Electricity was received, guaranteed to amuse the reader. Save this to re-read when you need a smile or an uplift in spirit.

The follow up on the Wallace information, ably prepared by Dr. George Feinstein, sheds some additional light on the history of the Wallace & Tiernan company while raising a few questions at the same time. Food for thought...

And finally, the promised material about the REIFLER clocks completes this issue. A wonderful presentation from the prestigous firm that made observatory clocks, ranked with Shortt, Fedchenko, and LeRoy in accuracy and acceptance.

Your comments and suggestions (and criticisms) are always welcome and encouraged. Good reading ahead...

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

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

ELECTRICITY

Todays scientific question is: What in the world is electricity? And where does it go after it leaves the toaster?

Here is a simple experiment that will teach you an important electrical lesson: On a cool, dry day, scuff your feet along a carpet, then reach your hand into a friends mouth and touch one of his dental fillings. Did you notice how your friend twitched violently and cried out in pain? This teaches us that electricity can be a very powerful force, but we must never use it to hurt others unless we need to learn an important electrical lesson.

It also teaches us how an electrical circuit works. When you scuffed your feet, you picked up batches of "electrons", which are very small objects that carpet manufacturers weave into carpet so that they will attract dirt. The electrons travel through your bloodstream and collect in your finger, where they form a spark that leaps to your friend's filling, then travels down to his feet and back into the carpet, thus completing the circuit.

AMAZING ELECTRONIC FACT: If you scuffed your feet long enough without touching anything, you would build up so many electrons that your finger would explode!! But this is nothing to worry about unless you have carpeting.

Although we modern persons tend to take our electric lights, radios, mixers, etc. for granted, hundreds of years ago people did not have any of these things, which is just as well because there was no place to plug them in. Then along came the first Electrical Pioneer, Benjamin Franklin, who flew a kite in an electrical storm and received a serious electrical shock. This proved that lightening was powered by the same force as carpets, but it also damaged Franklin's brain so severely that he started speaking only in incomprehensible maxims, such as, "A penny saved is a penny earned". Eventually he had to be given a job running the post office.

After Franklin came a herd of Electrical Pioneers whose names have become part of our electrical technology: Myron Volt, Mary Louise Amp, James Watt, Bob Transformer, etc. These pioneers conducted many important electrical experiments--Among them, Galvani discovered (this is the truth) that when he attached two different kinds of metal to the leg of a frog, an electrical current developed and the frog's leg kicked, even though it was no longer attached to the frog, which was dead anyway. Galvani's discovery led to enormous advances in the field of amphibian medicine. Today, skilled veterinary surgeons can take a frog that has been seriously injured or killed, implant pieces of metal into its muscles, and watch it hop back into the pond just like a normal frog, except for the fact that it sinks like a stone.

But the greatest Electrical Pioneer of them all was Thomas Edison, who was a brilliant inventor despite the fact that he had little formal education and lived in New Jersey. Edison's first major invention in 1877 was the phonograph, which could soon be found in thousands of American homes, where it basically sat until 1923, when the record was invented. But Edison's greatest achievement came in 1879 when he invented the electric company. Edison's design was a brilliant adaption of the simple electical circuit: the electric company sends electricity through a wire to a customer, then immediately gets the electricity back through another wire. Then (this is the brilliant part) sends it right back to the customer again.

This means that an electric company can sell a customer the same batch of electricity thousands of times a day and never get caught, since very few customers take the time to examine their electricity closely. In fact, the last year any new electricity was generated was 1937; the electric companies have been merely re-selling it ever since, which is why they have so much time to apply for rate increases.

Today, thanks to men like Edison and Franklin, and frogs like Galvani's, we receive almost unlimited benefits from electricity. For example, in the past decade scientists have developed the laser, an electronic appliance so powerful that it can vaporize a bulldozer 2000 yards away, yet so precise that doctors can use it to perform delicate operations to the human eyeball, provided they remember to change the power setting from "Vaporize Bulldozer" to "Delicate".

June 11, 1996

TO: Martin Swetsky, FNAWCC, President , EHS Chapter #78
FROM: Mel Kaye

SUBJECT: **NEW EHS LOGO**

I have examined the new EHS Logo with considerable interest.
On one hand, it does show commendable initiative and creativity.

However, I am rather disappointed. With all the available technological talent that exists in the Chapter, it is rather sad that you, as President, permitted this logo to be completed with such an obvious design deficiency.

You forgot to include provisions for a regulator. What happens when the sundial gains or loses time?

It seems to me, that with a little judicious electrical circuitry, either with an old fashioned resistor, or some newer solid state device, this design error easily could have been corrected.

At least you had the humility to remove the © from the design!

I hate to be critical, but as a member of the Chapter, I must put you on notice that if this flagrant and irresponsible conduct continues, I will propose that you and the other Officers of the Chapter forgo the usual year-end bonus.

EDITORIAL STAFF RESPONSE...

Your criticism regarding the new logo's lack of correction facility is a point well-taken... Our only excuse is that we were pre-occupied with what appeared to be a more important problem...the LUNAR activation of the sundial to permit night-time operation! Future efforts will address the dial's regulation as soon as the present issue is resolved.

Chapter members who have suggestions towards the solution of these problems are invited to submit their ideas for consideration by the advanced engineering committee.

The officers have decided to give serious consideration to the foirfeit of their year-end bonus IF it ever becomes a reality, but since it is non-existant at present, the proposal has been deferred for future attention. Please be assured that your communication will be given all of the attention that it merits, and future comments are, of course, always welcome.

WALLACE CLOCK

By Dr. George Feinstein

The following information comes from two drawings provided by Rev. Herbert T. Freeland of Nyack N.Y. One drawing is a black on white subsystems list for a Wallace Banjo style clock and is reproduced in its entirety. The other drawing is a 17" x 22" blueprint (white lines on a blue background) in very poor condition.

The second drawing is an assembly drawing for a model FU-457 mechanism and marked on it, in india ink, were modifications to its back plate to change it into a model FU-5Ø19 mechanism which is used in the previously mentioned Banjo.

The drawing had two views of the mechanism, the front and a side, which are reproduced on the attached white on black sheets. The drawing also had a detailed parts list, a revision date list, and some quality control testing notes which are reproduced below. The attached black on white drawing are my attempts at reconstructing the information available on the blueprint.

The revision date list shows a great deal of activity in the design of the clocks from mid 1929 to the end of 1931, which was the period of the stock market crash. An observation on the drawing is that the two views are not consistent, that is the various parts are not shown in the same location on the two views.

The drawings raise a number of interesting questions. Where there 41 or more styles of clocks contemplated as indicated by the designation of the Banjo clock as model FA-41? What is the meaning of the alphabetic prefixes of all the part numbers, such as CP, FA, FP, and FU? Why is there such a large jump in the part number for the Back Plate Assembly, from FU-431 to FU-5018? Where there over 2,ØØØ drawings made between 1929 and 1931 as indicated by the numbers on the revision list? If you have any ideas on these questions please write.

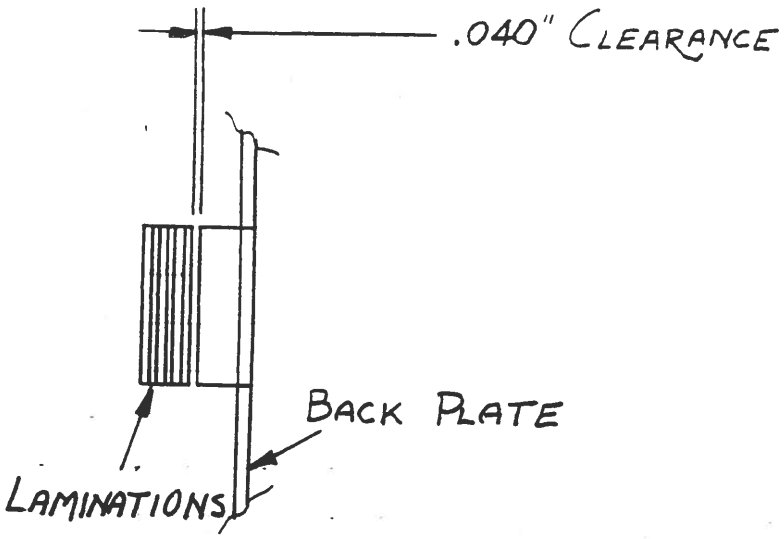
TESTING DATA -

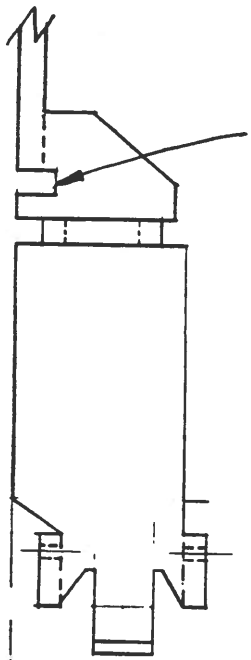
Insert special 5Ø gram TESTING spring FP-954 on coil FU-461. Clock must run two days without stopping with one cell. (Note: insert a short circuited block in place of one battery to complete connection).
After two day test is completed replace spring FP-954 adjusted to 75-8Ø grams.

NOTE: *Drop of clock oil to be put on each pin of escape wheel and 6 & 8 tooth pin type pinions and gears meshing with same.*

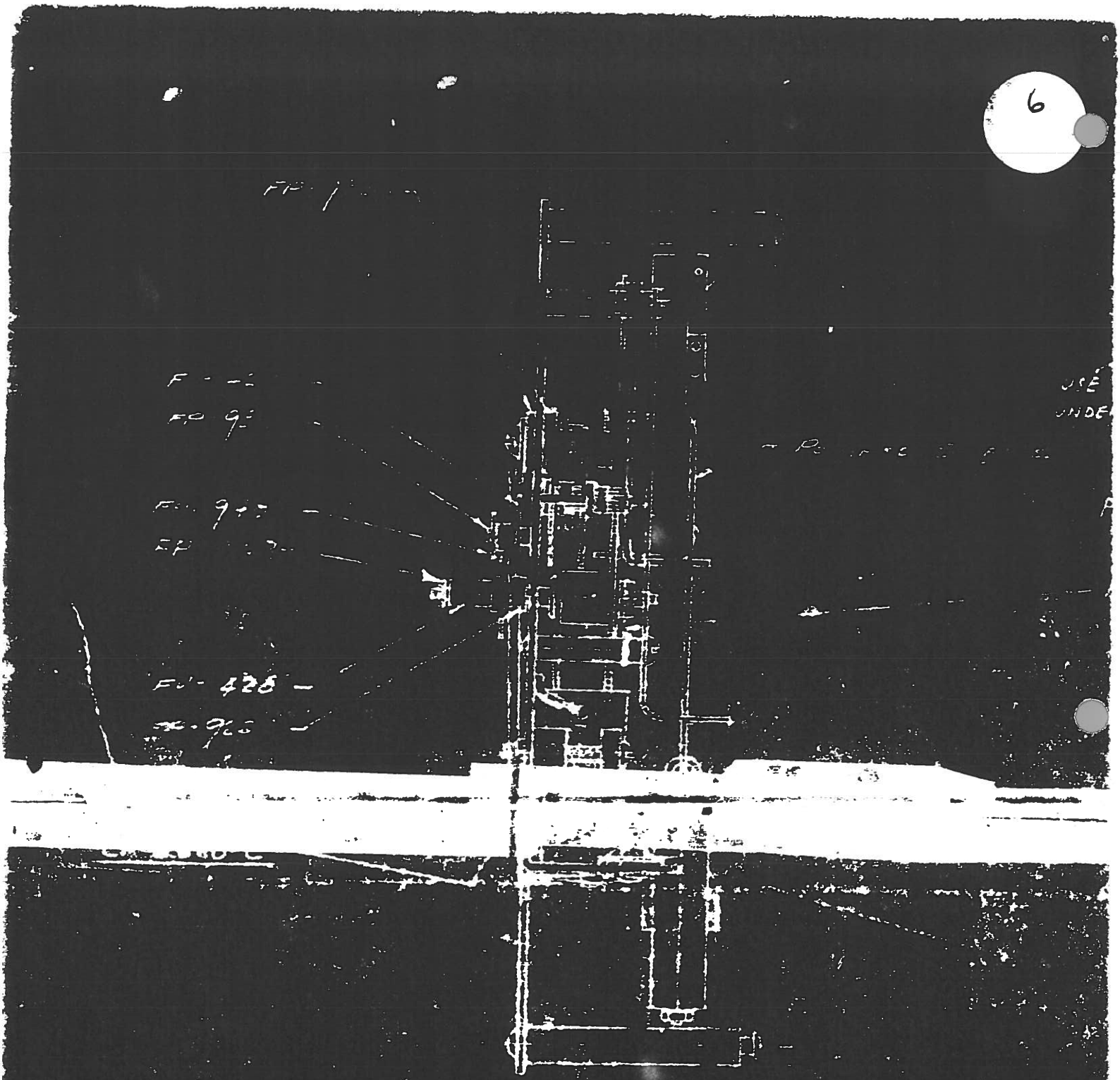
F

12/95





DRIVE SPRING FP-5008 SHOULD BE ADJUSTED TO GIVE READING OF 40 GRAMS AT THIS POINT ON ARMATURE.

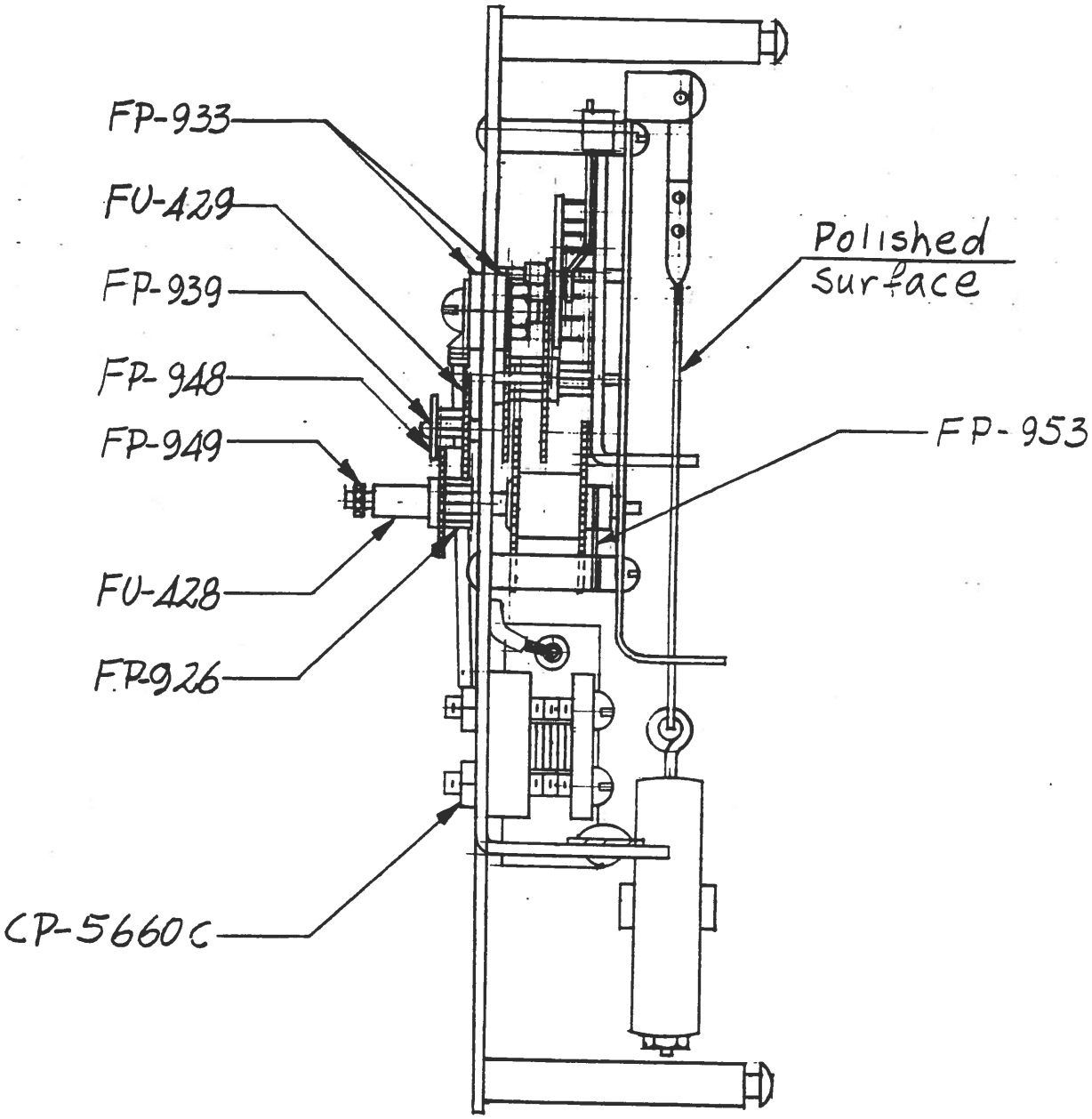


TESTING DATA-

INSERT SPECIMEN SO GRAM TESTING STRIPS FP-952
ON COIL #421. CLOCK MUST RUN TWO DAYS
WITHOUT STOPPING WITH ONE CELL. (NOTE: INSERT
A SHORT CIRCUIT BLOCK IN PLACE OF THE BATT

G

12/95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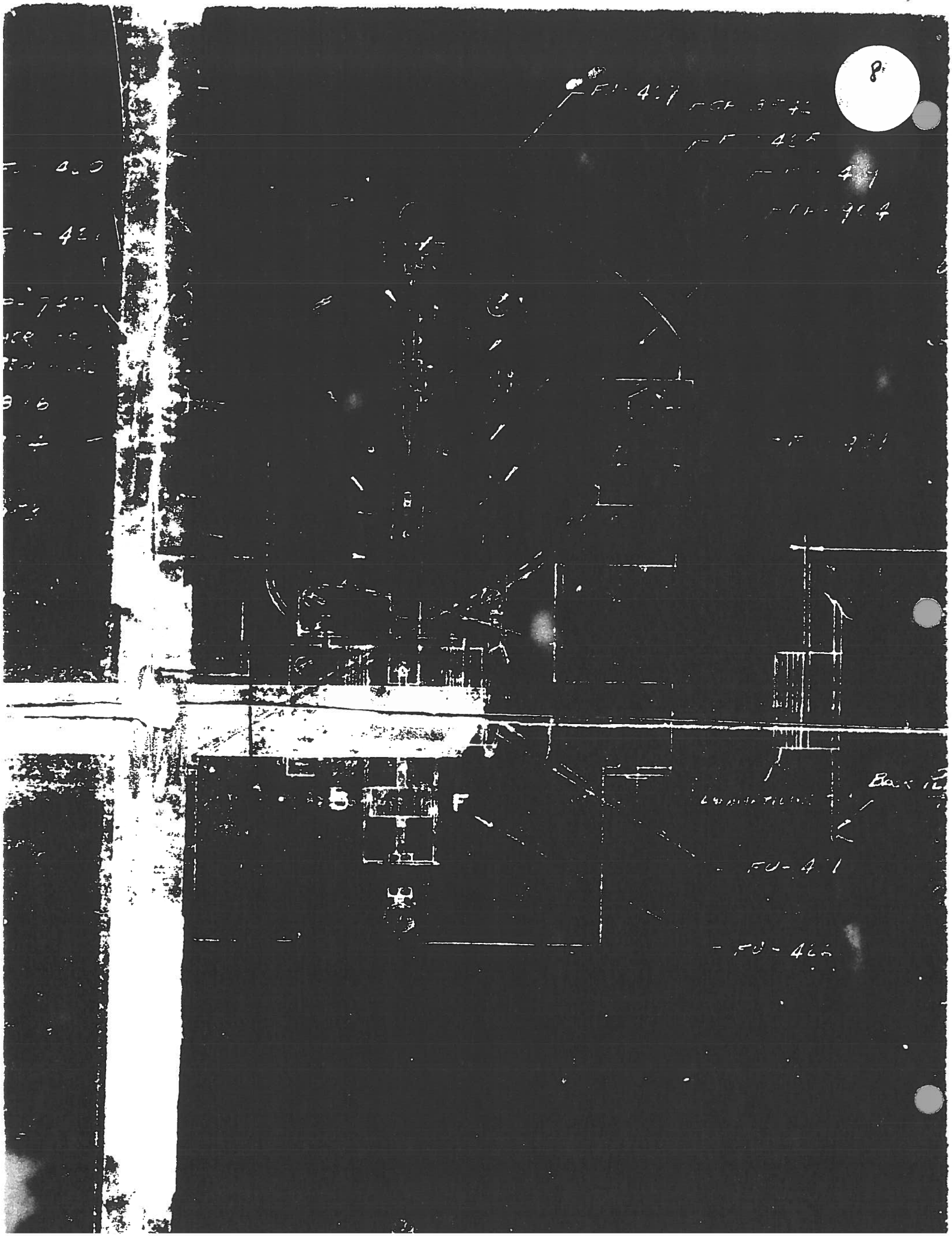
FU-429
FP-939
FP-948
FP-949
FU-428
FP926
CP-5660C
Polished surface
FP-953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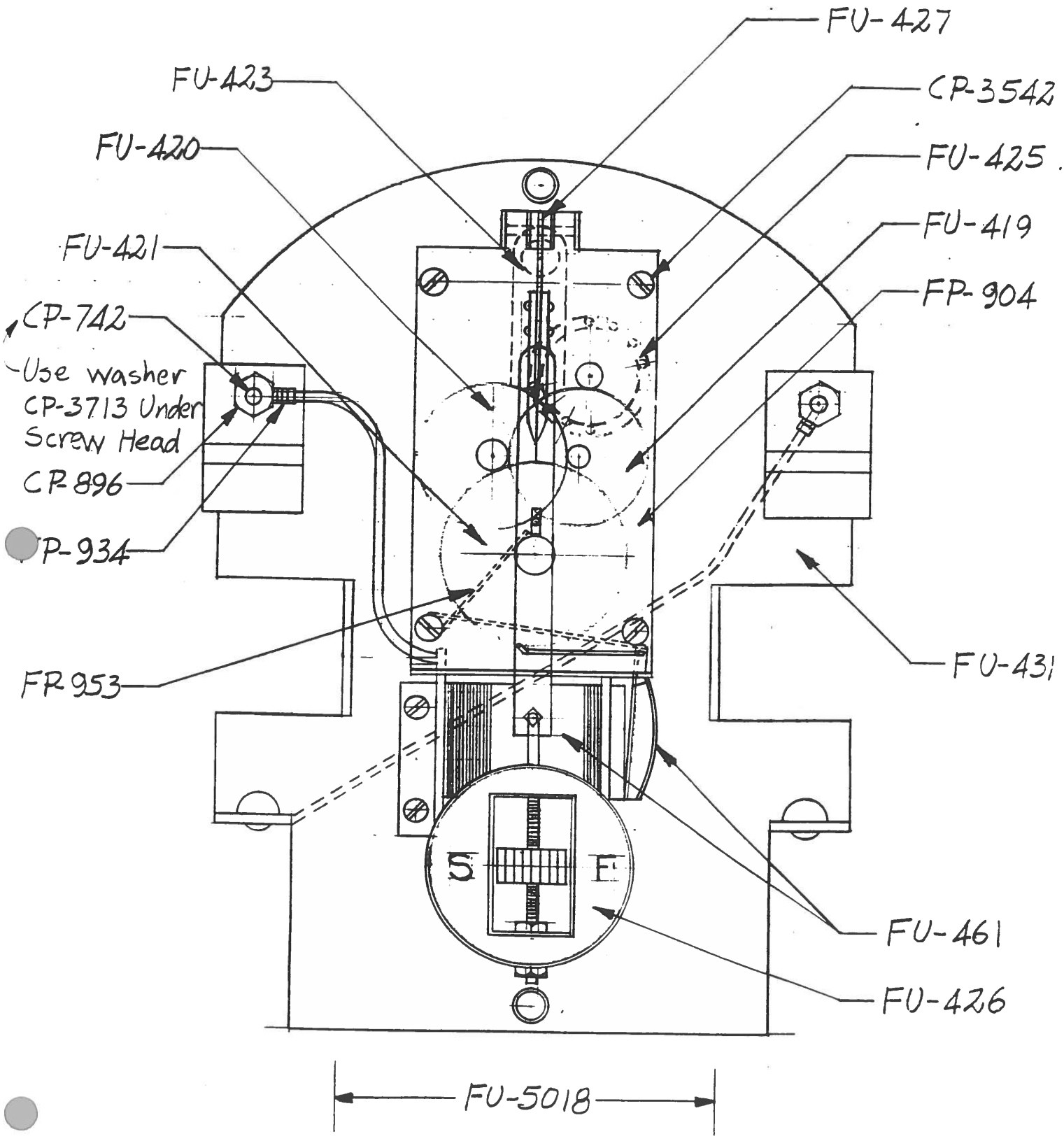

FU-427
FU-423
CP-3542
FU-420
FU-425
FU-419
FU-421
FP-904
CP-742
Use washer CP-3713 Under Screw Head
CR 896
P-934
FR 953
FU-431
S
F
FU-461
FU-426
FU-5018

CHECKED

APPROVED

FU-457

Used In FA-14

ISSUE		
#2	-29	#3954
#3	11-15-29	#4074
#4	12- 2-29	#4100
#5	1-20-30	#4184
#6	1-30-30	#4221

FU-5019

Used In FA-32

#2	12- 4-31	#6340
#3	12-14-31	#6370

PART	NAME	RQ.
FP-953	Back Lash Spring	1
FU-461	Coil Ass'y	1
FU-5018	Back Plate Ass'y	1
FU-431	Back Plate Ass'y	1
FU-429	Gear & Pinion Ass'y	1
FU-428	Idler Gear Ass'y	1
FU-427	Pend. Arm Ass'y	1
FU-426	Pend. Weight Ass'y	1
FU-425	Escape Wheel Ass'y	1
FU-423	Pendulum Drive	1
FU-421	Gear & Shaft Ass'y	1
FU-420	Gear & Shaft Ass'y	1
FU-419	Gear Ass'y	1
FP-948	Washer - Lock -	1
FP-939	Locking Clip	1
FP-934	Barr. Clip	1
FP-933	Insulating Wash.	2
FP-926	Gear	1
FP-904	Front Plate	1
FP-949	Nut	1
CP-3542	#4-36 RHBMS	4
CP-5660	#2-56 Hex Brass Nut	2
CP-896	Nut	1
CP-742	#6-32 RHBMS 3/8"Long	1
CP-3713	Washer - 13/32"x9/64"x1/32"	1

PENDULUM CLOCK MECHANISM ASS'Y — FU-457, FU-5019

Dr'n By
Tr'c'd By

Scale FULL
Date 6-11-29
App'd

WALLACE & TIERNAN Co., Inc. N. J.

FA-41

USED IN:

ISSUE 1: 12-1-30

FU-5019	MECHANISM	1
FU-5014	PENDULUM ARM ASS'Y	1
FU-5015	" HOOK "	1
FU-5017	CENTER WHEEL "	1
FU-5016	SECOND " "	1
FP-5032	PENDULUM WEIGHT	1
FP-5034	" " ADJ. SCREW	1
FU-	LEAD WIRE + TERMINAL - 25" LONG	1
FP-	WIRE 19½" LONG	1
	CASE (FILE 13/11 K SHEET 2)	1
FU-455	HOUR HAND	1
FP-947	MINUTE HAND	1
FU-5035	BEZEL, DIAL, GLASS + SCREWS	1
FP-958	BATT. HOLDER	1
FP-898	" CLIPS	2
	BRASS PLATE FOR MOUNTING MECH.	1
	STUDS FOR ABOVE	1
	4-36 R-H-B-M-S - ¼" LONG	

UNLESS OTHERWISE SPECIFIED, ALLOW
± ON ALL DECIMAL DIMENSIONS.
± ON ALL FRACTIONAL DIMENSIONS.
± ALLOWABLE ON ALL ANGLES.

BANJO
LONG PENDULUM
OLD MECHANISM

FA-41

DR'N BY:

SCALE:

TR'C'D BY:

DATE: 12-1-30

C'K'D BY:

APP'D:

WALLACE & TIERNAN CO., INC.
NEWARK, N. J.
FORM 454 8-10-30 SM

CLEMENS RIEFLER

MAKER

OF MATHEMATICAL INSTRUMENTS

NESSELWANG AND MUNICH

BAVARIA.

Clocks, pendulums and electric apparatus.

Illustrated Catalogue

of

Precision-pendulum clocks, nickel-steel compensation-pendulums and electric apparatus for time-service installations in observatories

manufactured by

CLEMENS RIEFLER

Maker of mathematical instruments

at

NESSELWANG and MUNICH

(near Kempten, Bavaria) (Lenbachplatz Nr. 1)

Telegraphic Address:
„Riefler, Nesselwang" or „Riefler, Munich."

Established 1841.

Partners: Dr. phil. Sigmund Riefler, Engineer in Munich.
Adolf Riefler, Kommerzienrat in Nesselwang.
Theodor Riefler, Manufacturer in Nesselwang.

Index.

Quotation of prices for clocks, pendulums etc.

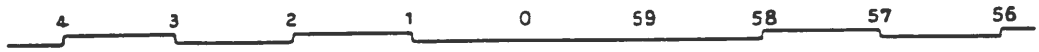
Remarks for ordering and despatching the clocks, pendulums etc.

In ordering a clock please state:

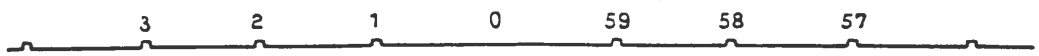
1. Whether the pendulum has to keep mean solar time or sidereal time.
2. The latitude and altitude above sea-level of the place where the clock is to be erected.
3. Which of the following six wheel-contacts should be provided for the clock:

   a) Intermittent contact, contact-wheel with 29 (30) teeth,
   b) „ „ „ „ „ 30 „
   c) One second contact „ „ „ 59 (60) „
   d) „ „ „ „ „ 60 „
   e) Two seconds contact „ „ „ 29 (30) „
   f) „ „ „ „ „ 30 „

   If the contact-wheel C (Fig. No. 111 page 19) has 29 (30) or 59 (60) teeth, the second „0" is not marked on the paper band of the chronograph; this indicates the beginning of the minute. The markings which the wheel contacts produce on the paper band of the chronograph are as follows:



a) Intermittent contact, contact-wheel with 29 (30) teeth



c) One second contact, contact-wheel with 59 (60) teeth

e) Two seconds contact, contact-wheel with 29 (30) teeth.

   If no distinct contact is mentioned, the intermittent contact a), (contact-wheel with 29 (30) teeth), will be provided in the clock because this contact is the best suitable for registration on the chronograph as well as for synchronizing secondary clocks and for working seconds-sounders.

4. The resistance, expressed in ohms, in the electromagnet of the chronograph or of the relay, the circuit of which is opened or closed by the clock contact.

The informations 1 and 2 are necessary in order that the pendulum might be so regulated before sending it off that at its place of destination it swings nearly correctly and requires only slight adjustment.

The different parts: wall-plates, wedge-screws, screw-keys, pins, spirit-levels, clock oil, vaseline etc. that are necessary for erecting the clocks, are furnished free of charge.

Every clock is provided with illustrated Instructions for erecting it.

The clocks are packed in durable wooden cases the cover being screwed.

The packing for a clock Type D (in air-tight glass case) which requires 5 double cases, costs Mark 90.—, and for a clock in wooden or glass case with metal columns Mark 30.—. If the cases are returned to me carriage paid, $^2/_3$ of their cost will be refunded.

The packing for single parts: Pendulums, switch-boards etc. is very cheap.

It is not advisable to send the clock Type D in the depth of winter because the cold would be disadvantageous to the hermetical closing of the clock.

Special catalogues are issued for the delicate drawing instruments.

Remarks about Precision-seconds pendulum clocks and time-service installations for observatories „System Riefler".

These clocks are especially constructed for observatories, physical and other scientific institutions and in fact for all purposes which demand the greatest accuracy in time-measurements. They are also used as Standard-clocks for central clock installations and for private purposes.

The principal differences between these clocks and the clocks of other systems, refer especially to the following parts:

1. The escapement with the pendulum which swings perfectly free D. R. P. No. 50739.
2. The nickel-steel compensation pendulum D. R. P. No. 100870.
3. The electric winding D. R. P. No. 151710.
4. The air-pressure compensation of the pendulum.
5. The hermetical closing of the clock.
6. The electric seconds contact and
7. The arrangement for synchronizing secondary clocks.

The accuracy of the rate of a clock depends in the highest degree upon the careful construction of the above named parts.

A description of the designs and of the clocks themselves is contained in the publication.

„Präzisions-Pendeluhren und Nickelstahl-Kompensationspendel von Dr. S. Riefler. München. Theodor Ackermann. kgl. Hofbuchhändler 1907"

and in the pamphlet.

„Präzisions-Pendeluhren und Zeitdienstanlagen für Sternwarten von Dr. S. Riefler. München. Theodor Ackermann. kgl. Hofbuchhändler 1907."

In the first publication the use of the nickel-steel pendulums of 2nd class for clocks of other systems is described at length; but the descriptions of the escapement, the air-pressure compensation and the chronographical registration are shorter than in the second one. The latter publication contains also a detailed description of the arrangements for the electric working of time-service installations in observatories and diagrams of the circuits of four typical clock installations.

The wheels, work-frames and dials of all clocks, also of the secondary clock A^2 (page 17) which for cheapness is provided with the Graham escapement, are made in the same dimensions. The principal parts of the works of the clocks D, B and A (page 15 and 16) are gilded and of the clocks A^1 and A^2 lacquered, while the wheels of all clocks are gilded. The diameter of the dials is 26 cm; they are silvered and encircled with massive gilded rings. The second and hour circles are placed eccentrically. The hour circle of the clocks Type D is divided into 24 parts with the figures 0 to 23, and of the other clocks into 12 parts with double lettering; 0 to 11 in Roman figures, and 12 to 23 in Arabic figures.

The clock Type D has an air-tight glass case, the other clocks have wooden cases or glass cases.

Other parts of the **time-service installations** are the **chronograph**, the **relay** and the **seconds-sounder**.

For the electric working of time-service installations the following arrangements and apparatus are principally required:

1. **The battery** that consists generally of dry elements, zinc-carbon elements, or for larger installations, of accumulators which can best be kept constantly charged by joining them to leads giving either 110 or 220 volts (direct current). Details are contained in the above mentioned pamphlet: „Präzisions-Pendeluhren und Zeitdienstanlagen für Sternwarten."
2. **The electric resistances** by which the current of every single circuit can be adjusted to the requisite strength. These resistances can be constant or variable. The constant resistances consist of **wire-coils** and the variable ones of **rheostats** of which two types are employed a) **sliding-rheostats,** that can be set to any resistance between 0 and 50 ohms, or b) **coil-rheostats,** the resistance of which is variable between 0 and 500 ohms in intervals of 50 ohms. The wire-coils are also employed as **spark-preventive coils** forming a shunt to the circuits of the electric contacts. For the charging of the accumulators electric **glow-lamps** are the most convenient additional resistances.
3. **The milli-ampère-meters** for measuring the strength of current and the **voltmeters** for measuring the potential of current.
4. **The switches** for making the necessary electric connections.

These resistance-coils, rheostats, milli-ampère-meters, voltmeters and switches are mounted on **switch-boards** in 8 different combinations.

The most convenient switch-boards I to VIII of the typical clock installations A, B, C and D which are described in the above-mentioned pamphlet, „Präzisions-Pendeluhren und Zeitdienstanlagen für Sternwarten", as well as the other items necessary for the electric working are specified in this catalogue.

The accuracy of the clock-rate.

The accuracy of the rate of the precision-pendulum clocks depends generally on their more or less favourable mounting and treatment. Every shock given to the clock-work or the glass case produces a small stretching of the pendulum spring and therefore a lengthening of the pendulum so that the clock loses every day some tenths of a second. whereby the interesting observation has been made that gradually the pendulum becomes shorter and after several weeks again recovers the former time of oscillation. A lengthening of the pendulum of only about 0.002 mm corresponds to a daily retardation of the clock of 0,1 seconds.

Large and sudden variations of temperature must also be avoided because they have a distinct influence on the stability of the mounting of the clock-work and on the consistency of the oil used for it.

The room where the clock is to be erected must be dry, of constant temperature and protected against vibrations and direct sunlight. If the room be kept at constant temperature by continuously acting heating-or refrigerating-apparatus, this apparatus must be placed under the floor to avoid disadvantageous stratifications of temperature.

Hitherto the best results have been obtained with the clocks in air-tight glass case in Cleveland (Case School Observatory) and in St. Petersburg (Chambre centrale des poids et mesures). In both places the clocks are mounted very favourably in rooms of constant temperature protected against vibration, into which persons seldom enter. It has been proved that the clock in Cleveland has a mean daily variation of the rate of 0,008 seconds, and the clocks in St. Petersburg have shown a still smaller variation.

The question may be here suggested as to whether it is possible to obtain a still greater accuracy of the rate of the clocks. since we have to consider that the frequent vibrations of the crust of the earth change the length of the pendulum-spring and therefore have a disadvantageous influence on the rate of the clock.

It is not possible to answer that question precisely because we are not yet informed with a sufficient degree of certainty about the influences of these motions, but it is very probable that the mentioned variation of rate of 0,008 seconds of the clock in Cleveland is very near to the limit that can be reached.

The influence of earthquakes is sometimes so considerable that clocks with Graham escapement, the supplementary arc of the pendulum of which is very small, stop, while the clocks with my free escapement never do so. In this respect the following information of the Philippine Weather Bureau in Manila about my clock No. 42 in air-tight glass case erected there, is very interesting:

> "It is a great advantage that till now the clock never stopped during an earthquake while all the other clocks have the unpleasant habit of doing so."

The magnetic forces also have a small influence on the oscillations of the pendulums because every ferriferous rod and also the pendulum rod of a nickel-steel pendulum, after some time receives a magnetic polarisation in the vertical position, and because the intensity of the earth-magnetic field is subjected to small variations.

The magnetic influence on the rate of the clocks is so small, that it may be disregarded.

Of the clocks manufactured by my firm the **clock Type D** has the least mean daily variation of rate, the variation being about 0,01 to 0,03 seconds. The daily rate of this clock can be so regulated by the air-pump that it amounts only to a few hundredths of a second. Such a small rate cannot be obtained from the other clocks, the slight adjustment of which is made only by additional weights.

The mean daily variation of the **clock Type B** with air-pressure compensation and pendulum of first class Type J, is about 0,03 to 0,06 seconds.

The **clock Type A,** which is distinguished from the clock Type B in not having the air-pressure compensation, has the same accuracy of rate as the clock Type B, but its daily rate must be reduced according to the air-pressure constant of the pendulum, as is described below.

The mean daily variation of the rate of the clock **Type A^1** with pendulum Type K of second class, is about 0,05 to 0,1 seconds.

The **clock Type A^2**, which differs from the clock A^1 by having the Graham escapement, is generally used as a synchronized secondary clock. This clock

is so carefully constructed that very often it is used as an independent clock without synchronizing arrangement and very good results of its rate have been obtained. In this case its mean daily variation of rate is about 0,1 to 0,3 seconds, but it can be still larger in consequence of the changes in the condition of the oil on the agate plates of the Graham-pallet, while clocks with my free escapement have not this disadvantage.

The accuracy of the rate of the clock Type A^2 is not so great because the clock-work is not screwed directly to the wall but to the back of the clock-case, as mentioned in the Instructions for erecting the clock, while the clocks B, A and A^1 have the clock-work as well as the case each separately fixed on the wall, so that they do not touch each other.

Reduction of the clock-rates to equal (mean) height of barometer. The air-pressure constant of the pendulum J of the clock Type A and of the pendulum K of the clocks A^1 and A^2 is 0,012 seconds [per day] for one millimeter air-pressure variation. If, for instance, the atmospheric air-pressure is 10 mm above the normal, the clock loses every day 0,12 seconds. In order to make the daily clock-rates independent of the influence of the air-pressure, they must be reduced according to this value to the mean height of barometer of the place where the clock is erected. as is shown by the following extract from the table of the rate of the clock Riefler No. 169. If the height of barometer (column 2) is read more frequently than once every day, a more accurate mean value (column 3) is obtained than by reading it only once.

From the corrections in column 6, determined by comparing the clock with a standard clock controlled by astronomical observations, result the values in column 7, and from these the clock-rates in column 8 reduced to the mean Munich barometric height of 716 mm. From these follows the mean daily rate of the clock $\pm$ 0,05 seconds and from column 9 the mean daily variation of the rate $\pm$ 0,017 seconds. From column 10, containing the squares of column 9, is derived the mean error M.E. of the daily rate of the clock according to Gauss' law of error. The mean error is $\pm$ 0,021 seconds.

From the mean daily rate of $\pm$ 0,05 seconds for 716^{mm} and from the mean daily height of barometer, the corrections of the clock can be calculated approximatively in advance by extrapolation.

If after a longer period of observation the constants of air-pressure, temperature etc. have been found by the method of least squares, one obtains a formula for the reduction of the observed clock-rates which gives still more accurate values than the reduction carried out with the above mentioned constant of air-pressure of the pendulum.

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Reduction of the rates of the clock Type A, Riefler No. 169 with nickel-steel compensation pendulum Type J No. 459, to the Munich mean barometric height 716 mm.

The air-pressure constant of the pendulum is 0,012 seconds.

1	2	3	4	5	6	7	8	9	10
Dec. 1906	Height of barometer 10 a. m. mm	mean mm	mean − 716 mm	b . . 0.012 seconds	Observed clock-corrections seconds	Observed daily rate seconds	Daily rate reduced to 716 mm seconds	Mean daily rate minus daily rate Δ seconds	Δ^2
21.	727	726	+ 10	− 0.12	+ 1.61	+ 0.18	+ 0.06	− 0.01	0.0001
22.	725	724	+ 8	− 0.10	+ 1.79	+ 0.17	+ 0.07	− 0,02	0.0004
23.	723	723	+ 7	− 0.08	+ 1.96	+ 0.11	+ 0.03	+ 0.02	0,0004
24.	723	717	+ 1	− 0.01	+ 2.07	+ 0.05	+ 0.04	+ 0.01	0.0001
25.	711	708	− 8	+ 0.10	+ 2.12	− 0.08	+ 0.02	+ 0.03	0.0009
26.	705	703	− 13	+ 0.16	+ 2.04	− 0 12	+ 0.04	+ 0.01	0,0001
27.	701	703	− 13	+ 0.16	+ 1.92	− 0,08	+ 0.08	− 0.03	0,0009
28.	705	706	− 10	+ 0.12	+ 1.84	− 0.06	+ 0.06	− 0.01	0.0001
29.	707				+ 1.78				
							total = + 0,40 s	total 0.14 s	total = 0.0030
							mean daily rate = + 0.05 s		M.E. = $\sqrt{\frac{0.0030}{8-1}}$
							mean daily variation of rate =	± 0.017 s	= ± 0.021 s

Price List

for the clock installations described in the pamphlet: „Präzisions-Pendeluhren und Zeitdienstanlagen für Sternwarten."

---

1. Clock installation A.

1 Standard clock Type D No. 101	Price
1 Switch-board I No. 171	„
1 Box-relay No. 149	„
1 Chronograph No. 145	„
1 Sliding rheostat No. 152 (for the chronograph) .	„
3 Batteries No. 161 (dry elements)	„
	Price

2. Clock installation B.

1 Standard clock Type D No. 101	Price
1 Secondary clock Type A^2 No. 106 with synchronizing arrangement No. 115	„
1 Switch-board II No. 172	„
1 Box-relay No. 149	„
1 Chronograph No. 145	„
1 Sliding rheostat No. 152 (for the chronograph) .	„
1 Switch-board VII No. 177	„
2 Batteries, with double capacity each, No. 161 .	„
2 Spare batteries, with double capacity, No. 161 .	„
	Price

3. Clock installation C.

1	Standard clock Type D No. 101	Price
2	Secondary clocks Type A^2 No. 106. with seconds-contact No. 111 and synchronizing arrangement No. 115	„
1	Switch-board III No. 173	„
1	Switch-board IV No. 174	„
1	Switch-board V No. 175	„
1	Switch-board VI No. 176	„
2	Box-relays No. 149	„
2	Chronographs No. 145	„
2	Sliding rheostats No. 152 (for the chronographs).	„
1	Double switch No. 159 (C 6)	„
4	Accumulator cells No. 162	„
2	Spare batteries (dry elements) No. 161	„
		Price

4. Clock installation D.

1	Standard clock Type D No. 101	Price
2	Secondary clocks Type A^2 No. 106 with synchronizing arrangement No. 115	„
1	Switch-board VIII No. 178	„
1	Switch-board IV No. 174	„
4	Batteries (dry elements) No. 161	„
		Price

Kgl. Hof- und Universitäts-Buchdruckerei von Dr. C. Wolf & Sohn, München.

Clemens Riefler

Maker of mathematical [illegible]

at Nesselwang and Munich (Bavaria)

Quotation of prices for clocks, pendulums etc.

I. Clocks.

No. 101 Type D. Astronomical precision-pendulum clock	Price	Mark	3500.—
No. 102 Type B. Astronomical precision-pendulum clock	„	„	2000.—
No. 103 Type A. Astronomical precision-pendulum clock	„	„	1750.—
No. 104 Type A^1. Seconds-pendulum clock	„	„	1125.—
No. 105 Type A^2. Seconds-pendulum clock with Graham escapement	„	„	500.—
No. 106 Type A^2. The same clock as synchronized secondary clock	„	„	563.—
No. 105 and 106 Increase for the electric seconds contact No. 111	„	„	63.—
No. 107 Precision-pendulum clock for measuring the value of „g“	„	„	2125.—
No. 108 Type F. Electric secondary clock (seconds dial)	„	„	275.—
No. 109. Escapement-pattern	„	„	350.—

II. Electric contacts, arrangements for synchronizing and regulating electrically clocks at a distance.

No. 111. Electric seconds contact for continuous current	Price	Mark	63.—
No. 112. Electric pendulum contact	„	„	125.—
No. 113. Electric seconds contact for alternating current	„	„	75.—
No. 114. Electric contact for alternating current for half-minutes dials	„	„	75.—
No. 115. Synchronizing-arrangement for secondary clocks	„	„	63.—
No. 116. Arrangement for regulating electrically a clock at a distance	„	„	125.—

III. Nickel-steel compensation pendulums.

D. R. P. No. 100 870.

No. 121 Type J. Nickel-steel compensation pendulum of first class	Price Mark		200.—
No. 122 Type J¹. Nickel-steel compensation pendulum of first class	„	„	230.—
No. 123 Type J². Nickel-steel compensation pendulum of second class for tower clocks	„	„	100.—
No. 124. Type K. Nickel-steel compensation pendulum of second class, seconds pendulum	„	„	70.—
No. 125 Type L. Nickel-steel compensation pendulum of second class with 80 swings per minute	„	„	45.—
No. 126 Type M. Nickel-steel compensation pendulum of second class with 90 swings per minute	„	„	42.—
No. 127 Type N. The same for half-seconds pendulum clocks	„	„	40.—

IV. Pendulum suspensions, suspension brackets and pendulum crutches.

No. 131. Pendulum suspension of steel	Price Mark		12.—
No. 132 Type O. Pendulum suspension for seconds pendulums	„	„	6.—
No. 133 Type O¹. Pendulum suspension for tower clock pendulums	„	„	6.—
No. 134 Type Q. Pendulum suspension for pendulums with 80, 90 and 120 swings per minute	„	„	4.—
No. 135 Type P. Suspension bracket for seconds pendulums	„	„	5.—
No. 136 Type R. Suspension bracket for pendulums with 80, 90 and 120 swings per minute	„	„	2.—
No. 137 Type S¹. Pendulum crutch with micrometer-screw	„	„	3.—
No. 138 Type S. Pendulum crutch.	„	„	0.50

V. Air-pressure compensation of pendulum.

No. 141. Air-pressure compensation	Price Mark		250.—

VI. Apparatus for registration, for conduction and measuring of current.

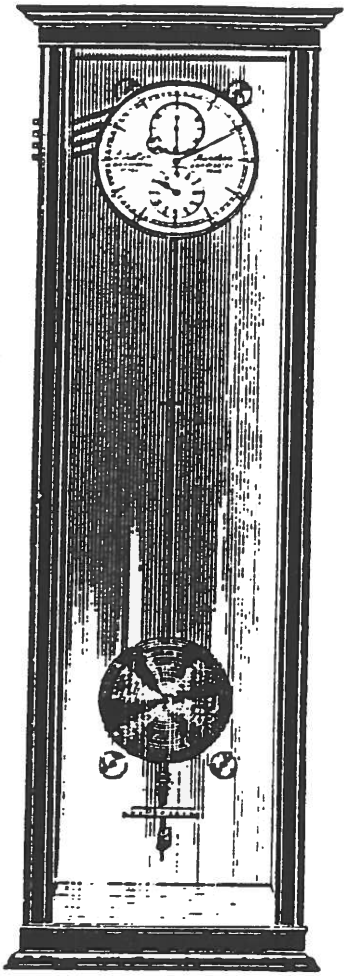
No. 145.	**Chronograph „System Hipp“**	Price Mark	525.—
No. 146.	**Paper band,** per roll	„ „	1.90
No. 147.	**Jnk for chronograph,** small bottle	„ „	2.50
No. 148a.	**Reading scale „System Fuess“** with the second 10 mm long	„ „	31.—
Nr. 148b.	**The same** with the second 15 mm long	„ „	31.—
No. 149.	**Box-relay**	„ „	106.—
No. 150.	**Seconds-sounder** (sounding relay)	„ „	50.—
No. 151.	**Resistance coils**	„ „	4.– to 6.–
No. 152.	**Sliding rheostat**	„ „	37.50
No. 153.	**Coil rheostat**	„ „	56.—
No. 154.	**Milli-Ampèremeter,** measuring 0—15 Milli-Ampère	„ „	70.—
No. 155.	**The same,** measuring 0—100 Milli-Ampère	„ „	75.—
No. 156.	**Voltmeter,** measuring 0—5 Volts	„ „	75.—
No. 157.	**The same,** measuring 0—10 Volts	„ „	75.—
No. 158.	**Handle switch** for two ways	„ „	3.10
No. 159.	**Double switch** for two circuits	„ „	5.—
No. 160.	**Handle switch** for three ways	„ „	3.75
No. 161.	**Dry element** (of the best system)	„ „	3.75
No. 162.	**Accumulator battery** of 4 Volts	„ „	25.—
No. 163.	**Connection binders**	„ „	0.40
No. 164.	**The same** to be screwed on	„ „	0.60
No. 165.	**Insulated copper wire** (gutta-percha wire) (diameter = 0,9 mm) 100 m (about 1,1 kg)	„	9.– to 11.–
No. 166.	**The same** (diameter = 1,5 mm) 100 m	„	22.50 to 27.50
No. 167.	**Conduction cable**	„	0.25 to 0.30

(The prices of wires vary with the prices of copper.)

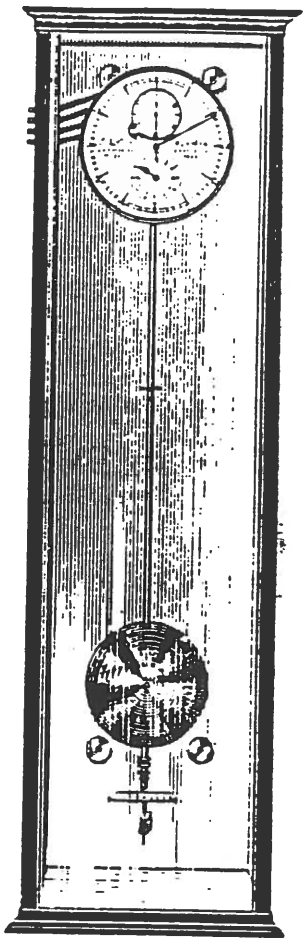
VII. Standard switch-boards for time-service installations.

No. 171.	Switch-board I	Price Mark 169.—
No. 172.	Switch-board II	„ „ 238.—
No. 173.	Switch-board III	„ „ 375.—
No. 174.	Switch-board IV	„ „ 100.—
No. 175.	Switch-board V	„ „ 625.—
No. 175.	Increase of switch-board V with a protecting case of mahogany	„ „ 75.—
No. 176.	Switch-board VI	„ „ 75.—
No. 177.	Switch-board VII	„ „ 106.—
No. 178.	Switch-board VIII	„ „ 163.—

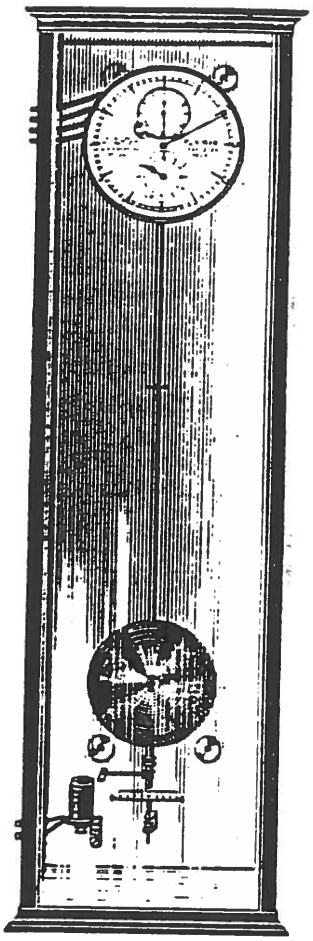
Kgl. Hof- und Universitäts-Buchdruckerei von Dr. C. Wolf & Sohn, München.



No. 104 Type A¹.
1/12 size.



No. 105 Type A².
1/12 size.



No. 106 Type A².
1/12 size.

No. 104 Type A¹. Seconds-pendulum clock in dust-tight mahogany case, with free escapement D. R. P. No. 50739, nickel-steel compensation pendulum D. R. P. No. 100870 Type K, electric winding D. R. P. No. 151710, electric seconds-contact, together with 3 dry elements and rheostat for electric winding.

Price

No. 105 Type A². Seconds-pendulum clock in dust-tight case, with Graham escapement, nickel-steel compensation pendulum D. R. P. No. 100870 Type K, electric winding D. R. P. No. 151710, together with 3 dry elements and rheostat for electric winding, without synchronizing arrangement, as independent clock.

Price

No. 106 Type A². **The same clock** as No. 105, with synchronizing arrangement. . . . . **Price**

The application of the electric seconds contact No. 111 to the clocks A² No. 105 and 106 increases their price by

No. 107. Precision-pendulum clock as Type A to be used with the coincidence-apparatus **for measuring the value of "g" (gravity),** as transport-clock, the case of which can be taken to pieces, packed up in wicker-baskets, with free escapement, nickel-steel compensation pendulum Type J, electric winding, electric seconds-contact at the wheel-train and electric seconds-contact at the pendulum No. 112, together with 3 dry elements and rheostat for electric winding.
Price

No. 108 Type F. Electric secondary clock without pendulum — **seconds dial** — to be used with an equatorial. For working this secondary clock the corresponding standard clock must be provided with the electric contact No. 113 for alternating current.
Price

The seconds dial clocks have not the same certainty of working as the synchronized secondary clocks.

No. 109. Escapement-pattern with my nickel-steel compensation pendulum Type K, swinging perfectly free, for demonstrations etc., with a support bracket, the latter to be screwed on the wall. without case.
Price

The escapement-pattern is worked by a small weight (supplying the motive power), the silk thread of which is wound off a cylinder, fixed on the axis of the scape wheel.

— MART —

All MART Ads are FREE, Send copy to the attention of the Editor:
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ELECTRO-MECHANICAL Clocks: One or a Collection, Any Condition.
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Plastic Alarm Dial Plate for **SETH THOMAS** 120 v. el. alarm clock, Model POISE E-861-000.
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TIFFANY Double Contact Movement Only (Have case, dial, pendulum)
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SYNCHRONOME MOVEMENT. Henry Weiland, 891 W. Guantosa Dr., Milwaukee, WI 53225

SWCC Dial and 2 lb. Bob w/ Wooden Pendulum Rod.
Roy Crowe, 9257 Appleby Street, Downey, CA 90240 (310) 861-8788

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

THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78
NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXII #4, DECEMBER 1996

Fellow Horologists:

This issue completes the publication schedule for 1996 and includes the customary dues notice. Our treasurer, again requests your cooperation in prompt remittance of the dues, STILL only $10.00, which will avoid the removal and subsequent reinstatement of your name in the computer mailing list. Our membership, now about 200, accounts for the ability to maintain the dues at its existing level... Journal printing cost goes down with an increase in quantity.

The Mart section will undergo its annual clean-up with the first 1997 issue. If you want your ad to be repeated or changed, you must advise our Mart coordinator, Dr. George Feinstein at 75-19 195th Street, Flushing, NY 11366. Dr. Feinstein also handles the placement of new ads as well as requests for reprints of previously published Jounal articles.

You will find, in this issue, a reprint of a BRILLIE catalog with an English translation of the descriptive material along with a French-English dictionary of the terms used at the illustrations. To our knowledge, this material has never been published in the English language before, and we thank Dr. Feinstein for his efforts in the preparation and translation.

Your committee members, officers, and editorial team join in wishing all of our members a Healthy, and Joyous Holiday Season.

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

BRILLIE Electric Clocks

INDEPENDENT CLOCKS - TIME DISTRIBUTION
AUTOMATIC ALARMS OR STRIKING
TIME-RECORDER
TOWER CLOCKS - STRIKES ON BELLS
CARILLON
SYNCHRONIZATION OF ALL TIME DISPLAYS
ALARM
WATCHMAN'S CLOCKS
CHRONOGRAPHS
TIME-DATERS
RELAYS

HIGHEST AWARDS AT:

BRILLIE Brothers Workshop, Inc.

Founded in 1899 with a sum of 350,000 francs.

BRILLIE Electric Regulators

The "Brillie Electric" regulator component of an independent clock system is reduced to two principal types:

1° A clock beating ½ seconds with a 250 mm. pendulum
2° A clock beating seconds with a 1.000 m. pendulum.

Both are high precision regulators.

The first provides a daily variation of the order of a second and is perfectly suitable for *the requirements of ordinary practice.*

The second has a daily variation of the order of 1/10th of a second, similar to the rating of astronomical regulators.

Description

The Brillie regulator is a clock with a pendulum motor, that is to say the pendulum drives the motion-works; this is accomplished through the intermediary of the ratchet wheel «R», over which jumps the catch «C» carried by the pendulum «B». The pendulum is especially built to avoid the effect of variations in temperature. It is made up of a rod of Invar steel «T» combined with a solid bronze ball «M» designed so as to correct for the slight

expansion of the Invar steel. Its length is adjusted in advance according to the latitude and altitude of the location at which the regulator is placed. One corrects thus for the influence of changes in the acceleration of gravity and for variations in the mean atmospheric pressure.

The Brillie regulator therefore meets the requirements of a high precision machine.

The oscillation of the pendulum is maintained by an electro-magnetic device composed of the magnet «A» suspended from the end of the pendulum «B», of the coil «N» through which the magnet freely moves and a battery «P». The circuit of this battery «P» and the coil «N» is closed by the contact «D» every double oscillation of the pendulum by the ratchet wheel «R».

The whole regulator is mounted on a slab of marble which assures absolute rigidity, and is fixed against a wall; it is thus protected from tremors and thus one is sure to find the conditions for a machine that is perfectly regular.

Operation of the Movement

With every double oscillation of the pendulum «B», the catch «C» reaches to engage with the ratchet wheel «R» and in the act advances it one tooth, which pushes the spring strip to make the contact «D» close the circuit with the battery «P»: the current from the battery then passes through the coil «N» and the magnet «A» is attracted towards the left. This light impulse due to the transmission of the current of the battery recurs with every double oscillation, this returns to the pendulum the energy lost during the preceding oscillations and maintains its motion. The maintenance battery is a Latimer-Clark type cell. The flow of current is so very small that this cell has a life of several years.

Note on adjustment

In addition to the primary regulation obtained by the height of the bronze sphere, two small soft iron masses are arranged on both sides of the magnet the level of which is manually adjustable, which act on the period of the pendulum. The magnet is constantly attracted to these fixed masses and from the reaction the result is to recall the magnet toward its position of equilibrium, recall more or less significant according to the position of the soft iron masses, this permits the modification of the period of the pendulum.

The "BRILLIE" electric clocks do not present a risk: their good operation is demonstrated by the experience of **20 years.**

It is only necessary to recall that the **"BRILLIE" apparatus** is the result of the work of the sorely missed scientist CORNU, member of the Academy of Sciences: of M. FERY, professor at the School of Physics and Chemistry, eminent physicist; of the engineer Lucien BRILLIE whose precision mechanisms are highly appreciated.

The Brillie apparatus is constructed at the Brillie workshop, which makes use of

perfected tools of high precision. The parts of the mechanism are strictly interchangeable and are machined to 1/100 of a millimeter.

VARIOUS APPLICATIONS

♣ ♣ ♣

The "Brillie" electric regulators can be provided with various devices for particular applications such as:

1° -- **Contacts for distribution of time** with current reversal every 30 seconds (normal model), every 15 seconds, every 6 seconds or every second.
2° -- **Synchronization contacts** for those who desire one regulator to control at intervals any number of other regulators whose pendulums will oscillate in synchronism with its own.
3° -- **Second reversing contacts** for the control of special relays for chronographs, for motor synchronizers.
4° -- **Fixed interval contacts** for the control of recording devices.
5° -- **Synchronizing double coils** make the regulator integral with the operation of a similar device but supplied with synchronizing contacts. -- The regulator supplied with this double coil functions as synchronized with the device to which it is linked by a circuit for synchronization and, in case of a break or a short-circuit of the wiring, it will not cease to operate, its operation being assured as that of a usual regulator, by a maintaining battery.
6° -- **Regulation coils** permit the adjustment, from a distance, of the operation of a regulator either by a button, or by an automatic device.
7° -- **Special reduction** (as in the case of a sidereal clock, decimal system clock), etc.

BRILLIE
Electric Time Distribution

♣ ♣ ♣ ♣ ♣

A BRILLIE time distribution system has the following advantages over ordinary mechanical clocks:

Elimination of all clock winding

Precise indication of time

Accurate agreement between the indication of various clocks

Setting to time of all the clocks at the same time by a simple action of the regulator clock.

An installation for a Brillie time distribution includes:

1° *The principal regulator or master clock.*

2° *The power supply.*

3° *The wiring.*

4° *The receiving (secondary) clocks.*

1° MASTER CLOCK :

The master clocks or BRILLIE electric regulators are clocks with 250 mm. pendulums of the styles 1556, 1555, 1594, 1598, 1592, 1595, 1570 and 1580.

They show the time with *a high precision* and their operation is *perfectly regular*. Any one regulator can operate as many secondary clocks as one wants by means of contacts that every half-minute send a current on the line which connects the receivers. By the action of this current the mechanisms of the receivers simultaneously advance by a quantity corresponding to a half-minute. They are therefore found *all at the same time* which is strictly that of the master clock.

2° THE POWER SUPPLY :

The current necessary for the operation of the installation is furnished by the cells of a large capacity battery; one cell is required to operate 4 to 7 clocks according to the type of battery chosen and the diameter of the receiving clocks.

3° WIRING :

One cable with two conductors passes by all the receivers which are branched by means of special resistances (series parallel wiring). This arrangement for the wiring of the receivers provides the advantage that a break or a short-circuit of a secondary line connected to a receiver does not prevent the other receivers from operating. The transmitted current being of very slight intensity (60 milli-amperes) one can employ small diameter wire, *always the same*, whatever may be the number of receivers and the length of the wiring; it is recommended in general to employ a cable with fuse of two conductors of 9/10 mm. diameter insulated bell wire.

4° RECEIVERS :

The Brillie receivers contain *neither a pendulum, nor a spring, nor a counterweight*; they receive from the battery by means of the contacts of the master clock, alternately reversed currents every half-minute for one second; with every transmission of current the hands advance a half-minute then remain at rest until the following half-minute.

The movements of these receivers consist essentially of an electro magnetic coil moving between the poles of a permanent magnet with each displacement alternately in the other direction between two terminal positions; this alternating movement of the coil acts to advance the minute-wheel and therefore the hands.

This is therefore a polarized apparatus of great efficiency; their conception assures *an accurate and uniform time* for all receivers controlled by one and the same master clock. The mechanism is very simple and very sturdy and is the reason for the disappearance of all return springs and counterweights required with mechanisms working from a direct current.

The movements of the receivers are of various types depending on the size of the hands to control; with every type the resistance of the coil of the movement varies with the size of the hands to drive.

a) SMALL MODEL (R 76): used for dials up to 500 mm. in diameter; it occupies a very small space (80 mm. diameter, 65 mm. height), which permits its use in any existing clock as a replacement for a mechanical movement.

Its operation is silent; in addition for hotels, hospitals etc... where one is required to suppress all kinds of noise, one assistant is a special arrangement for distribution of time which entirely suppresses stray noise.

b) MEDIUM MODEL (R. 120): is employed for dial sizes between 510 mm. and 1,600 mm. in diameter. This movement is very strong and has a locking device, which permits the driving of hands in the open air without requiring glass protection in front of the dial. The space occupied by this movement is fairly small (125 mm. diameter, 80 mm. height).

c) LARGE MODEL (R. 180): is employed for dial sizes between 1,601 mm. and 2,200 mm. in diameter; it has the same characteristics as the preceding movement, but the space occupied is the greatest (185 mm. diameter, 170 mm. height). This movement does not drive the hands directly, but drives by coupling to the minute-wheel by a universal joint placed behind the dial.

For dials greater than 2,201 mm., whatever their diameter, without any limit, one employs a system of a motor with differential; this arrangement permits for a control of a quality that is absolutely certain and accurate for very heavy hands as for example the large luminous hands carrying lamps destined to light the night.

BRILLIE FRENCH-ENGLISH DICTIONARY

A

a	has
à	at, for, on, to
acajou	mahogany
acier	steel
aiguille	hand
a la main	by hand
allonge	elongated
alors	in such a case
alternatif	alternating
angulaire	angular
appareil	display
appel	alarm
appliques	applied
arabes	Arabic
argenté	silver plated
armature	frame
astronomique	astronomical
au	in the
automatique	automatic
avec	with

B

balancier	pendulum
baromètre	barometer
battant	beating
biseautées	beveled
bois	wood
boîte	case
bronze	bronze
boule	ball

C

cadran	dial
cadre	frame
cage	frame
carre	square
cartel	wall clock
cas	case
ce	this
centre	center
ces	these
chaines	chains
cheminee	mantel
chêne	oak
chiffres	numerals
citronnier	lemonwood
commande	control
continu	direct
courant	current
cuivre	copper
cuivre rouge	pure copper
cylindrique	cylindric

D

d'	of
dans	with
de	for, about
declainage	illuminating
decore	decorated
dépolie	frosted
des	for the
destine	destined
deux	two
devant	front
diametre	diameter
dimensions	sizes
dispositif	device
dore	gilded
double	double

eclairage	illuminate
électriques	electric
emaille	enamel
en	from, in
encastre	embedded
epaisseur	depth
face	face
facon	imitation
fait	case
fer forge	wrought iron
glace	glass
grande	large
hauteur	height
ils	they
interieur	interior
la, le	the
laiton	brass
largeur	width
magnétique	magnetic
marbre	marble
medaille	medallion
meme	same
mesures	dimensions
nickele	nickel
octogonal	octagonal
ogive	pointed arch

E

erable	maple
et	and
etanche	air tight
être	be
excentrée	eccentric
exterieures	outside

F

fonctionne	operates
fondu	cast
forme	form
fourni	furnished

G

gravé	engraved
gris	grey

H

horloge	clock

I

Invar	Invar
ivorine	Ivorine (plastic)

L

l'heure	time
lunette	bezel

M

metallique	metallic
modele	model
modernes	modern
monté	mounted
mouvement	movement

N

noyer	walnut

O

ou	or
ouvrantes	opening

P

par	by
paralleles	parallel
patine	patina
peints	painted
pendule	clock
peuvent	can
pierre	stone
plaque	covered with (veneered)
pleine	solid
poids	weight
poli	polished
porte	door
portent	have

R

receptrice	receiver (secondary clock)
réglage	regulation
règulateur	regulator
remise	delivery
repousse	embossing
romains	Roman
ronde	round

S

sans	without
se	each
seconde	second
se fait en	comes in
semi	semi
separation	partition
simple	single
socle	base
sonneries	striking
sur	upon
suspension	hanging support

T

teintes	colors
thermomètre	thermometer
thuya	Thuja, arbor vitae
tige	rod
tole	sheet metal
ton	manner
total	entire
toutes	all
T.S.F.	wireless telegraphy (radio)
type	style

V

verni	varnished
vieil	aged
volonte	will
volts	volts

HORLOGES ÉLECTRIQUES

BRILLIÉ

HORLOGES INDÉPENDANTES — DISTRIBUTION D'HEURE
APPELS OU SONNERIES AUTOMATIQUES
ENREGISTREURS D'ENTRÉE DU PERSONNEL
HORLOGES D'ÉDIFICES — SONNERIES SUR CLOCHES
CARILLONS
SYNCHRONISATION DE TOUS APPAREILS HORAIRES
RÉVEILLE-MATIN
CONTROLEUR DE RONDES
CHRONOGRAPHES
HORODATEURS
RELAIS

LES PLUS HAUTES RÉCOMPENSES AUX :

Exposition Universelle : Paris 1900
Exposition Universelle : Saint-Louis (U. S. A.) 1904.
Exposition Universelle : Liége 1905.
Exposition Universelle : Bruxelles 1910.
Exposition Coloniale : Marseille 1922.
Exposition des Arts Décoratifs : Paris 1925.
Exposition Universelle : Madrid 1927.
Exposition Universelle : Barcelone 1929.

Ateliers BRILLIÉ Frères

SOCIÉTÉ ANONYME

Fondée en 1899 au capital de 550.000 francs.

28, Boulevard de Villiers -- LEVALLOIS-PERRET

TÉLÉPHONES : Wagram 45-73. Péreire 06-53. Galvani 81-31.

Reg. de Commerce Seine N° 113.256

RÉGULATEURS ÉLECTRIQUES
BRILLIÉ

Les régulateurs " Electriques Brillié " constituent des horloges indépendantes qui se ramènent à deux types principaux :

1° L'horloge battant la 1/2 seconde avec balancier de 0 m. 250.

2° L'horloge battant la seconde avec balancier de 1 m. 000.

Toutes deux sont des régulateurs de haute précision.

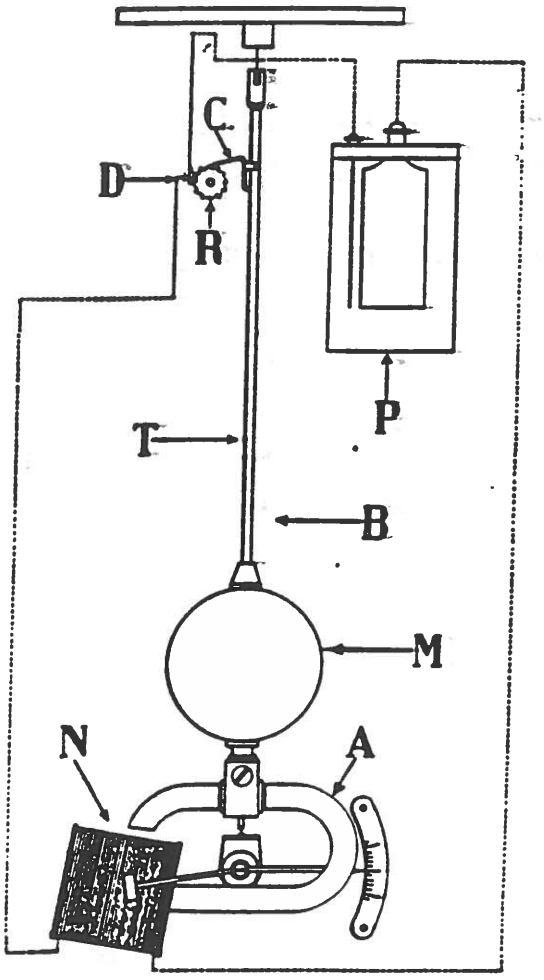
Le premier correspond à une variation journalière de l'ordre de la seconde et convient parfaitement aux besoins de la pratique courante.

Le second correspond à une variation journalière de l'ordre du 1/10me de seconde, semblable au réglage des régulateurs astronomiques.

Description

Le régulateur Brillié est une horloge à balancier moteur, c'est-à-dire à balancier commandant le mouvement de la minuterie ; cette commande se fait par l'intermédiaire d'une roue à rochet «R», sur laquelle agit un cliquet «C» porté par le balancier «B». Ce balancier est spécialement construit pour échapper à l'influence des variations de température. Il est constitué par une tige en acier Invar «T» combiné avec une boule en bronze massif «M» calculée de façon à corriger la faible dilatation de l'acier Invar. Sa longueur est réglée à

l'avance suivant la latitude et l'altitude du lieu où doit se trouver le régulateur. On corrige ainsi l'influence des modifications de l'accélération de la pesanteur et des variations moyennes de pression atmosphérique.



Le régulateur Brillié satisfait donc aux conditions d'une marche de haute précision.

Le mouvement d'oscillation du balancier se trouve entretenu par un dispositif électro-magnétique composé d'un aimant «A» suspendu à l'extrémité du balancier «B», d'une bobine «N» à l'intérieur de laquelle pénètre librement l'aimant et d'une pile «P». Le circuit de cette pile «P» se ferme sur la bobine «N» par un contact «D» établi à chaque oscillation double du balancier par la roue à rochet «R».

L'ensemble de ce régulateur, monté sur une plaque de marbre qui assure une indéformabilité absolue, est fixé contre un mur : on est ainsi à l'abri des trépidations et on est sûr de se trouver dans les conditions d'une marche **parfaitement régulière.**

Marche du Mouvement

A chaque oscillation double du balancier «B», le cliquet «C» vient en prise avec la roue de rochet «R» et la fait avancer d'une dent, il repousse la lame de ressort qui établit le contact «D» fermant le circuit de la pile «P» :

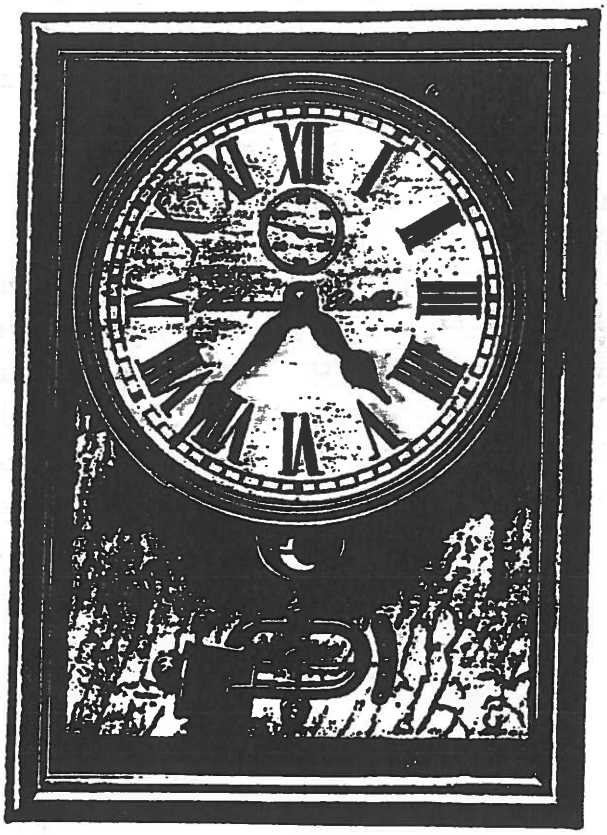
le courant de cette pile passe alors dans la bobine « N » et l'aimant « A » est attiré vers la gauche. Cette légère impulsion due à l'émission du courant de la pile se renouvelle à chaque oscillation double, rend au balancier l'énergie perdue pendant l'oscillation précédente et entretient son mouvement. La pile d'entretien est un élément genre Latimer-Clark. La dépense de courant est si infime que cet élément dure plusieurs années.

Note sur le réglage

En plus du premier réglage obtenu par la hauteur de la sphère en bronze, deux petites masses en fer doux disposées de part et d'autre de l'aimant et dont le niveau est réglable à la main, permettent d'agir sur la période du balancier. L'aimant attire constamment ces masses qui sont fixes et par réaction il en résulte un rappel de l'aimant vers sa position d'équilibre, rappel plus ou moins important suivant la position des masses de fer doux, ce qui permet de modifier la période du balancier.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPES 1555 et 1555 B.



Mouvement monté sur marbre. Cadran de 0m23

Balancier tige Invar avec boule bronze

Cadran chiffres romains

Aiguille des secondes excentrée. Réglage magnétique

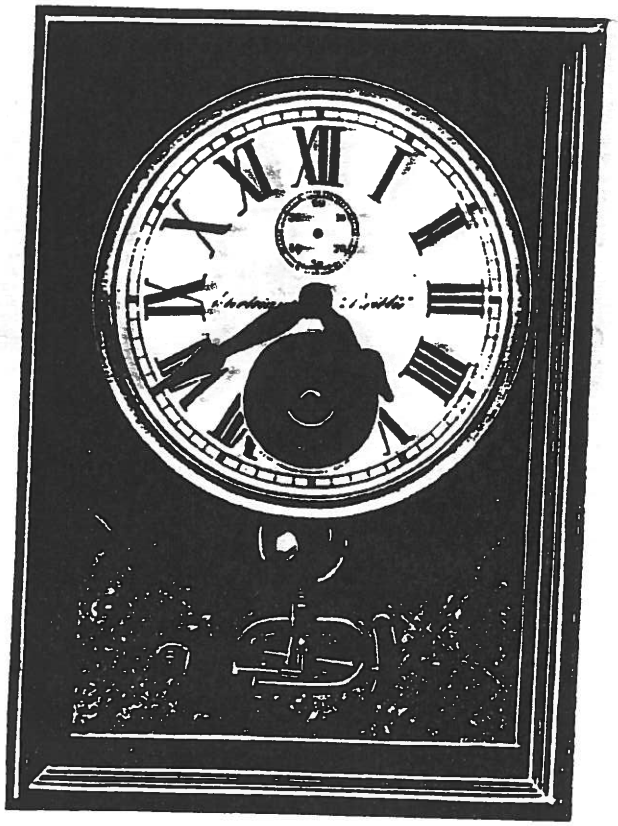
Boîte chêne, noyer ou acajou

Ce régulateur peut être muni d'un dispositif permettant de mettre à l'heure le régulateur en appuyant à distance sur un bouton agissant sur l'aiguille des secondes ; il porte alors le n° 1555 B.

Hauteur 0m45. Largeur 0m32. Epaisseur 0m14.
Poids : 15 kilos.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1570



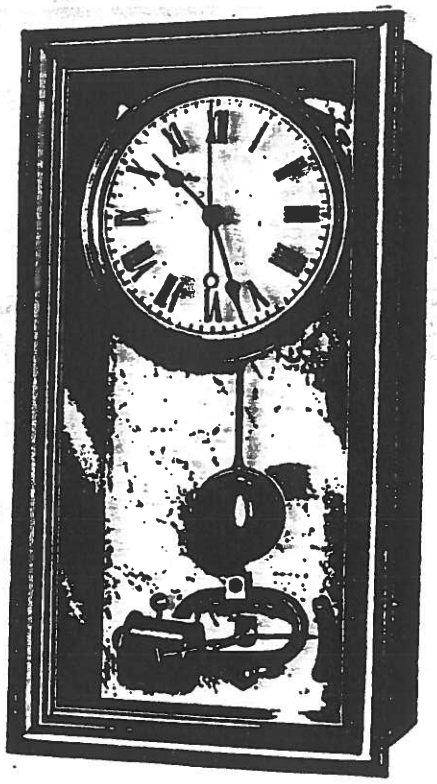
Régulateur monté sur marbre. Cadran de 0m25
Balancier tige Invar avec boule bronze
Dispositif de commande automatique de sonneries d'appel
Aiguille de secondes excentrée. Réglage magnétique
Boîte chêne, noyer ou acajou

Hauteur 0m46. **Largeur 0m34.** **Epaisseur 0m14.**

Poids : 15 kilos.

Régulateur Électrique BRILLIÉ

TYPE 1556



Mouvement monté sur marbre. Cadran de $0^{m}15$
Balancier tige Invar avec boule bronze
Cadran chiffres romains
Grande aiguille des secondes. Réglage magnétique
Boîte chêne, noyer ou acajou

Hauteur $0^{m}45$. **Largeur $0^{m}25$.** **Epaisseur $0^{m}14$.**

Poids : 11 kilos.

APPLICATIONS DIVERSES

Les régulateurs électriques " Brillié " peuvent être livrés avec différents dispositifs répondant à certaines applications particulières telles que :

1° — **Contacts de distribution d'heure** par courants inversés toutes les 30 secondes (modèle normal), toutes les 15 secondes, toutes les 6 secondes ou toutes les secondes.

2° — **Contacts de synchronisation** grâce auxquels un régulateur commande à distance un nombre quelconque d'autres régulateurs dont les balanciers oscillent en synchronisme avec le sien.

3° — **Contacts inversés de seconde** pour la commande de relais spéciaux de chronographes, de moteurs synchronisés.

4° — **Contacts à intervalles fixes** pour le contrôle d'appareils enregistreurs.

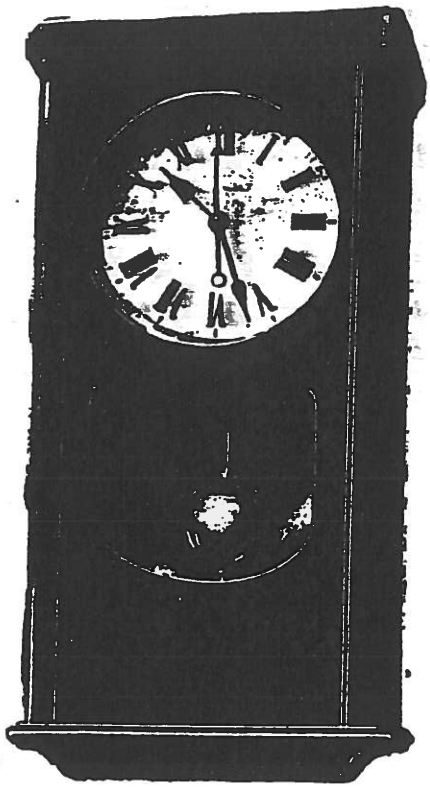
5° — **Bobines doubles de synchronisation** rendant le régulateur solidaire de la marche d'un appareil analogue mais muni de contacts de synchronisation. — Le régulateur muni de cette bobine double fonctionne en synchronisme avec l'appareil auquel il est relié par un circuit de synchronisation et, en cas de rupture ou de court-circuit dans la canalisation, il ne cesse pas de fonctionner, sa marche étant assurée comme celle d'un régulateur ordinaire, par une pile d'entretien.

6° — **Bobines de réglage** permettant de régler à distance la marche d'un régulateur soit par un bouton, soit par un dispositif automatique.

7° — **Démultiplication spéciale** (cas de pendules sidérales, pendules de système décimal), etc.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1594



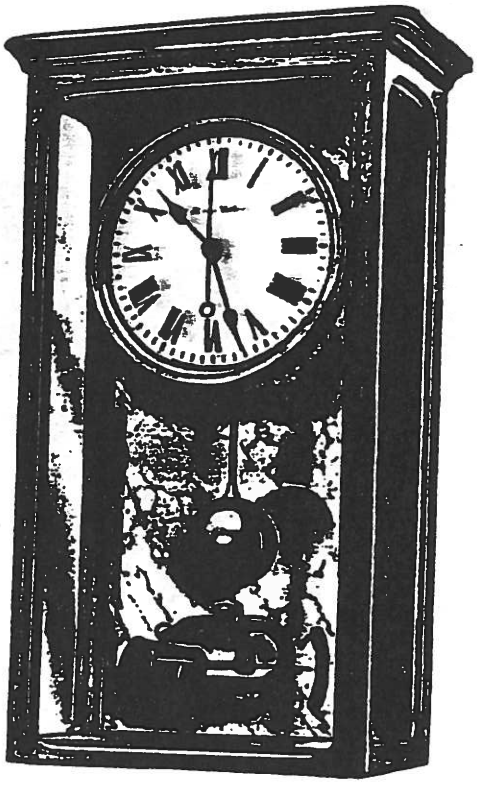
Mouvement monté sur marbre
Balancier tige Invar avec boule bronze
Cadran chiffres romains
Grande aiguille des secondes. Réglage magnétique
Boîte pleine chêne, noyer ou acajou

Hauteur 0m47. **Largeur 0m28.** **Epaisseur 0m16.**

Poids : 12 kilos.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1598



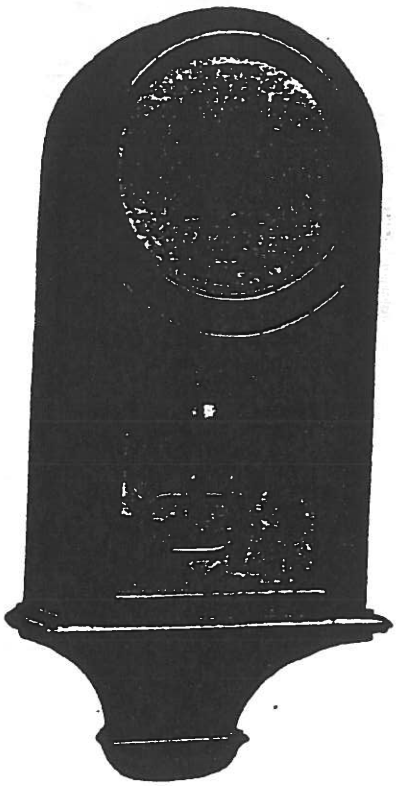
Mouvement monté sur marbre. Cadran de $0^{m}15$
Balancier tige Invar avec boule bronze
Cadran chiffres romains
Grande aiguille des secondes. Réglage magnétique
Cage chêne ou acajou. 3 glaces

Hauteur $0^{m}47$. **Largeur $0^{m}28$.** **Epaisseur $0^{m}16$.**

Poids : 12 kilos.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1592



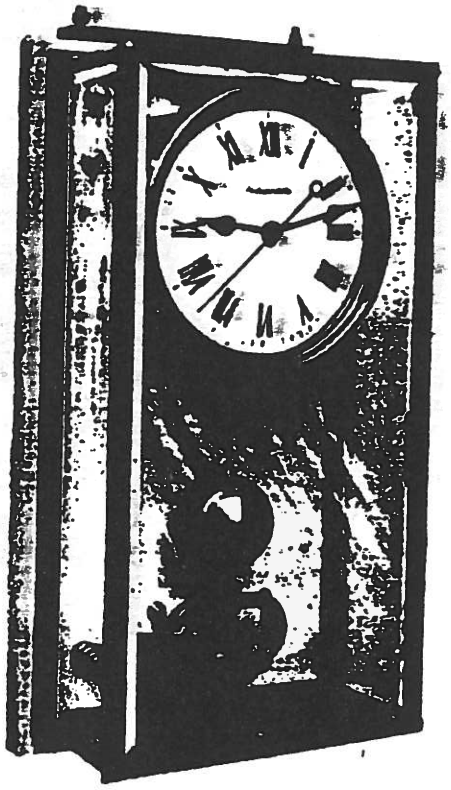
Mouvement monté sur marbre. Cadran de 0m15
Balancier tige Invar avec boule bronze
Cadran chiffres arabes
Grande aiguille des secondes. Réglage magnétique
Cage acajou ou citronnier avec socle

Hauteur 0m55. Largeur 0m26. Epaisseur 0m14.

Poids : 12 kilos.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1595



Mouvement monté sur marbre. Cadran de 0m15
Balancier tige Invar avec boule bronze
Cadran chiffres romains
Grande aiguille des secondes. Réglage magnétique
Cage cuivre verni, 5 glaces biseautées

Hauteur 0m45. **Largeur 0m25.** **Epaisseur 0m13.**

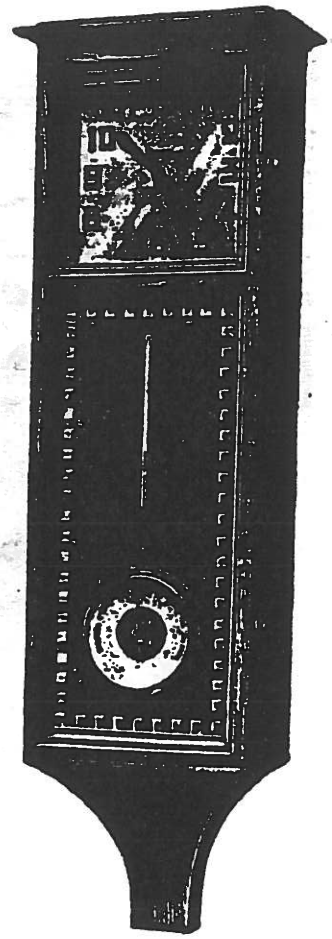
Poids : 14 kilos.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1580

Hauteur 1ᵐ00.

Largeur 0ᵐ24.



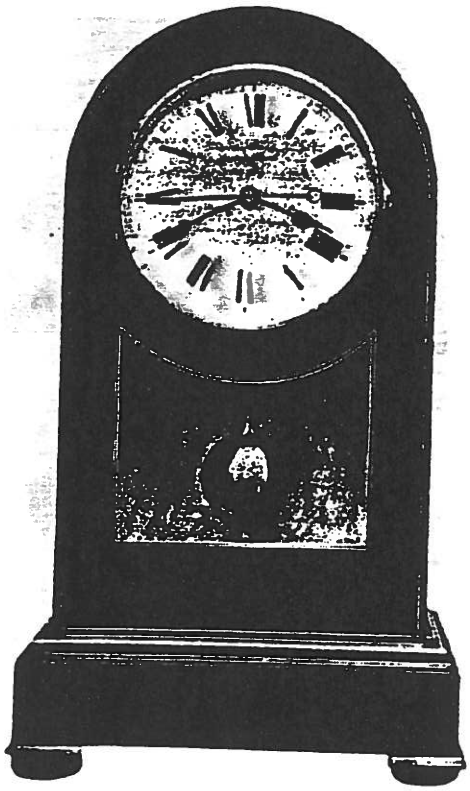
Epaisseur 0ᵐ14.

Poids : 18 kilos.

Mouvement monté sur marbre. Cadran de 0ᵐ20
Balancier tige Invar avec boule bronze
Cadran chiffres arabes modernes
Réglage magnétique
Boîte chêne ou acajou avec devant glace dépolie
Baromètre et Thermomètre

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1578



Mouvement monté sur marbre. Cadran de 0m15
Balancier tige Invar avec boule bronze
Cadran chiffres romains
Grande aiguille des secondes. Réglage magnétique
Cage acajou ou citronnier

Hauteur 0m49. **Largeur 0m28.** **Epaisseur 0m16.**

Poids : 12 kilos.

RÉGULATEUR ÉLECTRIQUE BRILLIÉ

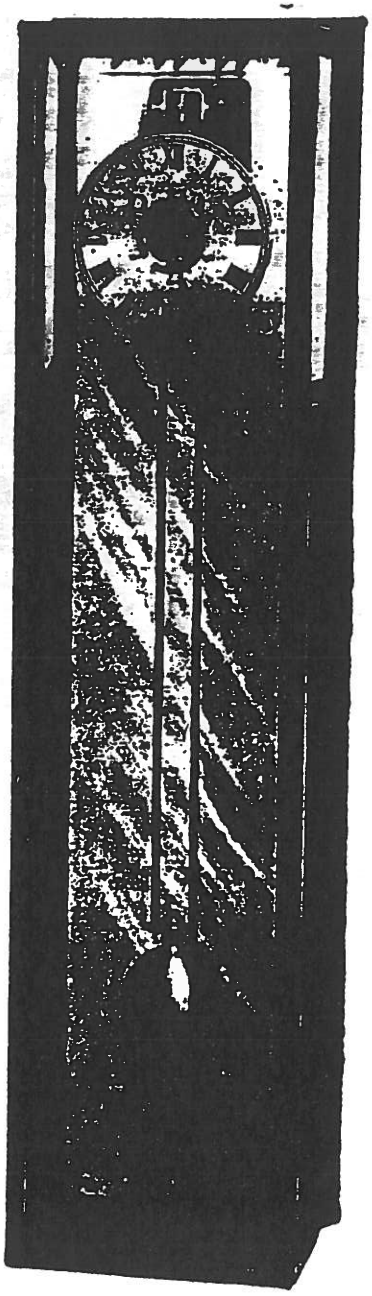
TYPE 1567

Mouvement monté
sur marbre

Cadran
chiffres romains gravé
et argenté de 0^m23

Aiguilles des secondes
au centre

Cage acajou
3 glaces biseautées



Régulateur type
astronomique

Balancier en acier
Invar
battant la seconde

Hauteur 1^m55.

Largeur 0^m26.

Epaisseur 0^m13.

Poids : 58 kilos.

REGULATEUR ÉLECTRIQUE BRILLIÉ

TYPE 1565

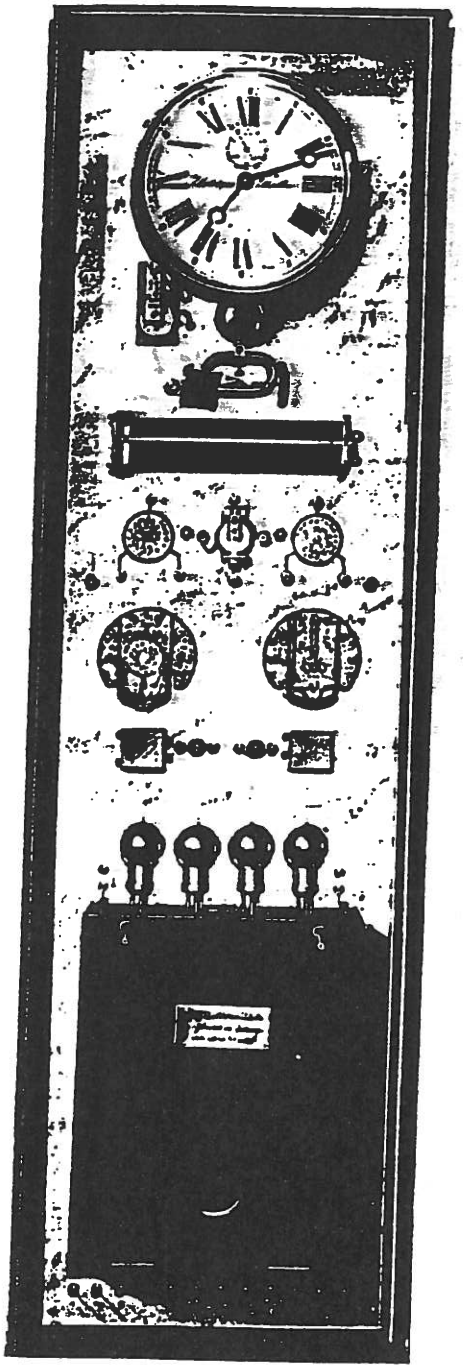
Mouvement et appareil monté sur marbre

Cadran chiffres romains de 0^m23

Réglage magnétique

Aiguille des secondes excentrée

Cage acajou



Régulateur à remise à l'heure ou réglage automatique par T. S. F.

Fonctionne sur le courant continu ou alternatif 110 volts

Hauteur 1^m66.

Largeur 0^m49.

Epaisseur 0^m19.

Poids : 80 kilos.

DISTRIBUTION D'HEURE ÉLECTRIQUE

BRILLIÉ

Une distribution d'heure BRILLIÉ présente sur les horloges mécaniques ordinaires les avantages suivants :

Suppression de tout remontage
Indication de l'heure avec précision
Concordance rigoureuse entre les indications des différentes horloges.
Mise à l'heure de toutes les horloges en même temps en agissant simplement sur l'horloge-régulateur.

Une installation de distribution d'heure Brillié comprend :

1° *Le régulateur principal ou horloge mère.*
2° *La source de courant.*
3° *La canalisation.*
4° *Les horloges réceptrices.*

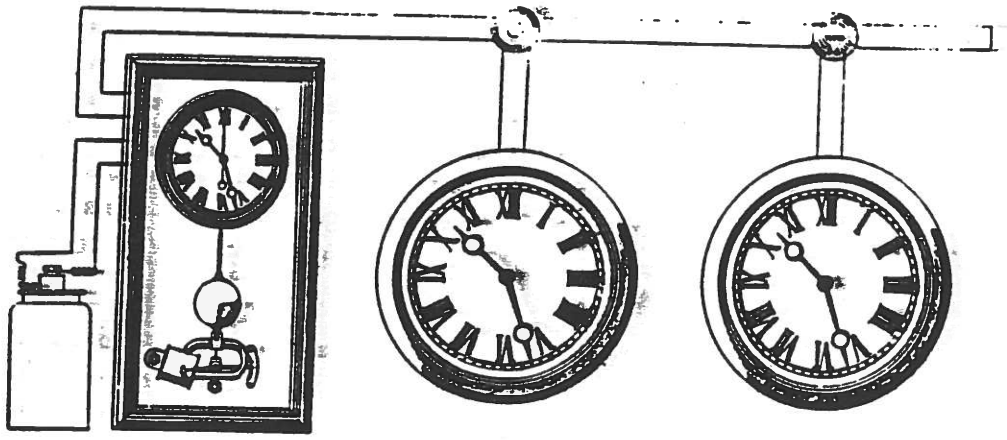
1° HORLOGE MÈRE :

Les horloges mères ou régulateurs électriques BRILLIÉ sont des horloges à balancier de 0^m25 des types 1556, 1555, 1594, 1598, 1592, 1595, 1570 et 1580.

Elles donnent l'heure avec *une grande précision* et leur marche est d'une *régularité parfaite*. Un seul régulateur peut commander autant d'horloges secondaires que l'on veut par l'intermédiaire de contacts envoyant toutes les demi-minutes un courant dans la ligne sur laquelle sont connectées les réceptrices. Sous l'effet de ce courant les mécanismes des réceptrices avancent simultanément d'une quantité correspondant à une demi-minute. Elles se trouvent donc *toutes à la même heure* qui est rigoureusement celle de l'horloge mère.

2° SOURCE DE COURANT :

Le courant nécesssaire au fonctionnement de l'installation est fourni par des éléments de pile à grande capacité ; un seul élément suffit à actionner 4 à 7 horloges suivant le type de pile choisi et le diamètre des horloges réceptrices.



3° CANALISATION :

Un seul câble à deux conducteurs passe par toutes les réceptrices qui y sont branchées par l'intermédiaire de résistances spéciales (montage série parallèle). Cette disposition pour le montage des réceptrices présente l'avantage que la rupture ou le court-circuit d'une ligne secondaire correspondant à une réceptrice n'empêche pas les autres réceptrices de fonctionner. Le courant envoyé étant de très faible intensité (60 milli-ampères) on peut employer des fils de petit diamètre, *toujours le même*, quel que soit le nombre des réceptrices et la longueur des canalisations ; il est recommandé en général d'employer du câble sous plomb à deux conducteurs de 9/10 ‰ de diamètre isolement sonnerie.

4° RÉCEPTRICES.

Les réceptrices Brillié ne comportent *ni balancier, ni ressort, ni contrepoids ;* elles recoivent de la pile par l'intermédiaire des contacts de l'horloge mère des courants alternativement inversés toutes les demi-minutes pendant une seconde ; à chaque émission de courant les aiguilles avancent d'une demi-minute puis restent au repos jusqu'à la demi-minute suivante.

Les mouvements de ces réceptrices sont essentiellement formés par une bobine électro-magnétique mobile entre les pôles d'un aimant permanent et se déplaçant alternativement dans l'un et l'autre sens entre deux positions limites ; ce mouvement alternatif de la bobine fait avancer la minuterie et par suite les aiguilles.

Ce sont donc des appareils polarisés à grand rendement ; leur conception permet d'assurer *une heure exacte et uniforme* à toutes les réceptrices commandées par une même pendule-mère. Le mécanisme est très simplifié et très robuste du fait de la disparition de tout ressort de rappel et de contrepoids nécessaires dans les mécanismes à fonctionnement à courant direct.

Les mouvements des réceptrices sont de différents types suivant la grandeur des aiguilles à commander ; dans chaque type la résistance de la bobine du mouvement varie avec la grandeur des aiguilles à entraîner.

a) PETIT MODÈLE (R 76) : s'applique aux cadrans allant jusqu'à 0^m50 de diamètre ; il a un encombrement très réduit (diamètre 0^m08, hauteur 0^m065), ce qui permet de l'appliquer dans n'importe quelle pendule existante en remplacement d'un mouvement mécanique.

Son fonctionnement est silencieux ; de plus pour les hôtels, hôpitaux, etc... où l'on veut supprimer toute espèce de bruit, on adjoint un dispositif spécial de distribution d'heure qui supprime totalement les bruits parasites.

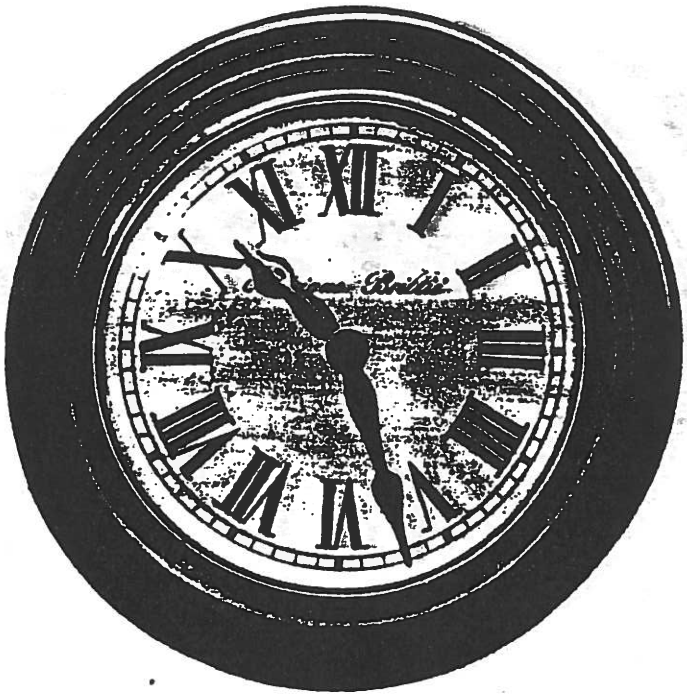
b) MOYEN MODÈLE (R. 120) : est employé pour les cadrans d'un diamètre compris entre 0^m510 et 1^m600. Ce mouvement est très robuste et possède un dispositif de blocage, ce qui permet de conduire les aiguilles à l'air libre sans nécessiter de verre protecteur devant le cadran. L'encombrement de ce mouvement est assez réduit (diamètre 0^m125, hauteur 0^m080).

c) GRAND MODÈLE (R. 180) : est employé pour les cadrans de 1^m601 à 2^m200 de diamètre : il a les mêmes caractéristiques que le mouvement précédent, mais son encombrement est plus grand (diamètre 0^m185, hauteur 0^m170). Ce mouvement ne commande pas directement les aiguilles, mais entraîne par un accouplement de cardan une minuterie placée derrière le cadran.

Pour les cadrans supérieurs à 2^m201, quel que soit leur diamètre, sans aucune limite, on emploie un système à moteur avec différentiel ; ce disposisif permet de commander d'une façon absolument sûre et rigoureuse les aiguilles les plus lourdes comme par exemple les grandes aiguilles lumineuses portant les lampes destinées à les éclairer la nuit.

RECEPTRICE ÉLECTRIQUE BRILLIÉ

TYPE N° 2



Cadre bois façon chêne, noyer ou acajou verni

Lunette laiton poli et verni

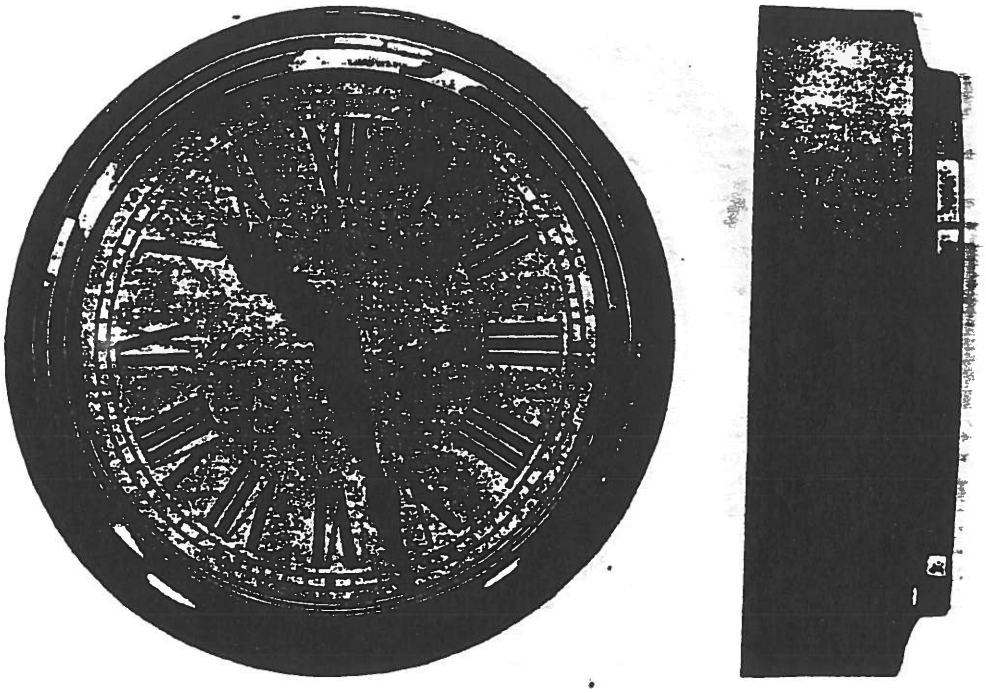
Cadran chiffres romains

Ce type se fait en simple face ou double face

Diamètre des cadrans :	$0^{m}25$.	$0^{m}30$.	$0^{m}40$.	$0^{m}50$.
Diamètre total :	0,34.	0,39.	0,52.	0,65.
Poids :	4 kilos.	5 kilos.	6 kilos.	7 kilos.

RÉCEPTRICE ÉLECTRIQUE BRILLIÉ

TYPE N° 2 B



Cadre bois façon chêne, noyer ou acajou verni

Lunette laiton poli et verni

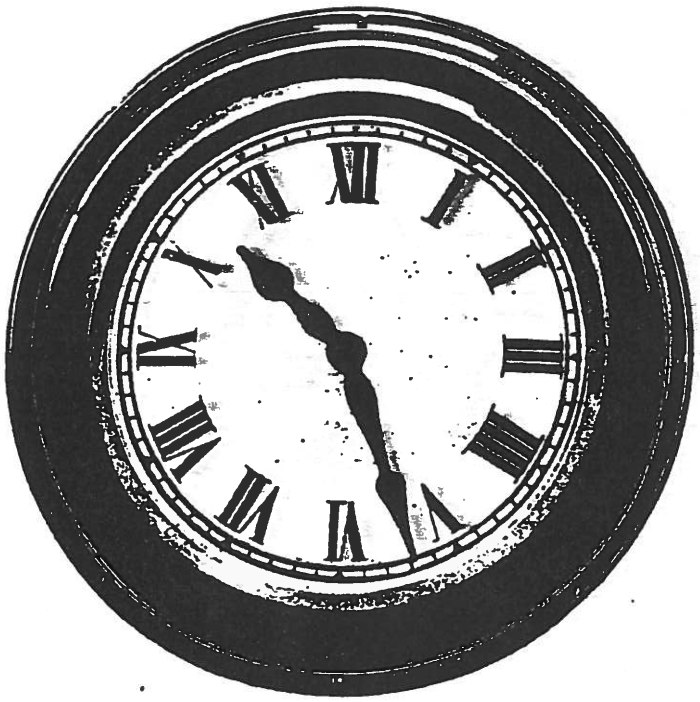
Cadran chiffres romains

Ce type se fait en simple face ou double face

Diamètre des cadrans :	o'"25,	o^{m}30,	o^{m}40,	o^{m}50.
Diamètre total :	o,305,	o,355,	o,455,	o,555.
Poids :	4 kilos,	5 kilos,	6 kilos,	7 kilos.

RÉCEPTRICE ÉLECTRIQUE BRILLIÉ

TYPE N° 2 S. M.



Cadre métallique toutes teintes

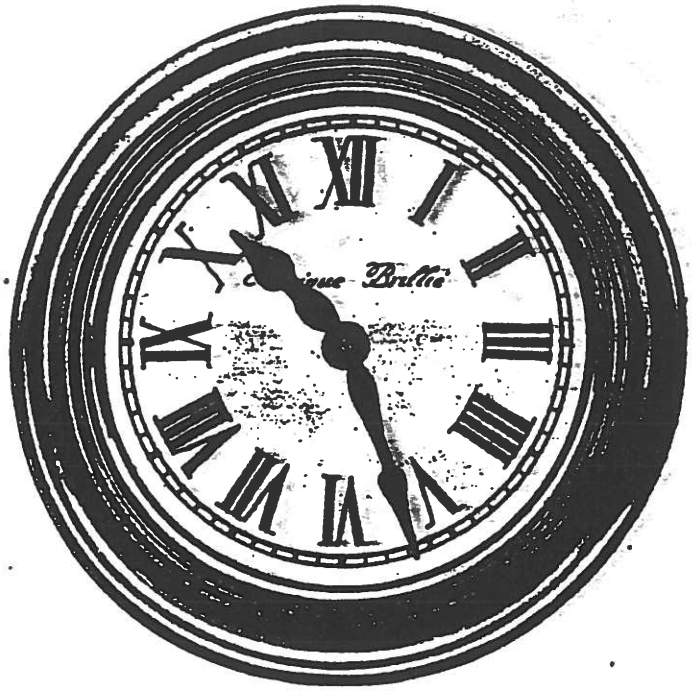
Cadran chiffres romains

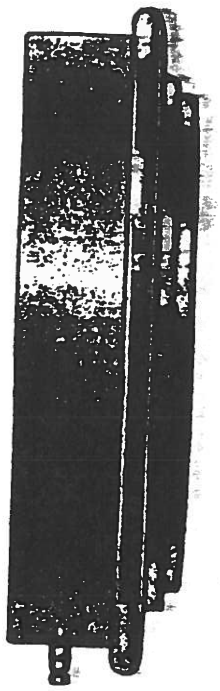
Ce type se fait en simple face

Diamètre des cadrans :	$0^{m}20$.	$0^{m}30$.	$0^{m}40$.	$0^{m}50$.
Diamètre total :	0,210,	0,420,	0,520,	0,620.
Poids :	2 k. 200,	3 k. 500.	4 k. 600.	5 kilos 300.

RÉCEPTRICE ÉLECTRIQUE BRILLIÉ

TYPE N° 2 T-76





Cadre métallique étanche émaillé toutes teintes

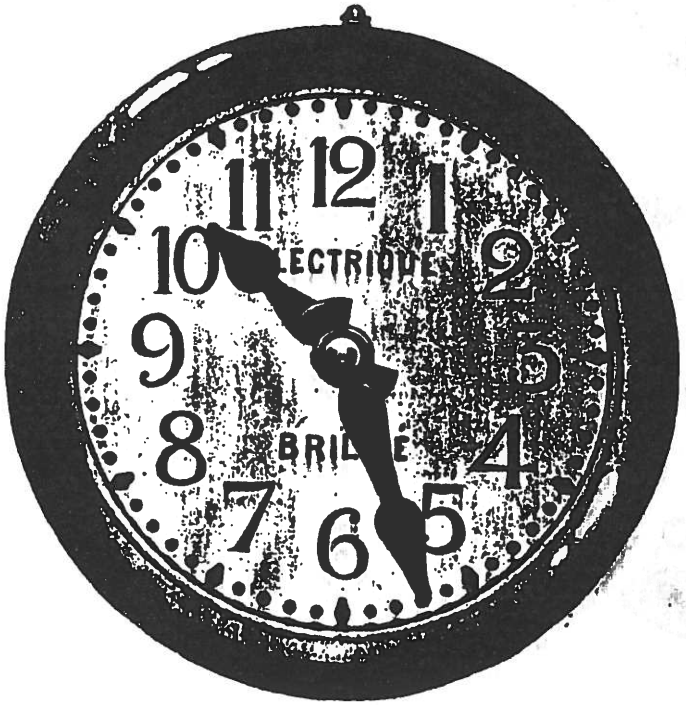
Cadran chiffres romains

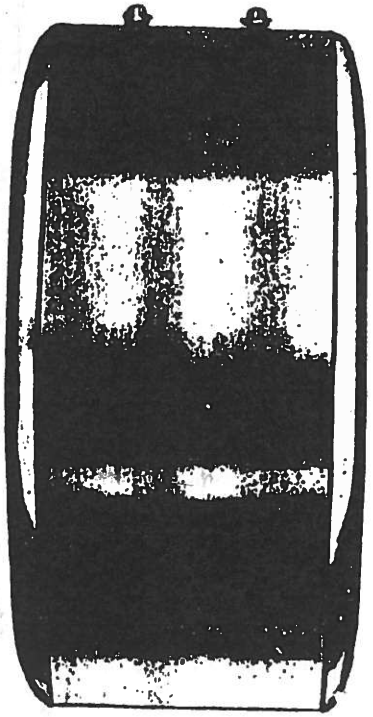
Ce type se fait en simple face ou double face

Diamètre des cadrans :	$0^{m}25$,	$0^{m}30$,	$0^{m}40$,	$0^{m}50$.
Diamètre total :	0,340,	0,390,	0,515,	0,645.
Poids :	4 kilos,	5 kilos,	6 kilos,	9 kilos.

RÉCEPTRICE ÉLECTRIQUE BRILLIÉ TYPE N° 2 T-120

Modèle simple face.





Modèle double face.

Cadre métallique émaillé toutes teintes — Cadran chiffres arabes ou romains *(à volonté)*

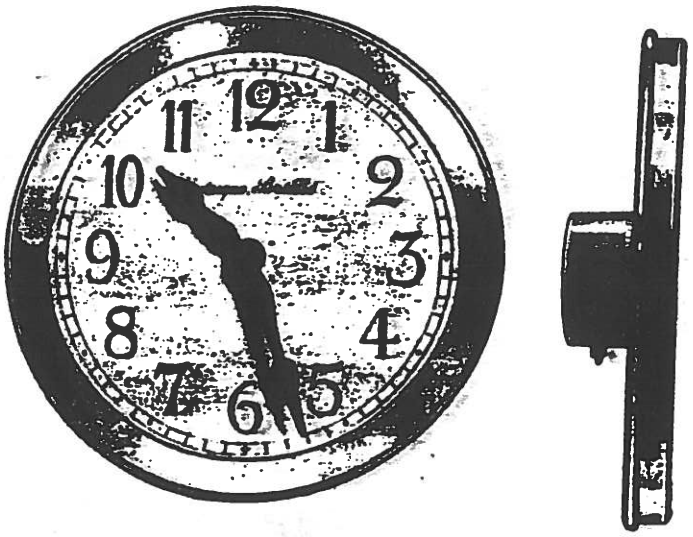
Ce type se fait en simple face, double face à cadrans parallèles, et double face angulaire avec cadrans de :

Diamètre :	0m60	0m70	0m80	0m90	1m00	1m10	1m20	1m30	1m50
Diamètre total :	0,72	0,82	0,92	1,02	1,15	1,25	1,34	1,425	1,660
Poids des modèles à simple face :	22	37	48	60	68	80	90	105	120 kilos
Poids des modèles à double face :	32	50	60	70	75	90	105	123	145 kilos

Ces réceptrices peuvent être fournies avec cadrans en glace et dispositif d'éclairage intérieur.

CARTELS ÉLECTRIQUES BRILLIÉ

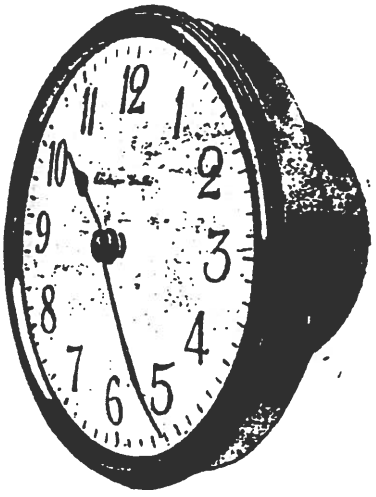
TYPE N° 4



Cartel semi-encastré, cadre laiton nickelé
Cadran chiffres arabes
Ce type se fait en simple face avec cadrans de :

Diamètre : $0^{m}17$, $0^{m}25$, $0^{m}30$
Poids : 1 k.400, 3 kilos, 4 kilos.

TYPES N° 5 et 5 B.



Lunette laiton repoussé, poli et verni
avec boîte d'encastrement

Cadran chiffres arabes de :

Diamètre : $0^{m}13$, $0^{m}17$, $0^{m}21$, $0^{m}30$
Poids : 0 k.800, 1k.100, 1k.400, 2 kilos.

Les lunettes peuvent être fournies en laiton fondu et ouvrantes, dans ce cas ce type porte le n° 5 B.

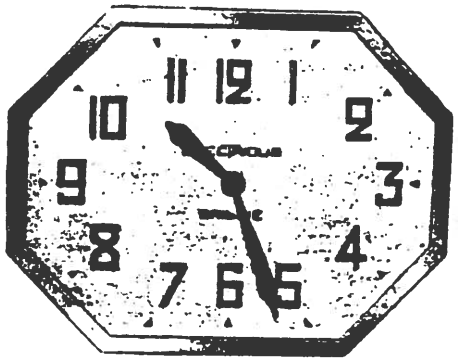
CARTELS ÉLECTRIQUES BRILLIÉ

TYPE N° 6

Cadre ivorine
ton pierre ou marbre toutes teintes
Lunette laiton verni
Cadran chiffres arabes
Simple face

Diamètre du cadran : $0^{m}09$.
Diamètre total : $0^{m}16$
Poids : 1 kilo 400.

TYPE N° 7



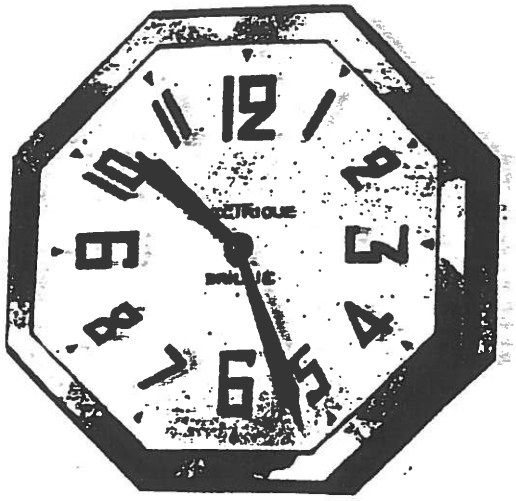
Cadre laiton nickelé et
Cadran octogonal allongé
Chiffres arabes
Avec socle bois façon chêne, noyer ou acajou
Simple face ou double face
Ou sans socle (destiné à être encastré)

Se fait en deux dimensions :

Mesures extérieures : $0^{m}130 \times 0^{m}100$. Poids : 0 kilo 800.
Mesures extérieures : $0^{m}182 \times 0^{m}140$. Poids : 1 kilo 200.

CARTELS ÉLECTRIQUES BRILLIÉ

TYPE N° 8



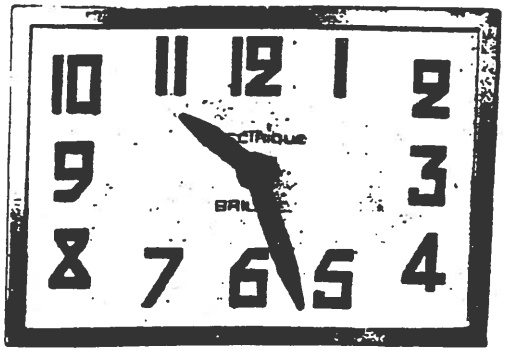
Cadre laiton nickelé et
Cadran octogonal régulier
Chiffres arabes
Avec socle bois façon chêne, noyer ou acajou
Simple face ou double face
(ou sans socle destiné à être encastré)

Se fait en deux dimensions :

Mesures extérieures : $0^m140 \times 0^m140$.
Poids : 1 kilo.

Mesures extérieures : $0^m260 \times 0^m260$.
Poids : 2 kilos.

TYPE N° 9



Cadre laiton nickelé
et cadran rectangulaire
Chiffres arabes
Avec socle bois façon chêne, noyer ou acajou
Simple face ou double face
ou sans socle (destiné à être encastré)

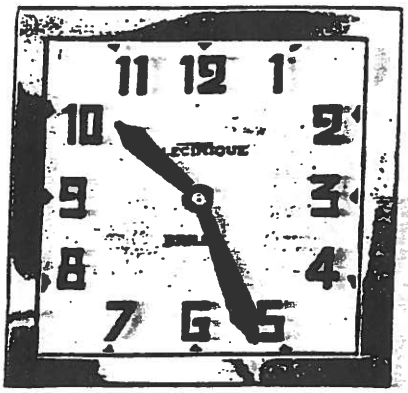
Se fait en deux dimensions :

Mesures extérieures : $0^m165 \times 0^m130$. Poids : 1 kilo 100.

Mesures extérieures : $0^m230 \times 0^m160$. Poids : 1 kilo 200.

CARTELS ÉLECTRIQUES BRILLIÉ

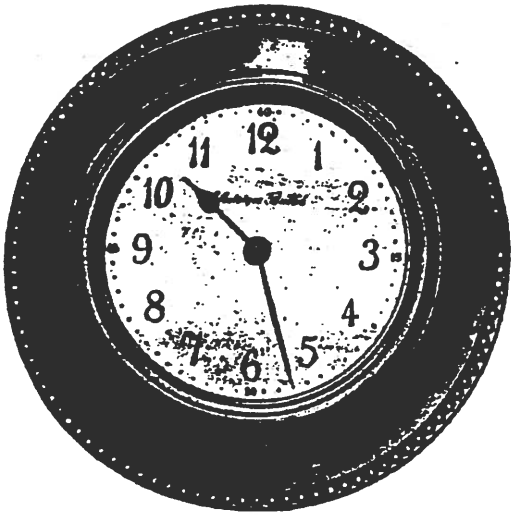
TYPE N° 10

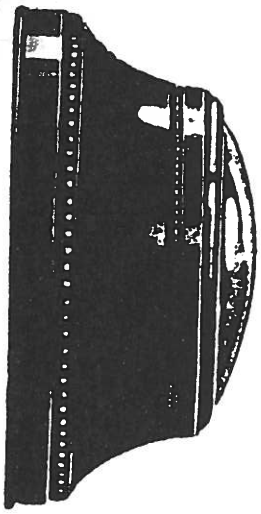


Cadre laiton nickelé et cadran carré
Chiffres arabes
Avec socle bois façon chêne, noyer ou acajou
Simple face ou double face
ou sans socle (destiné à être encastré)

Se fait en deux dimensions
Mesures extérieures : o^{m}140 × o^{m}140,
Poids : 1 kilo.
Mesures extérieures : o^{m}180 × o^{m}180.
Poids : 1 kilo 400.

TYPE N° 11



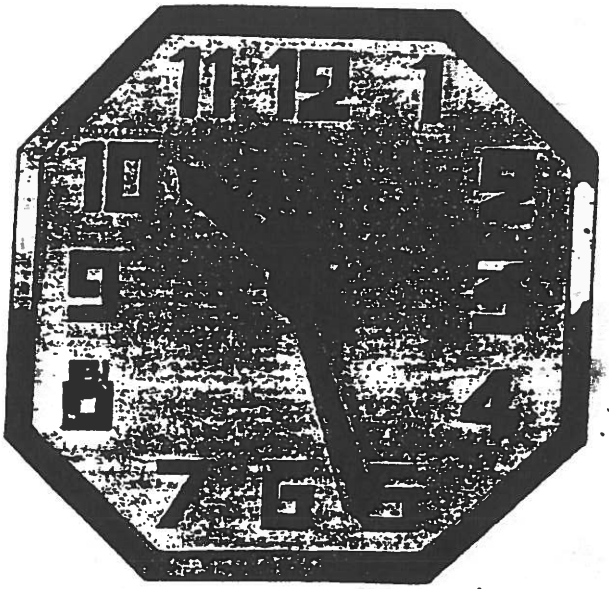


Cadre laiton poli verni ou émaillé toutes teintes
Cadran chiffres arabes
Simple face ou double face avec cadrans de :

Diamètre :	o^{m}13,	o^{m}17,	o^{m}21,	o^{m}30,	o^{m}50,	o^{m}60.
Diamètre total :	0,203,	0,260,	0,29,	0,436,	0,688,	0,820.
Poids :	1 k. 500,	1 k. 800,	2k.500,	4,	6,	8 kilos.

CARTELS ÉLECTRIQUES BRILLIÉ

TYPES N° 12 et 12 B.



Cadre laiton nickelé ou doré

Cadran octogonal irrégulier

Chiffres arabes

Avec socle bois façon chêne, noyer ou acajou

Simple face ou double face ou sans socle (destiné à être encastré)

Se fait en deux dimensions :

Mesures extérieures : $0^m270 \times 0^m270$

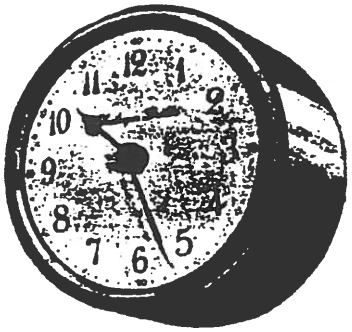
Poids : 2 kilos.

Mesures extérieures : $0^m340 \times 0^m340$

Poids : 2 kilos 400.

Ces cartels peuvent être fournis avec cadrans glace et chiffres appliqués en laiton nickelé ou doré et dans ce cas ils portent le n° 12 B.

TYPE N° 14



Cartel cylindrique

Cadre laiton verni ou nickelé

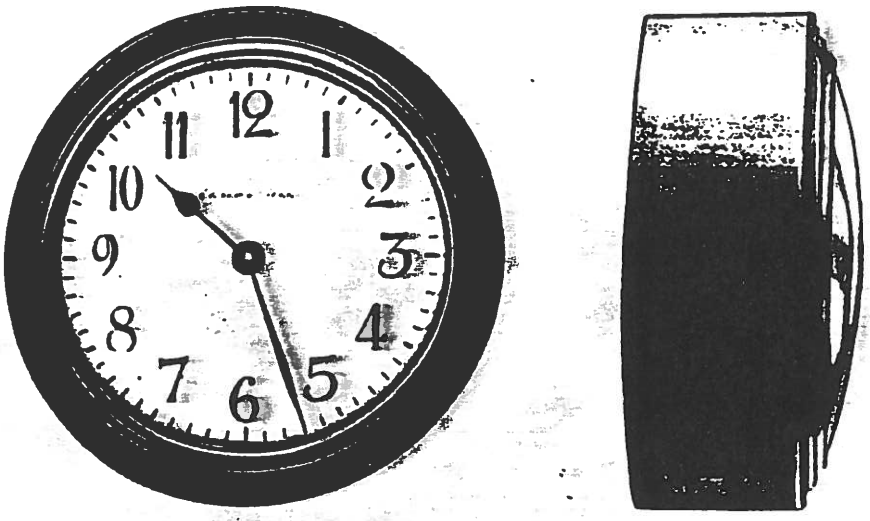
Cadran chiffres arabes

Diamètre du cadre : 0^m100

Poids : 1 kilo 200.

CARTELS ÉLECTRIQUES BRILLIÉ

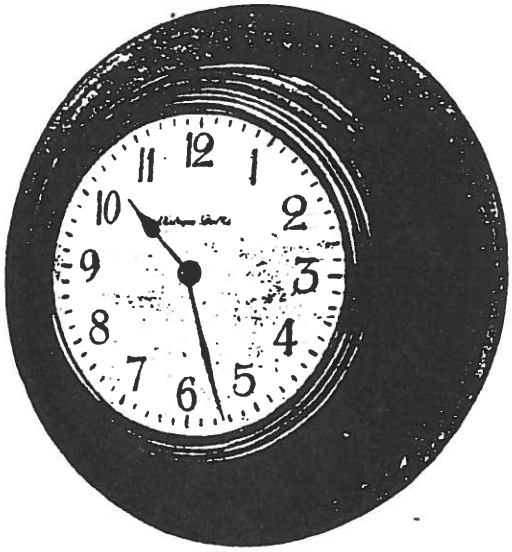
TYPE N° 16



Cadre bois façon chêne, noyer ou acajou
Lunette laiton verni Cadran chiffres arabes
Simple face ou double face, avec cadran de :

Diamètre :	o^{m}13,	o^{m}17.	o^{m}21.	o^{m}3o.
Diamètre total :	0,156	0,190.	0,227.	0,337.
Poids :	1 k. 200.	1 k. 500.	3 k.	4 kilos 600.

TYPE N° 25



Cadre bois façon chêne noyer ou acajou

Lunette laiton verni

Cadran chiffres arabes

Simple face ou double face

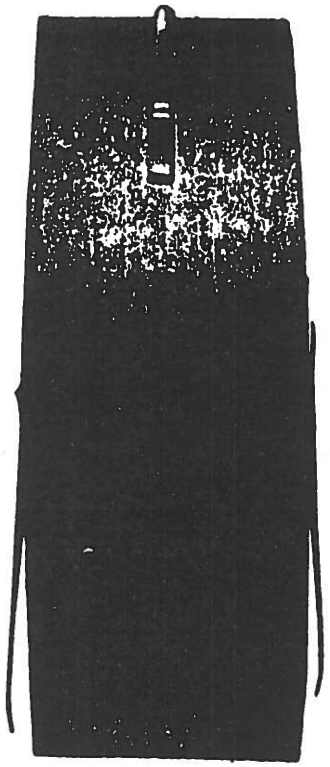
Avec cadran de :

Diamètre : o^{m}13, o^{m}17, o^{m}21, o^{m}3o.

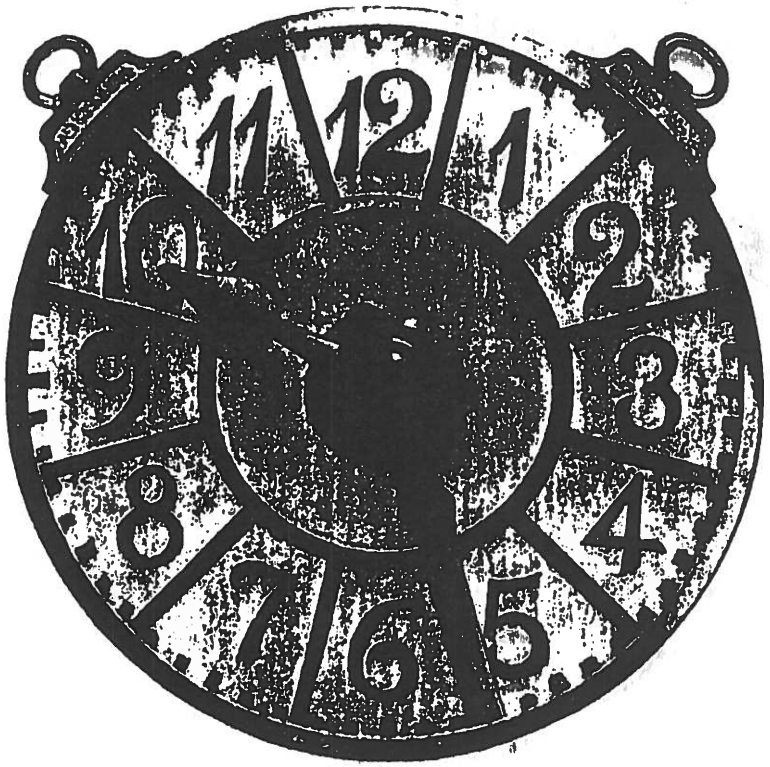
Diam. tot. : 0,243, 0,280, 0,320, 0,445

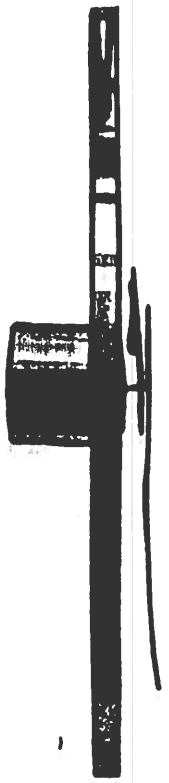
Poids : 1 k. 200, 1 k. 500, 3k. 4k. 600

CARTEL DÉCORATIF ÉLECTRIQUE BRILLIÉ (TYPES N° 50 et N° 51)



Modèle double face





Modèle simple face

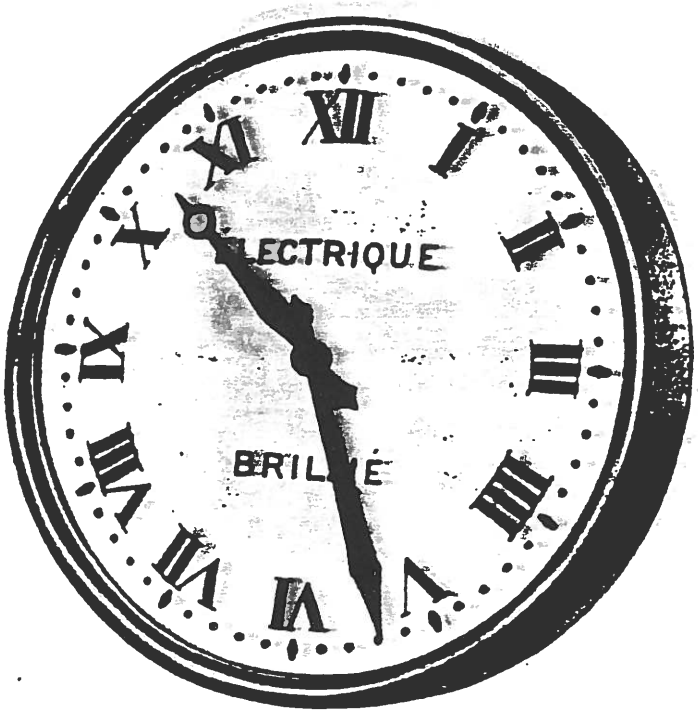
Armature en bronze doré, nickelé ou patiné vieil acier, fer forgé ou bronze médaille. Cadran glace dépolie
Chiffres arabes appliqués en bronze même décor que l'armature, fourni avec chaînes de suspension

Se font en simple face ou double face avec cadran de : Mesures extérieures : 0^m30, 0^m50, 0^m70.
Poids : 2 k. 500, 6 kilos, 13 kilos.

Ces cartels peuvent être fournis avec cadran tôle, chiffres et séparation peints, ils portent alors le n° 51.

CARTEL ÉLECTRIQUE BRILLIÉ

TYPE N° 55



Cadre cuivre rouge verni ou décoré bronze médaille

Cadran argenté, chiffres romains peints à la main

Simple face avec cadran de :

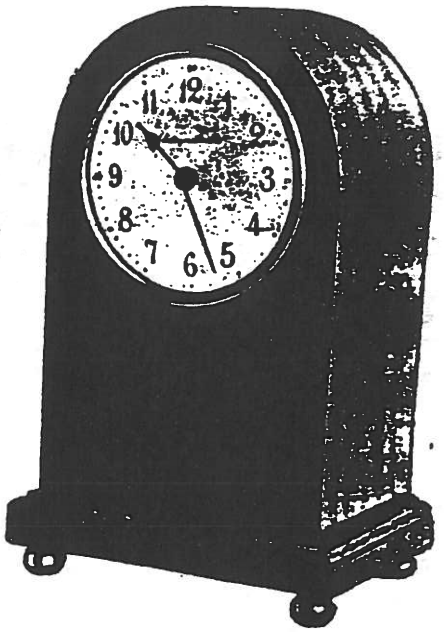
Diamètre : $0^{m}30$, $0^{m}40$, $0^{m}50$.

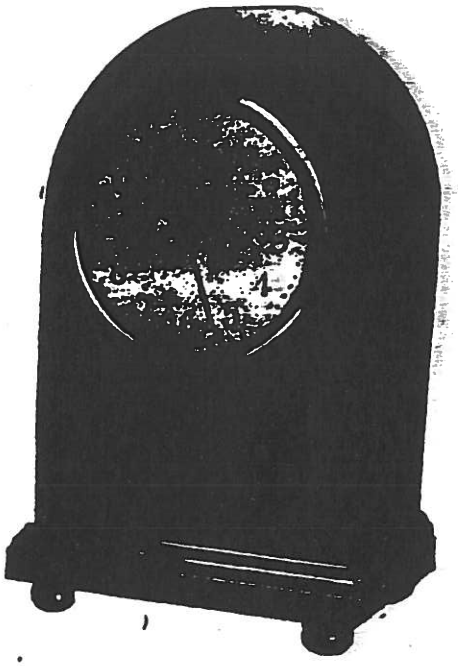
Poids : 2k.800, 3k.700, 4 kilos 200.

Ces cartels peuvent être fournis avec cadrans gravés et portent alors le N° 55 B.

Pendules de Cheminée Électriques BRILLIÉ

TYPES 176 à 182





Cadre bois plaqué acajou, chêne ou citronnier

Lunette laiton repoussé verni

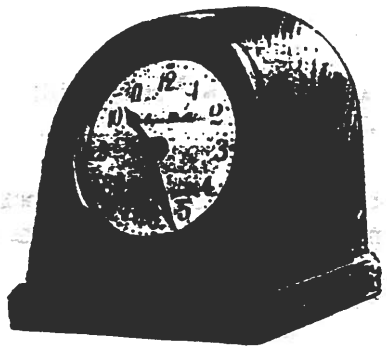
Cadran chiffres arabes

Forme Ronde type n° 176 : cadran 0^m09, hauteur 0^m21. Poids : 1 kilo 200.
Forme Ronde type n° 177 : cadran 0^m13, hauteur 0^m30. Poids : 2 kilos 100.
Forme Ronde type n° 178 : cadran 0^m17, hauteur 0^m40. Poids : 3 kilos 630.

Forme Ogive type n° 180 : cadran 0^m09, hauteur 0^m21. Poids : 1 kilo.
Forme Ogive type n° 181 : cadran 0^m13, hauteur 0^m30. Poids : 2 kilos.
Forme Ogive type n° 182 : cadran 0^m17, hauteur 0^m40. Poids : 3 kilos.

Pendules de Bureau Électriques BRILLIÉ

TYPE N° 30



Cadre bois façon chêne, noyer ou acajou

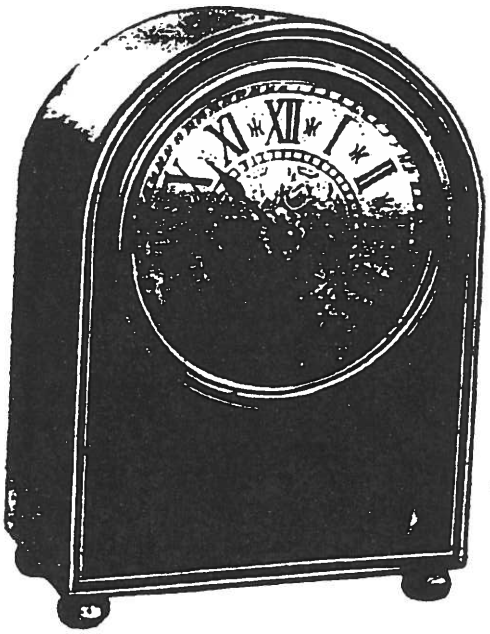
Cadran chiffres arabes

Diamètre du cadran : $0^{m}09$

Hauteur totale : $0^{m}126$

Poids : 2 kilos.

TYPES N° 190 et 191



Cadre bois façon acajou, thuya, citronnier, érable gris

Cadran gravé chiffres romains

Diamètre : $0^{m}15$

Type 190 : hauteur $0^{m}25$.

Poids : 2 kilos.

Type 191 : hauteur $0^{m}27$.

Poids : 2 kilos 300.

— MART —

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Harvey Schmidt, 75-80 179th St., Flushing, NY 11366. Limit 3 lines.

WANTED: HOROLOGICAL LITERATURE, Repair info, Catalogs, etc. for the Journal **PORTESCAP** Secticon Clock or Movement. Antique Watch & Clockmaker's Tools & Machinery. (718) 969-0847 Harvey Schmidt, 75-80 179th St., Flushing, NY 11366

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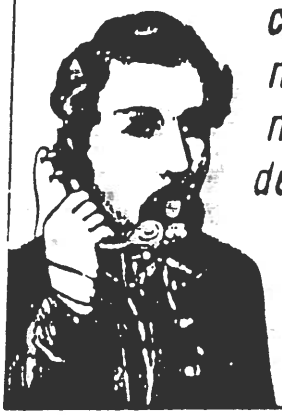
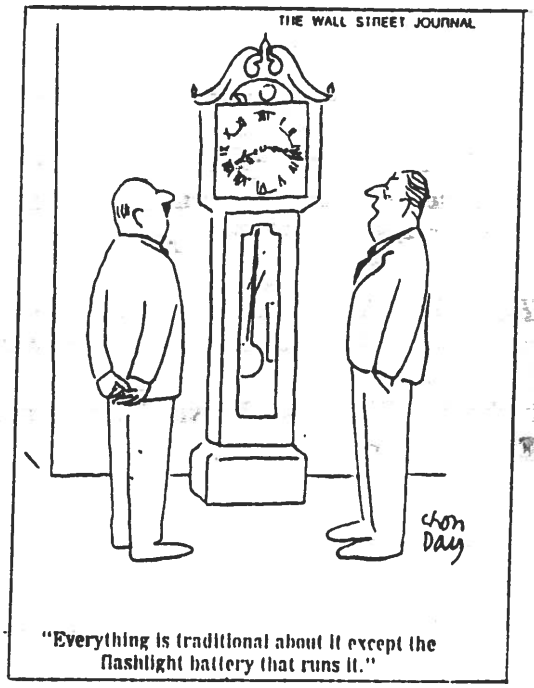
ON THE LIGHTER SIDE...

QUOTABLE

This "telephone" has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us.

—Western Union internal memo 1876





"Everything is traditional about it except the flashlight battery that runs it."

THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER 78
NATIONAL ASSOCIATION OF WATCH AND CLOCK COLLECTORS

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