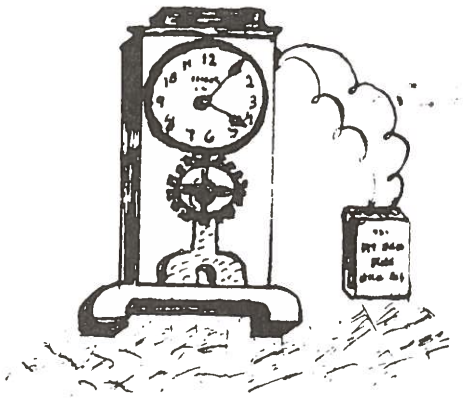
The JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

Chapter No 78

February, 1983
VOLUME IX---ISSUE #1
Martin C. Feldman, Editor



Hello fellow enthusiasts:

This month marks the beginning of Volume IX of our Journal and we are very pleased to bring you a translation by Dr. Scott Samuel of the PERRET CLOCK description found in A. Favarger's 1924 book dealing with electrical clocks. We published a similar translation which I did in our then Newsletter #8 of September 1974. This is an important clock and rare, thus it certainly deserves to be seen again. We also continue the MAGNETA CLOCK MANUEL reprint and feature some early ads for the Self-Winding Clock Company in the JEWELER'S CIRCULAR of September and December 1886 respectively. For the latter we are indebted to the NAWCC Museum and Library and in particular to Stacy Wood.

Remember, DUES of $10.00 for 1983 are due!

Enjoy this Issue!

Electromagnetically yours,

Martin C. Feldman,FNAWCC

DAVID PERRET'S ELECTRIC CLOCK SYSTEM

From: A. Favarger, L'ÉLECTRICITÉ ET SES APPLICATIONS À LA CHRONOMÉTRIE, Neuchâtel, 1924, pp.192-195; 295-296.
Translated by: Scott R. Samuel, PhD

Selfwinding Clock by David Perret, Neuchâtel.

In figures 135a and 135b, R is a cylindrical spring which drives the movement and is periodically "rewound." The left-hand end of this spring is attached to a fixed post via an adjustable screw; its right-hand end is connected to the upper part of a lever H which makes up part of lever C; the latter is interconnected with the armature a of the electromagnet A. V and q (fig.135b) are stop-screws which limit the travel of armature a and lever C. The arbor of armature-lever C can be seen below the right-hand end of spring R.

Lever C is elongated to the left parallel to R, and has the drive pawl C_2 mounted on its left-hand end. The lower end of this drive pawl is equipped with a small pallet g_2 which advances the ratchet wheel F by one tooth per minute. Ratchet wheel F is the driving first wheel of the clock movement (one can see the clock movement near the bottom in fig.136, including the escape wheel and the balance wheel). Ratchet wheel F rotates continuously in the direction indicated by the arrow thanks to the influence of the drive pawl C_2; the latter is itself driven by the slow pressure of spring R. The stop-pawl C_1 is equipped with a pallet g_1, a small flat spring r_1, and an extension b_1; this stop-pawl prevents any backward movement of ratchet wheel F.

On its reverse side the drive pawl C_2 has a small inclined plane; resting against this plane is an adjustable finger attached to the middle of a flat spring D_2. As pawl C_2 descends under the influence of R, it pushes D_2 against the platinum-plated contact v_2 of the fixed post B_2, closing this contact just before the drive pawl has reached its maximum possible travel downwards. Right after this contact has been established, the flat spring D_1 makes its own contact with v_1B_1 at the precise moment when the pallet g_1 of stop-pawl b_1 finally slides off the inclined plane of the tooth of ratchet wheel F and drops onto the base of the following tooth. Now since both contacts v_2B_2 and v_1B_1 are closed at this point, they apply the battery current to the windings of electromagnet A. Electromagnet A attracts armature a, lever C rises up abruptly, dragging pawl C_2 along with it; g_2 ends up being positioned behind the next tooth of ratchet F, contact v_1B_1 is opened, and it breaks the circuit of A; A stops attracting its armature a. This entire process is repeated each minute.

One can see that, under the influence of R, the armature a will shift slowly from the position it took up right after being attracted by the electromagnet, gradually attaining its fully non-attracted position; levers C_1 and C_2 both participate in this slow movement.

One should further note that the switching contact of the Perret selfwinding clock is in two parts: one contact, v_1B_1, makes the circuit, while the other, v_2B_2, breaks the circuit. According to the inventor, this arrangement has the advantage of separating up into two distinct points those risks of oxidation which arise due to extra-current sparks occuring when the switch is opened and closed. This allows one to let the contact surfaces go longer between cleanings (i.e. they need not be cleaned as frequently). Let us also note here the precautions which have been taken to prevent the armature a from sticking to the poles of electromagnet A by using a non-magnetic metal spring m (fig.135b and 136). We should also note the precision with which all the moving components can be adjusted in terms of their range of travel, and the precision with which one can adjust the tension of the cylindrical and flat springs.

David Perret's electric selfwinding clock has been applied both to gallery ("oeil-de-boeuf") wall clocks (using a circular balance wheel escapement similar to that found in pocket watches) and to precision pendulum regulators with Graham escapements. The Neuchâtel Observatory possesses two precision clocks of the David Perret type, made by M. Charles Rosat. One of them, which is reset to the precise time each day, electrically transmits the exact time to different horological centers in the Swiss Jura and to the Central Telegraph Bureau in Bern. Up until 1901 this time-signal service had been performed by an electric clock made by Shepherd of London, running via "indirect reactions" (Trans. note: A clock running via "indirect reactions" is one which lacks a traditional train and escapement, and which uses electricity only to periodically reset a weight or spring. The pendulum is driven by this weight or spring, rather than directly by the electricity. The well-known Synchronome clock fits into this category.) Shepherd's clock functioned for almost 40 consecutive years and is presently one of the interesting pieces on display in the Museum of Neuchâtel Observatory.

Another Perret-type clock made by Rosat had an average daily variation of only 0.08 seconds over the course of a month of observations and daily comparisons.

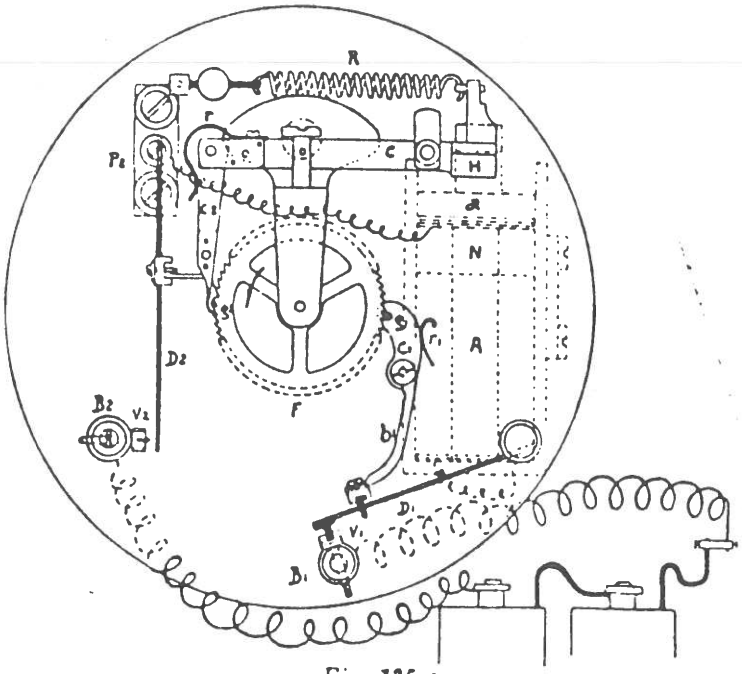


Fig. 135 a

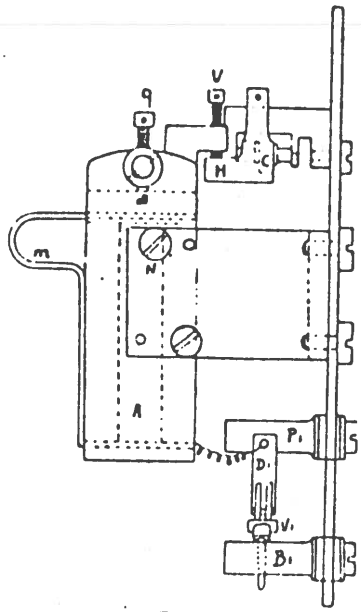


Fig. 135 b

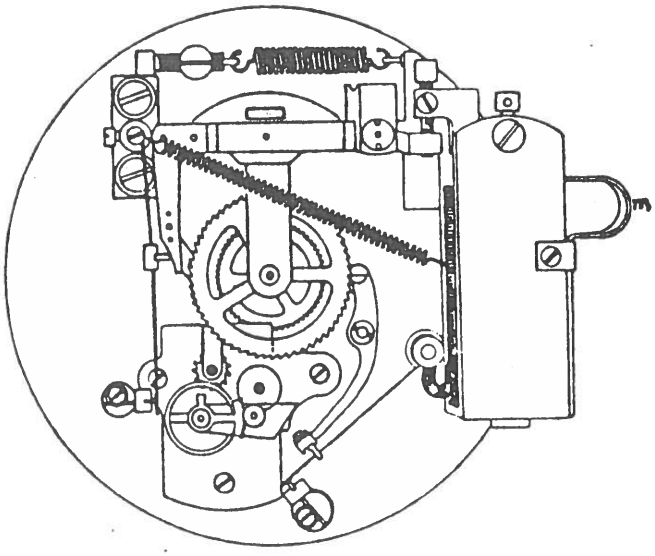


Fig. 136

Slave Clock by David Perret

Electromagnet E has a single core and a single bobbin; its magnetic circuit includes the two sheet-iron plates B (fig.205) which are parallel to each other and which support the arbor o of armature A between them. Thus the whole arrangement bears a certain resemblance to a shielded electromagnet. Ratchet wheel R is mounted on arbor o of A with an adjustable friction-fit. The ratchet wheel has 60 teeth; around its circumference run the two pawls c^1 and c^2. The first of these pawls, c^1, is mounted on one of the fixed plates B, while the other, c^2, is mounted on the end of an arm B^2 which in turn is connected to the armature A. u^1 and u^2 are two stop-screws which limit the movements of the two pawls; one of them, u^1, is attached to a second arm B^1 which is in turn connected to the armature A. The other one, u^2, is mounted on a fixed post located on one of the plates B. Finally, a counteracting spring r maintains all the moving components in the non-attracted position with respect to armature A.

This device functions in the following manner: when a current-pulse arriving from the master clock passes through the windings of electromagnet E, the pole n of the core strongly attracts the lower end of armature A; this armature thus carries out an angular movement about its arbor-axis o. The arms B^1 and B^2 move along with the armature. The tip of pawl c^2 slides along the inclined plane of the reverse side of one of the teeth on ratchet wheel R and ends up being located behind the radial face of this tooth. Along with this, the screw u^1 ends up butting against the raised portion of pawl c^1, thus stopping ratchet wheel R. As soon as the current ceases in E, spring r returns the armature and the arms B^1 and B^2 back to their original (non-attracted) position, and pawl c^2 advances the ratchet wheel R by one tooth. This movement is transmitted via arbor o to a standard motion work located on the other side of one of the plates B. The arbor o is itself elongated and carries the minute hand.

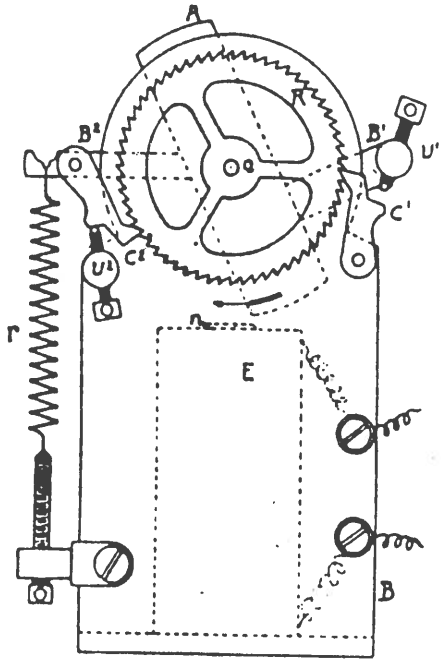


Fig. 205

PLATE 1.

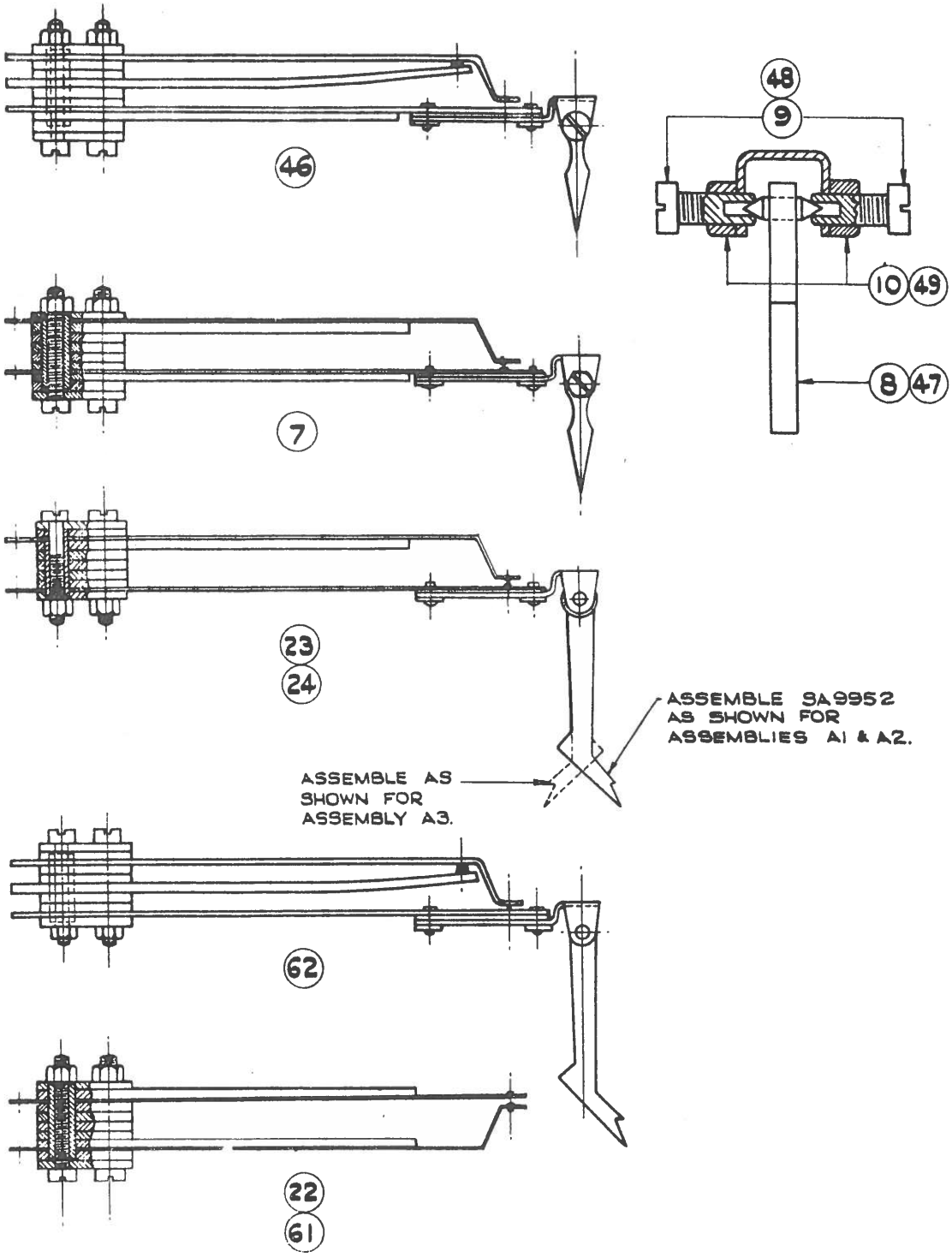

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PLATE 2.

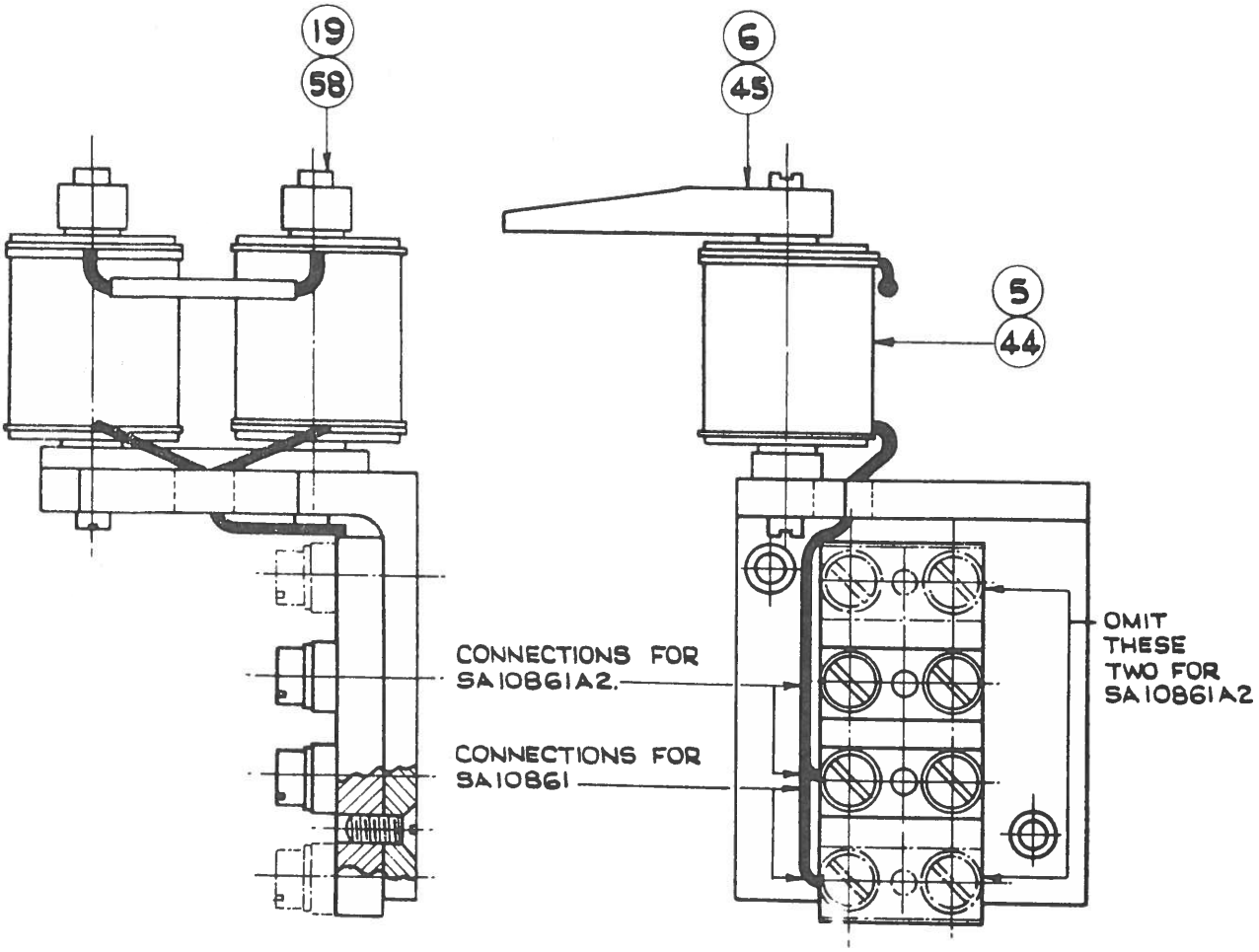
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PLATE 3.

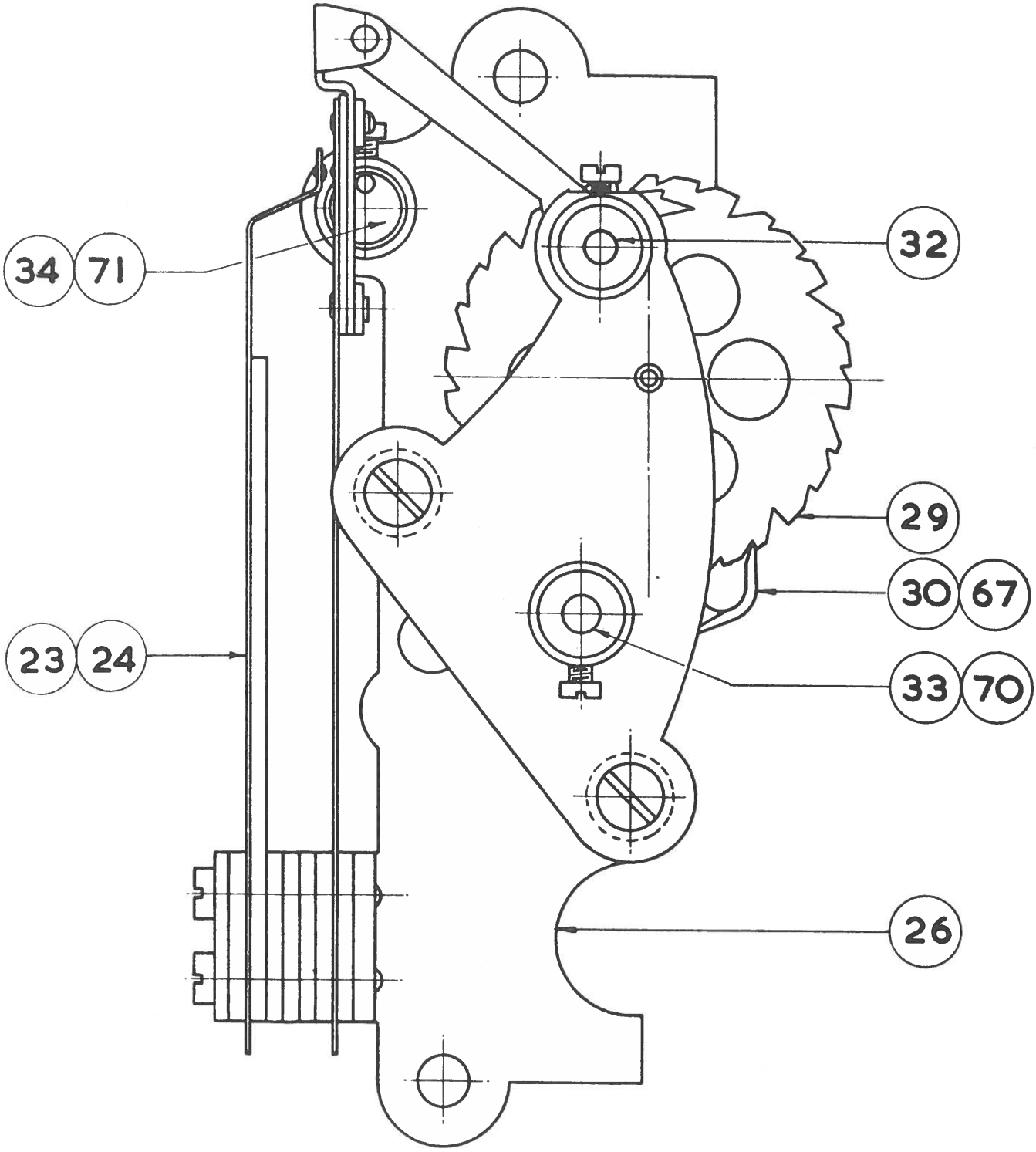


PLATE 4

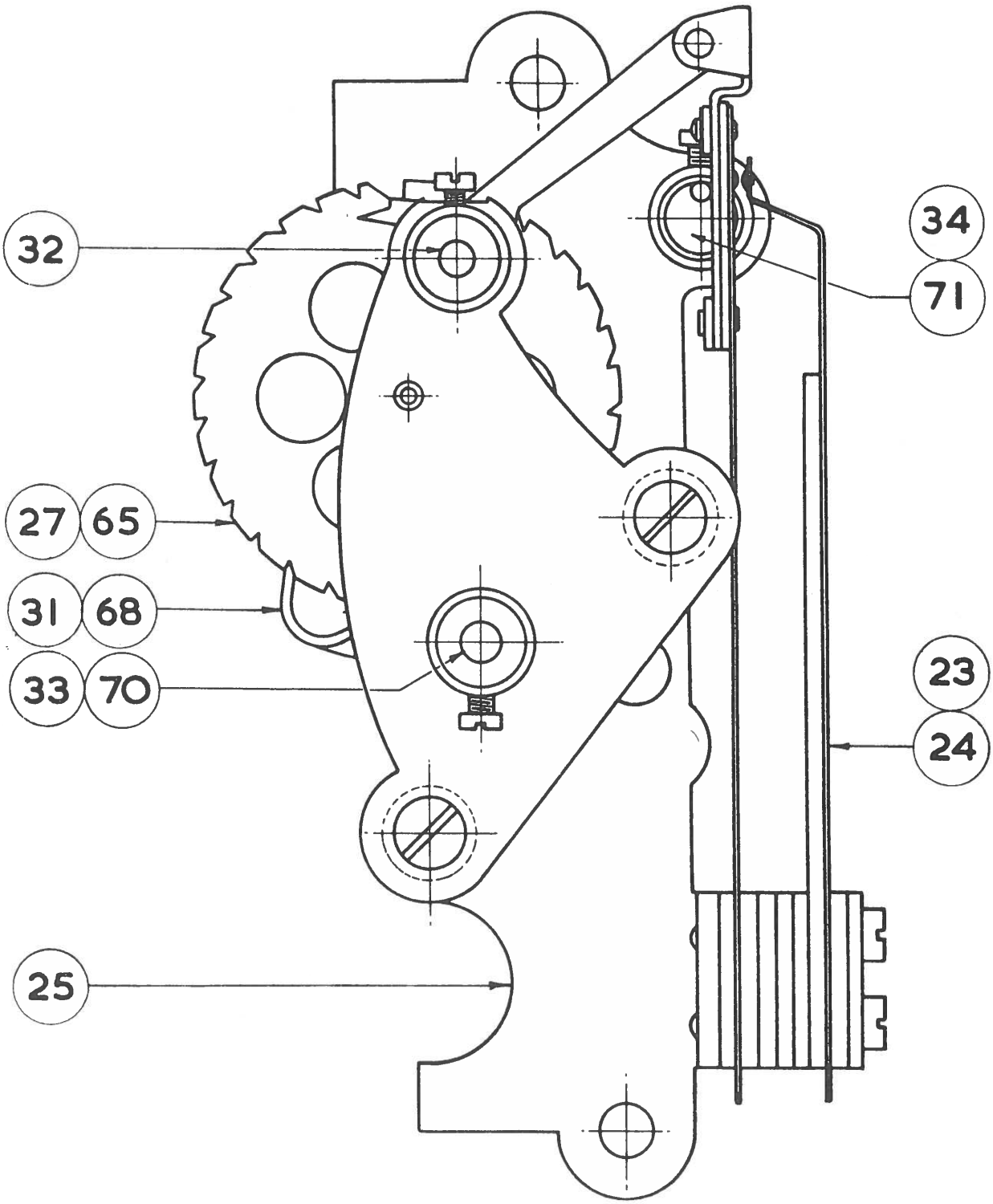
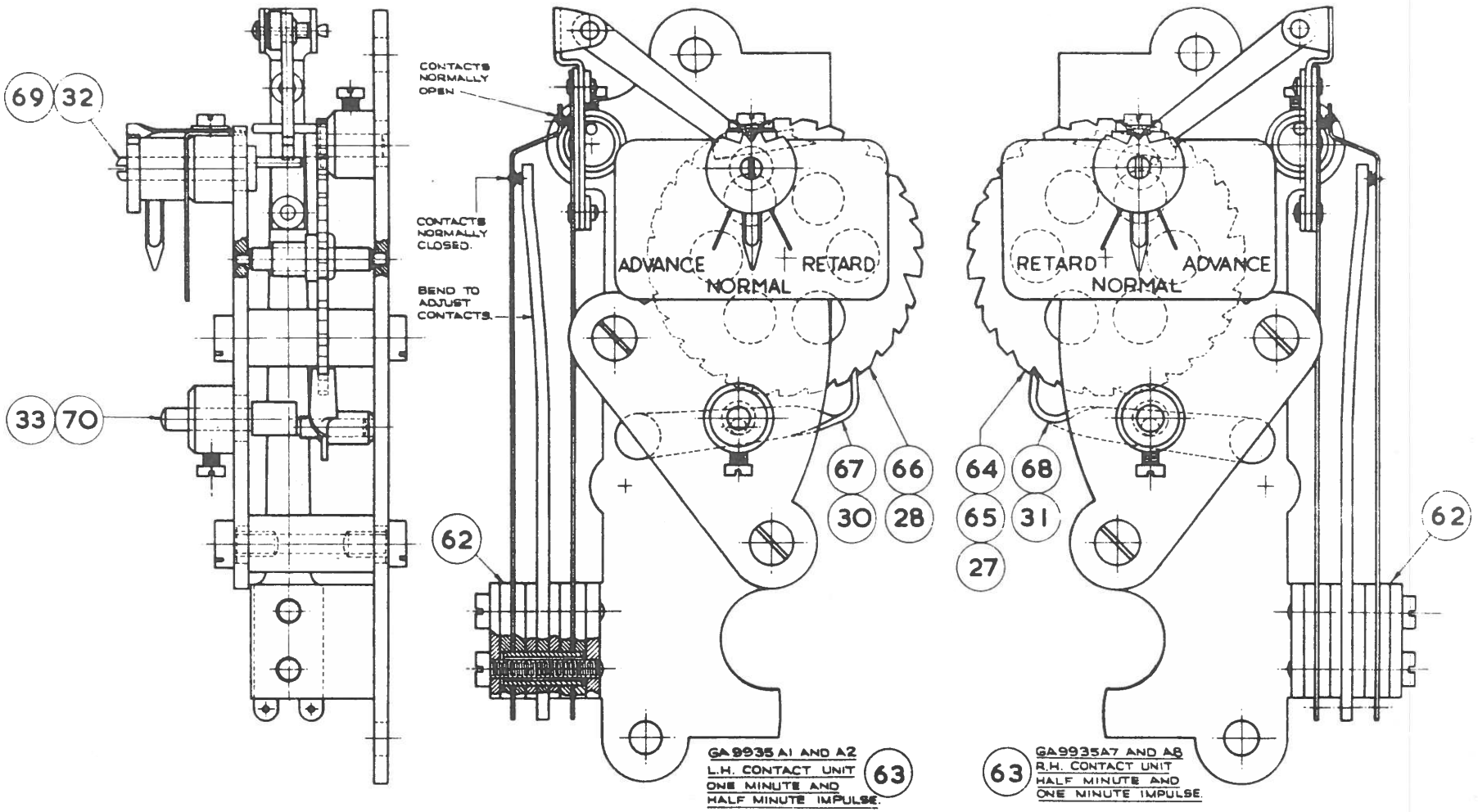


PLATE 5.



NOTE:- ADJUSTMENTS TO BE MADE ON FINAL ASSEMBLY

SELF WINDING CLOCK COMPANY,

Sole Manufacturers under "the Pond" Patents.

SELF-WINDING CLOCKS AND REGULATORS.

SOMETHING ENTIRELY NEW.

Acknowledged by clock experts and scientists to be the greatest advance in horology made in the last century.

ADAPTED

FOR JEWELERS, PUBLIC AND PRIVATE OFFICES, RAILWAY STATIONS, PRIVATE RESIDENCES, ETC.

THEIR ADVANTAGES ARE:

1st.—They are entirely automatic, self winding at regular intervals by electricity, thus obviating all the care and attention required in the use of key-winding clocks.

2d—By reason of this new method of winding, clocks so constructed are superior as accurate time keepers.

3d.—This principle of frequent and regular winding not only shortens the "train," but decreases the friction and strain upon it to the lowest degree.

4th.—This system does away with all necessity for use of a **"maintaining power,"** as the spring is wound in the **same** direction the "train" is moving, thus maintaining a perfect **uniformity of tension,** which all horologists admit is of the greatest importance, and without which perfect time cannot be had.

5th.—These clocks wind to the **same tension every time.**

6th.—It requires no expert in electrical mechanisms to set these clocks running. Any competent watchmaker can do it.

The action required of the battery is so slight, that it performs its work of winding the clock for **over one year** without renewal or attention.

The expense of renewal does not exceed twenty-five cents.

These clocks are the **first in their line** ever put upon the market. They are **in no way** similar to "*electric clocks.*"

They have all the advantages of the ordinary key-wound clocks, and the improvements herein referred to.

These clocks are made of the best material, with polished steel cut pinions, and are put up in a variety of styles and sizes, from the highest grade of astronomical movements to the common office clock.

From JEWELERS CIRCULAR - Sept, 1886

CHESTER H. POND. MARSHALL E. HUNTER.

C. H. POND & CO.,

SOLE MANUFACTURERS

AND WHOLESALE DEALERS IN

"The Pond"

Self-Winding Clocks and Regulators.

SOMETHING ENTIRELY NEW.

Acknowledged by clock experts and scientists to be the greatest advance in horology made in the last century.

These clocks are the **FIRST IN THEIR LINE** ever put upon the market. They are **IN NO WAY** similar to "*electric clocks.*"

SEND FOR CIRCULAR.

17 MURRAY STREET, NEW YORK

New York Central and Hudson River R. R. Co.,
General Superintendent's Office,
GRAND CENTRAL STATION,
New York, Nov. 9th, 1886.

MR. CHESTER H. POND,
17 Murray St., N. Y.
Dear Sir :—

Replying to your inquiry, would say that the large Self-Winding Clock purchased of you March 10th for our Incoming Passenger Station has never failed to wind, and has proven entirely satisfactory.

The small Regulator placed in this office in June has performed equally well.

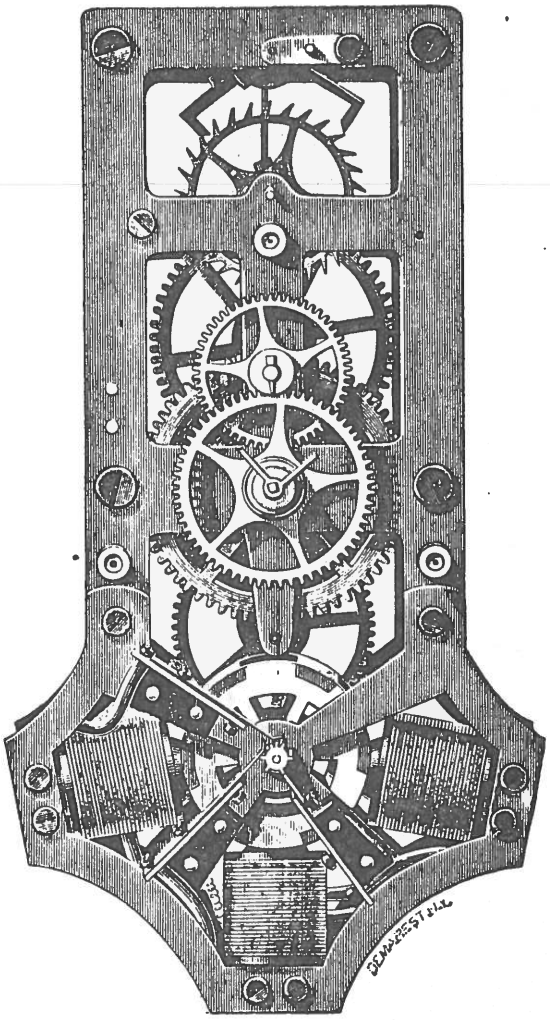
Yours truly,
J. M. TOUCEY,
Gen'l Supt.

Baltimore and Ohio Telegraph Company,
Office of the President and Gen'l Manager,
63 Broadway,
New York, 5th Nov., 1886.

MR. CHESTER H. POND,
17 Murray St., New York City.
Dear Sir :—

In reply to your inquiry, the Self-Winding Regulator which you kindly placed in my office on February 8th, 1886, has, up to date, recorded accurate time without attention, and has given satisfaction in all respects.

Yours truly,
D. H. BATES,
Prest. and Gen'l Manager.



The Boston and Albany Railroad Co.,
General Superintendent's Office,
Springfield, Mass., Oct. 30th, 1886.

MR. CHESTER H. POND,
17 Murray St., New York.
Dear Sir :—

In reply to your letter of inquiry, I can say that the Self-Winding Clock which you placed in this office nearly eight months ago has never failed to wind, and has given full satisfaction.

Truly yours,
E. H. GALLUP,
Gen'l Supt.

Dear Sir :—

On my return, after an absence of several weeks, I find your favor of the 20th ult., in reference to "Pond's Self-Winding Clock."

In answer, I may say, that I have thoroughly examined the Pond Clock, and, in my opinion, it has very superior advantages over the ordinary weight and spring clocks now upon the market.

I reach this conclusion because the Pond Clock has, through its simple winding, eliminated the drawbacks all other clocks are subject to, viz.: long train work, which multiply friction and varying tensions, and, furthermore, obviates altogether the shock of winding and the temporary strain from over winding.

Having been so many years a manufacturer of clocks, it gave me great pleasure to examine a clock which I believe obviates defects that all others are subject to.

Yours, very truly,
E. HOWARD,
Late President E. Howard Watch and Clock

CATALOGUE FURNISHED UPON APPLICATION. **CORRESPONDENCE SOLICITED.**

SELF WINDING CLOCK COMPANY,

17 MURRAY STREET,
NEW YORK.

38 MADISON STREET,
CHICAGO, ILL.

JEWELER'S CIRCULAR, DEC. 1886

*****MART*****

FOR SALE: JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY-1975-1980 ORIGINAL COPIES 50¢ a copy-minimum $4. Inquiries, SASE or send money payable to EHS, % C.Roth, 2 Circle Lane, Roslyn Hghts, N.Y. 11577

FOR SALE: VERY HIGH QUALITY EARLY BATTERY CLOCKS for the serious collector by Synchronome, Gents, Vaucanson, Leroy, Fully restored. C.Roth,2 Circle Lane,Roslyn Heights, N.Y.11577

WANTED: "Junker" early battery clocks, movements, parts,etc. Send details and $ wanted. ELECTRICAL CLOCK LITERATURE for possible reprinting in our Journal.

Electrical Horological Literature of any type. Hahl-Wenzel pneumatic clock face and weights. Will buy entire clock if necessary. M.Feldman,620 Reiss Place,7e, Bronx,NY 10467

REPAIRS: ALL EARLY BATTERY CLOCKS including Pooles, Barrs, Tiffany Never-Winds, Eurekas,etc. SPECIALIZING IN BULLE CLOCK USING ORIGINAL PARTS. One month maximum time for all repairs. M.Feldman, 620 Reiss Place,7e, Bronx, N.Y. 10467

WANTED: Unusual Electrical Clocks, A. Marx, 105 Bayeau Road,New Rochelle, N.Y.10804

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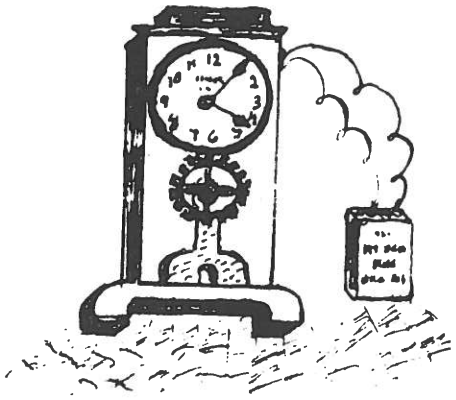

Hello fellow enthusiasts:

This month we continue reprinting the Magneta Clock Manual. We are also including a rather interesting clock which was brought to our attention by the Director of the NAWCC Museum, Stacy Wood. It would be interesting if this particular clock were still in existence.

We plan to hold elections for Officers in June and all members of the EHS are eligible to either nominate or run themselves. Please send me, if you wish, the names of people to be nominated along with a short personal history and, of course, their permission.

Good friend and member Joseph Singer has brought the following news to my attention: The Smithsonian Institute is planning a medium size exhibit to commemorate the 100th Anniversary of the introduction of Standard Time in North America. The exhibit is scheduled to open November 18, 1983. This should be quite interesting and further information may be obtained from the Smithsonian. We shall also try to keep you up to date as soon as we know more about this.

In subsequent issues we are planning to run a large series of photographs of battery clocks which should be of great interest to, we hope, everyone.

Enjoy this Issue!

Electromagnetically yours,

Marty

Martin C. Feldman, FNAWCC

SEE PAGE 12
FOR JUNE 3rd
MEETING NOTICE

PLATE 6.

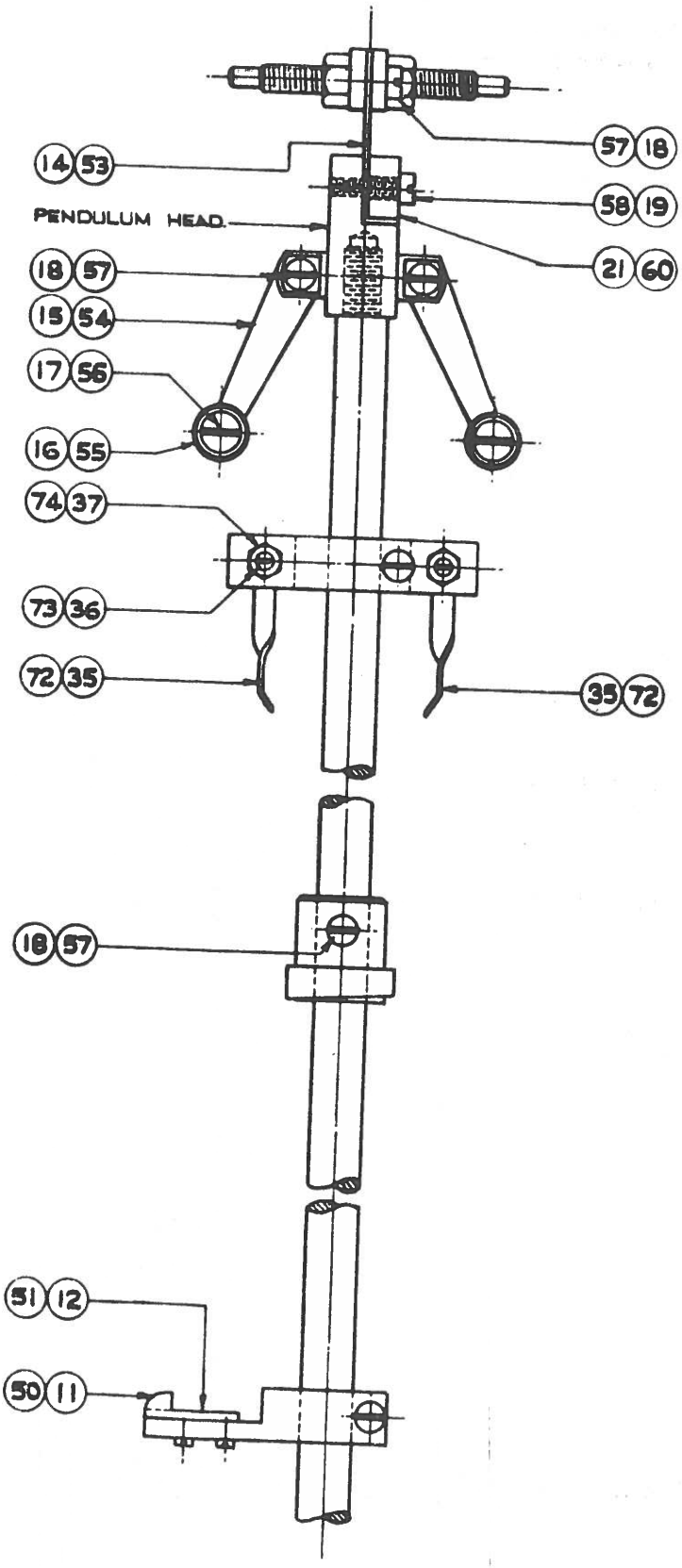
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PLATE 7.

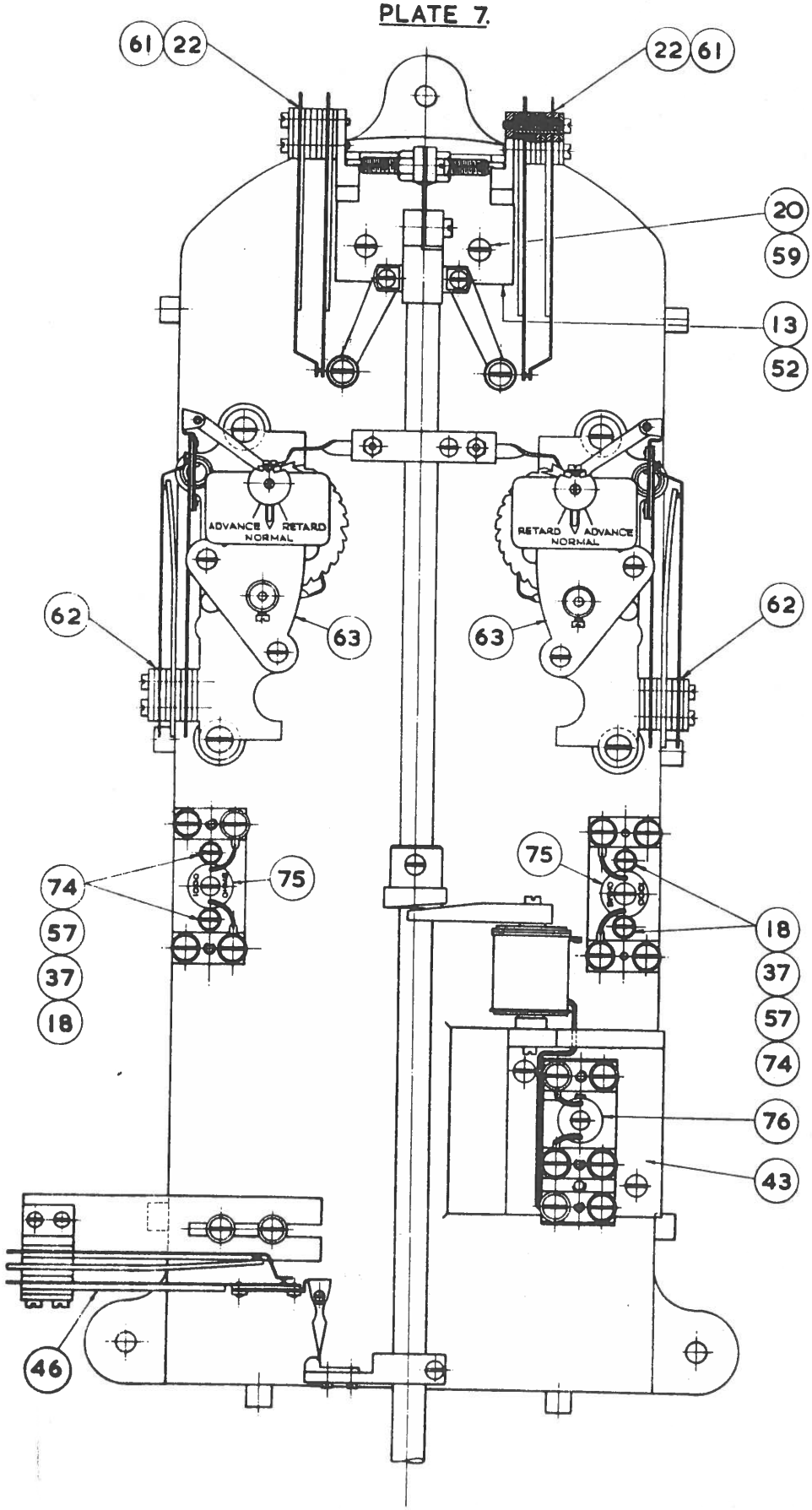
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PLATE 8

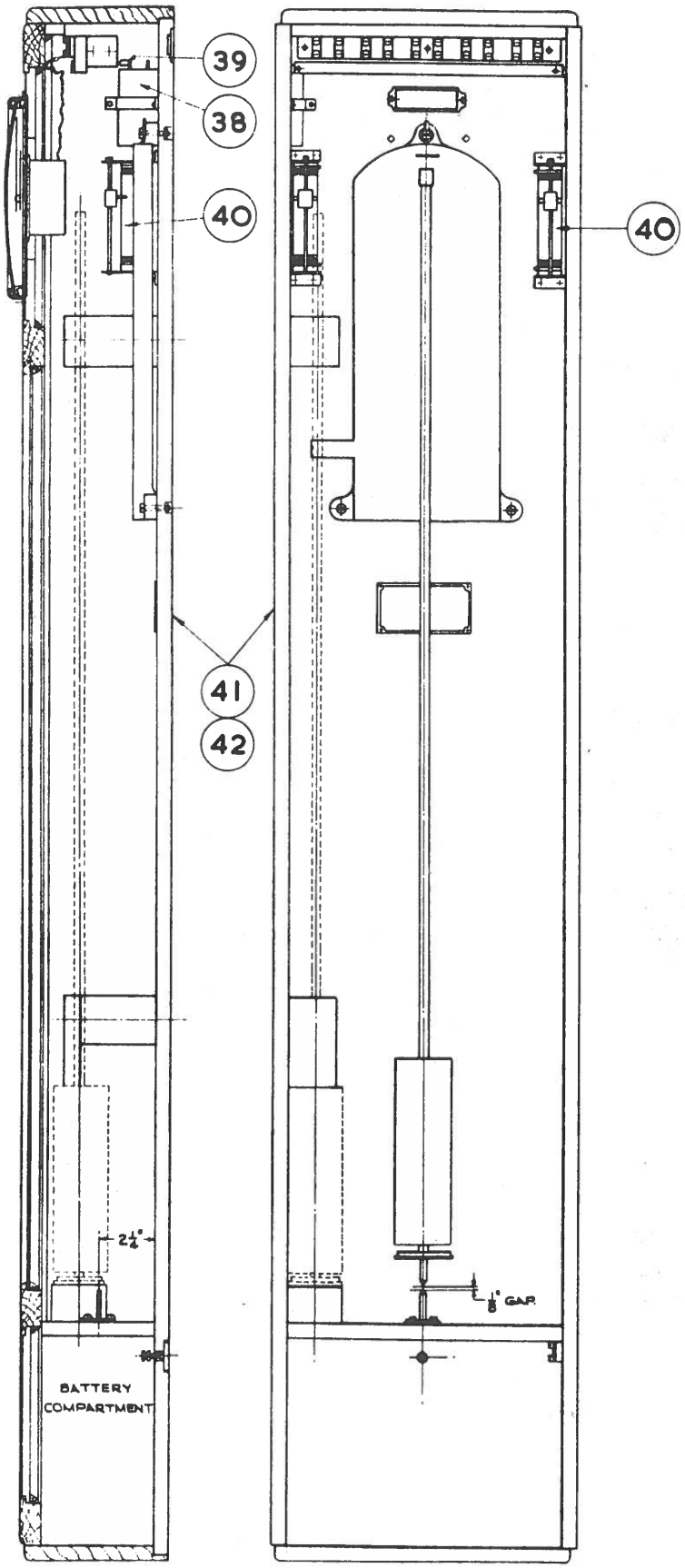
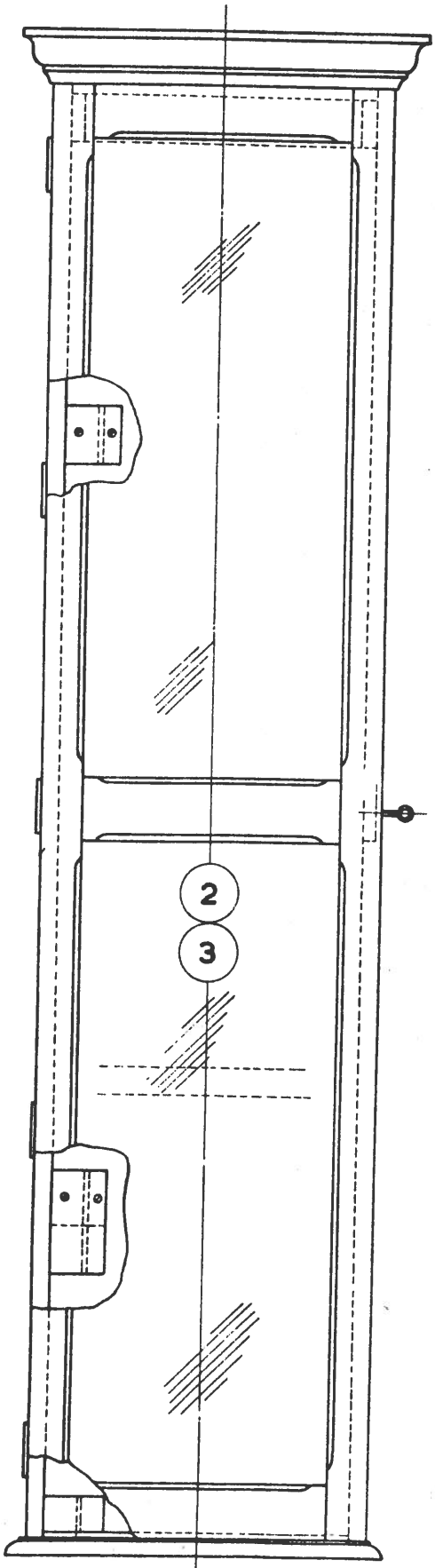
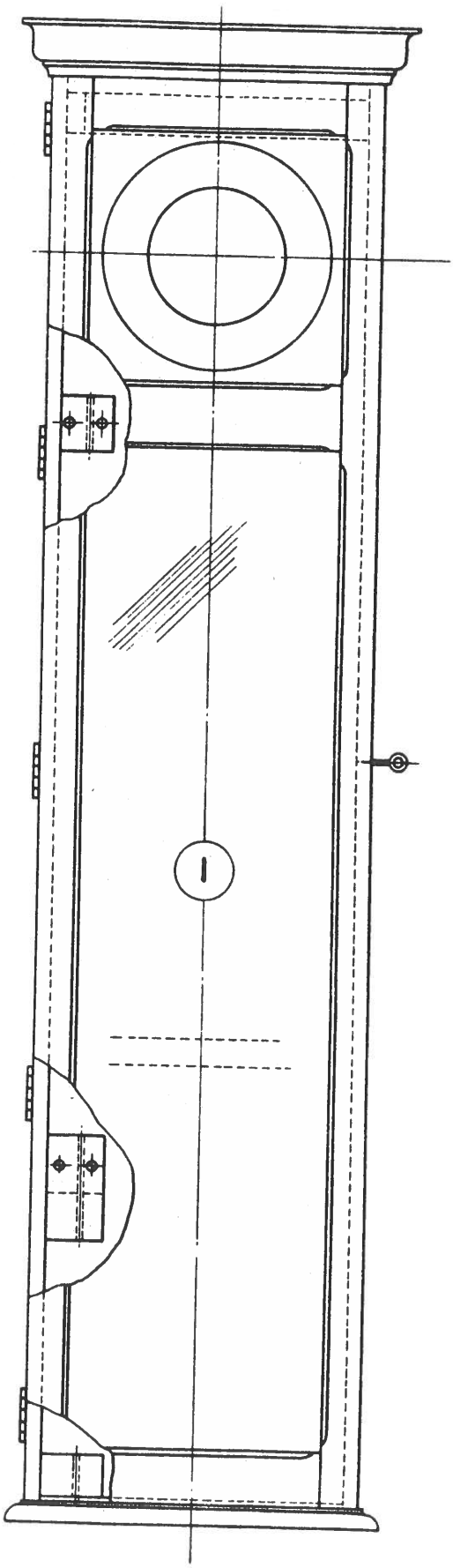
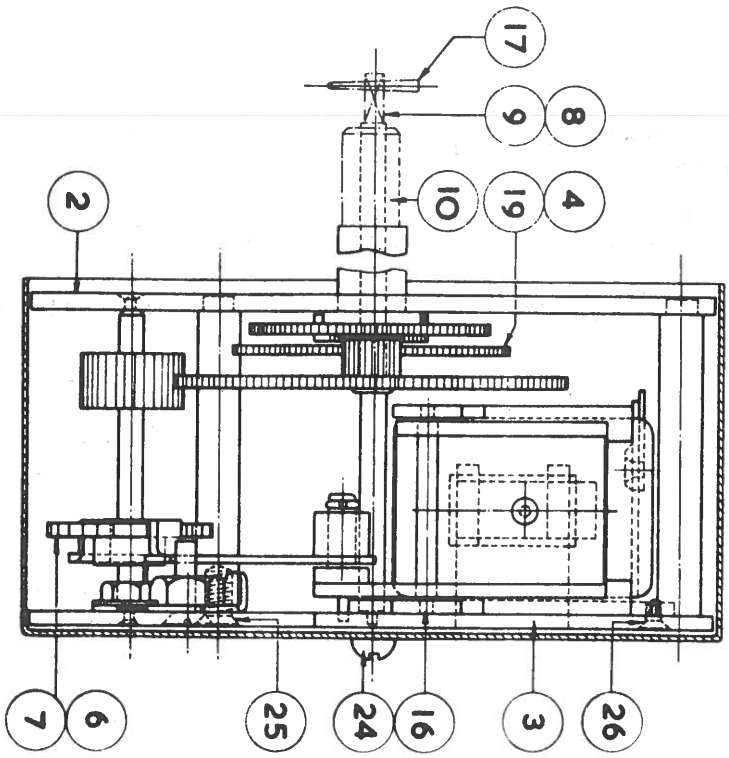


PLATE 9



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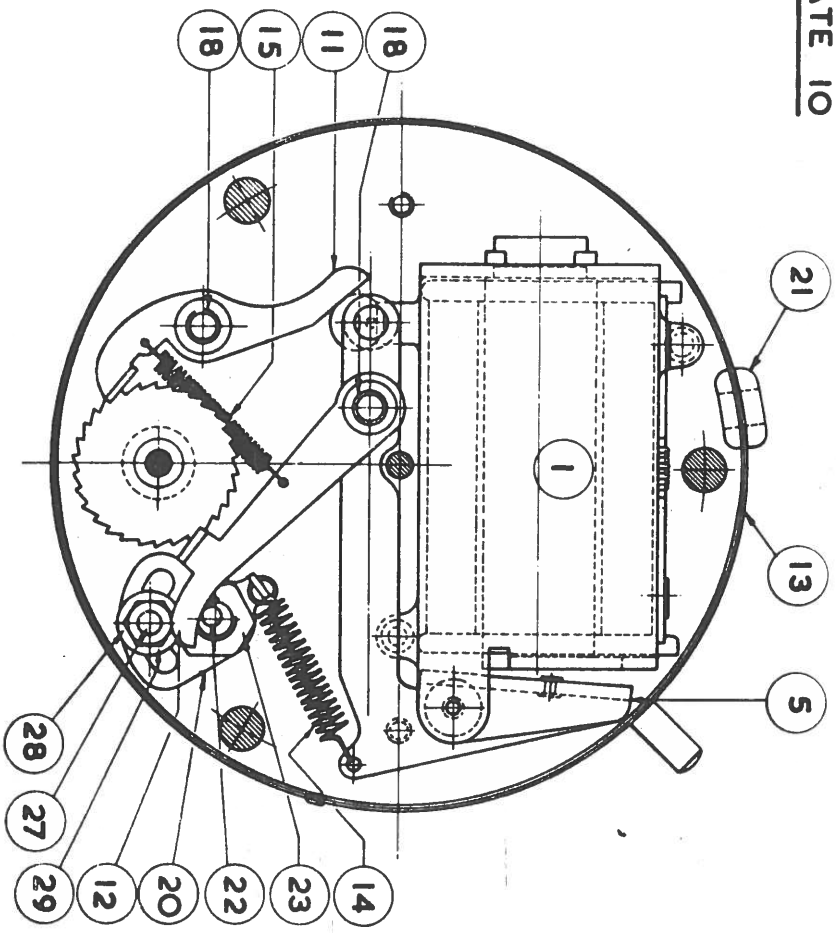
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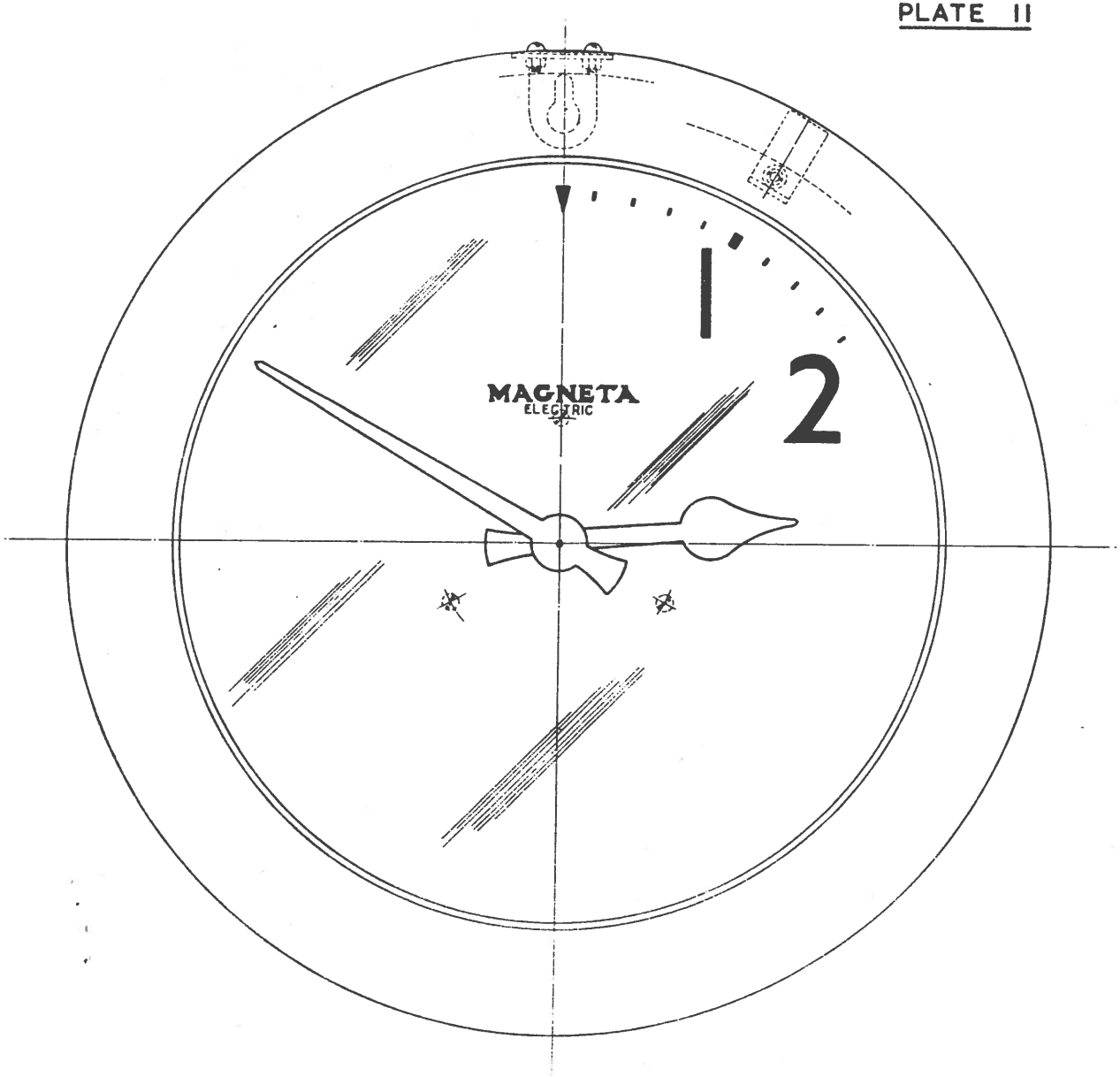
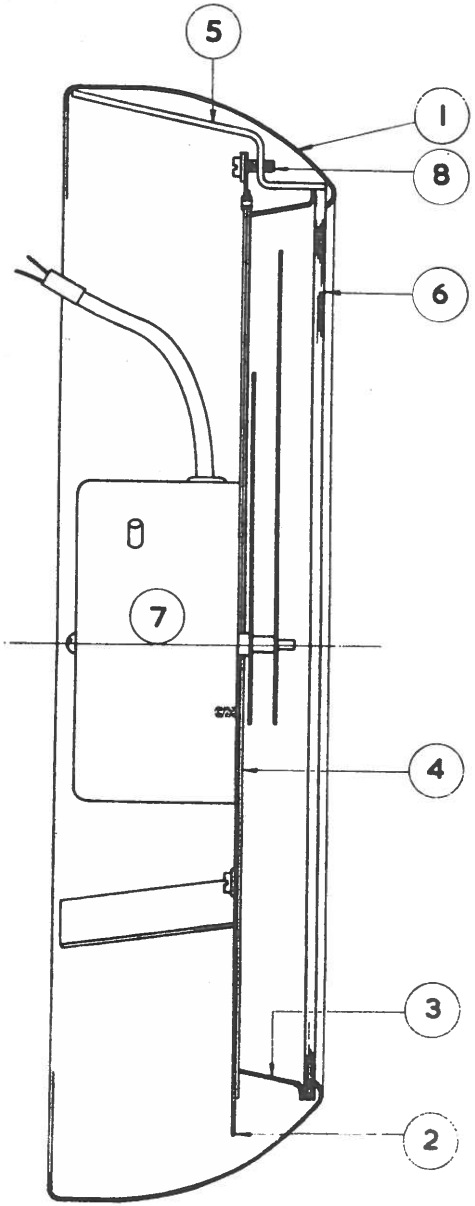
PLATE II





ARRANGEMENT FOR
9" & 12" CLOCKS.

MASTER CLOCK. M 36 G.P.O. TYPE

1.

Index No.	GA and SA Nos.	P and A Nos.	Screws Nuts Washers Sundries	Plate	Description.
1	GA 11495			9	Clock Case (Oak with Pilot Dial)
2	GA 9596 A1			9	Clock Case (Oak without Pilot Dial)
3	GA 9596 A2			9	Clock Case (Teak without Pilot Dial)
4	SA 10861			2	Pendulum Drive Unit
5		277 A2		2	Pendulum Drive Unit Coil (5 ohms)
6		153		2	Pole Piece
7	SA 9786			1	Pendulum Control Spring Set
8		289 A		1	Trailing Nib
9		168		1	Nib.Pivot Screw
10			4210 B	1	Nut. 7 B.A. Full Brass
11		235		6	Agate Stone
12		283 A		6	Agate Stone in Holder
13		P 10791 A1		7	Pendulum Head with Lugs
14		186		6	Pendulum Suspension Spring
15		190		6	Contact Operating Arm
16		191		6	Contact Roller
17		192		6	Contact Roller Screw
18			3428 S.P	6	Screw. 5 B.A.
19			3433 S.P	6	Screw. 5 B.A.
20			3405 S.P	7	Screw. 4 B.A.
21		250		6	Pendulum Head Clamp
22	SA 9791			1	Contact Spring Set. (1 sec. Impulse)

Index No.	GA and SA Nos.	P and A Nos.	Screws Nuts Washers Sundries	Plate	Description.
23	SA 9792 A1			1	Contact Spring Set. (6 secs. Impulse) complete with Shoe Piece
24	SA 9792 A3			1	Contact Spring Set. (30 secs. Impulse) complete with Shoe Piece
25	GA 10859 B1			4	Impulse Contact Unit complete. Right Hand ½ min.
26	GA 10859 A1			3	Impulse Contact Unit complete. Left Hand 6 secs.
27		302 A		4.5	Count Wheel. Right Hand ½ min.
28		282 A		5	Count Wheel. Left Hand ½ min.
29		275 A		3	Count Wheel. Left Hand 6 secs.
30		274 A		3.5	Backlash Pawl. Left Hand.
31		301 A		4.5	Backlash Pawl. Right Hand
32		139		3.4.5	Shoepiece Eccentric Pin. Control Unit
33		149		3.4.5	Backlash Eccentric Pin. Control Unit
34		137		3.4	Contact Eccentric Pin. Control Unit
35	SA 9931			6	Driving Click
36		201		6	Grub Screw. 5 B.A.
37			4201 B	6	Locknut. 5 B.A. Brass
38			31-45	8	Condenser. M.C.101. 1Mfd.
39			74-46	8	Resistor No 6 (200 ohms)
40			34-1	8	Variable Resistor

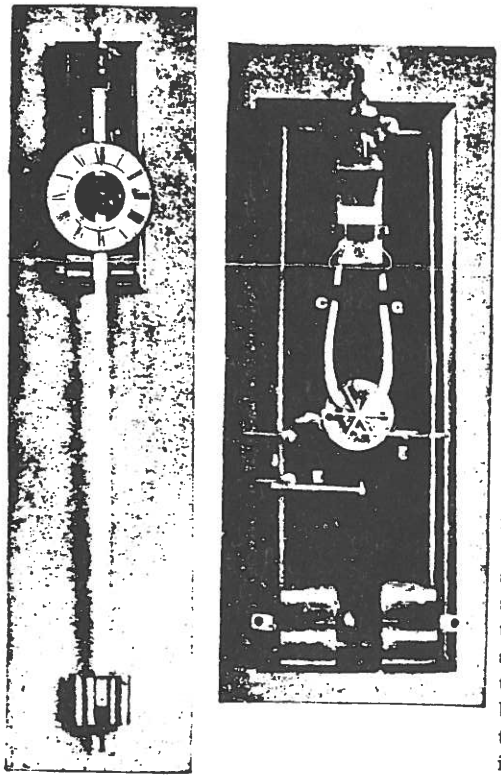
MASTER CLOCK M 37 STANDARD TYPE

1.

Index No.	GA and SA Nos.	P and A Nos.	Screws Nuts Washers Sundries	Plate	Description.
41	GA 9795			8	Clock Case. Oak
42	GA 9795 A2			8	Clock Case. Teak
43		279 A		7	Pendulum Drive Unit
44		277 A		2	Pendulum Drive Unit Coil (6 ohms)
45		153		2	Pole Piece
46	SA 10713			1.7	Pendulum Control Spring Set
47		289 A		1	Trailing Nib
48		168		1	Nib. Pivot Screw
49			4210 B	1	Nut. 7 B.A. Full Brass
50		235		6	Agate Stone
51		283 A		6	Agate Stone in Holder
52		P 10790 A2		7	Pendulum Head without Lugs
53		186		6	Pendulum Suspension Spring
54		190		6	Contact Operating Arm
55		191		6	Contact Roller
56		192		6	Contact Roller Screw
57			3428 S.P	6	Screw. 5 B.A.
58			3433 S.P	6	Screw. 5 B.A.
59			3405 S.P	7	Screw. 4 B.A.
60		250		6	Pendulum Head Clamp
61	SA 9791			1.7	Contact Spring Set. (1 sec. Impulse)

The Hayden Century Clock.

MR. J. F. HAYDEN, class of '96, Trinity College, Durham, N. C., has designed and constructed a novel clock which may now be seen running in the Physical Laboratory, says a writer in the *Electrical Engine*. The clock is run entirely by electro magnets, which are actuated by the current from an earth battery. The pendulum is constructed after the usual pattern, with wooden shaft and



THE HAYDEN CENTURY CLOCK.

heavy cylindrical weights for the bob, and is suspended from the bracket attached to the back-boards, as seen in Figs. 1 and 2. It is the pendulum that runs the clock.

By means of the automatic switch C G, the current from the battery is sent around first one and then the other of the electromagnets D and H. The screw A at the upper end of the pendulum is electrically connected to the upper binding post J, and also to two contact points, one on each side of the shaft at L. The arms C and G, of the automatic switch are insulated from each other. The upper arm G is in metallic connection, through the central screw with a wire in the rear of the back boards, leading to the coils about the pair of magnets H. The lower arm C rests on the brass plate F, the latter being connected with the coils about the magnets D. As the pendulum swings, it is readily seen that the current will alternately pass around the two pairs of electromagnets D and H, and the two soft iron armatures at I will be alternately attracted.

The working of the clock can best be understood by following the current through a complete cycle. Starting from the upper of the binding posts, J, the current passes to A, then through the piece of sheet steel, B, attached to the upper end of the pendulum shaft, to the contact points, L. When the pendulum starts from the magnets H, towards the magnets D, the contact is made from L through C, and the current will pass around magnets D, and from there to the lower binding post, completing the circuit through the battery. It will be seen that this aids the force of gravity in carrying the pendulum towards D. When the pendulum starts back from D, the contact is made with G, and the current passes around the magnets H, giving the pendulum a pull in that direction. If these pulls at each stroke of the pendulum are sufficient to overcome the loss by friction of the moving parts, it will continue to vibrate.

To regulate the amount of current passing to the electromagnets, two brass tips are affixed to the shaft at K, their distance apart being readily adjusted by screws. Shortly after the contact is made with C, as the pendulum swings toward D, the connection is broken by the arm, C, coming in contact with the strip, K, on that side, and if the current is very strong the strip will push the switch far enough to throw G into contact, and the current will pass around the magnets H. The latter acting will tend to retard the motion of the pendulum toward D. By adjusting the distance between these strips, almost any current may be used to run the clock.

As a novelty in the construction, the works and dial are placed upon the pendulum and swing with it. The seconds hand is attached to a rachet wheel having 60 teeth, and is actuated at each stroke of the pendulum by the pawls, E E, which are attached to the back board. The motion is communicated to the minute and hour hands by the usual intermediate wheels. The movement is jeweled and the pawls have steel tips. The tips of the pawls work in semicircular grooves in such a manner as to make it impossible for them to catch more than one tooth at each stroke of the pendulum. The length of pendulum is adjustable both at the upper and at the lower end by means of suitable screws.

The lower end of the pendulum is provided with two needle points fixed in the nut, *n*. These pass simultaneously through two drops of mercury, each of which is in metallic connection with one of the binding posts at the right hand lower side of the case. Thus we have a clock that may be used in many laboratory experiments where a seconds pendulum is required. A local circuit will be closed through an electric bell or telegraph sounder at each stroke of the pendulum. All the electrical contact points in the clock are of platinum, and the working parts of the switch are adjustable for wear.

The earth battery is built in the ground near the building and consists of several old boiler grate bars as one electrode and several bushels of coke as the other. The battery will last for an indefinite period and should run the clock for 50 or 100 years.

D. F. Rosen has engaged in the jewelry business in Altoona, Pa.

* * * *MART* * * *

WANTED: (Photo)copies of EHS Journal: 1975 #1; 1976 #1,2,3,4,5: 1977 #1,6.

FOR SALE: Rare French electric sceleton clock $800. Will send 3 pictures for $1.50. J. E. Bosschieter, Zonneveldstraat 6, 2311 RV Leiden, THE NETHERLANDS.

FOR SALE: JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY-1975-1980 ORIGINAL COPIES 50¢ a copy-minimum $4. Inquiries, SASE or send money payable to EHS, % C. Roth, 2 Circle Lane, Roslyn Hghts. NY 11577

FOR SALE: VERY HIGH QUALITY EARLY BATTERY CLOCKS for the serious collector by Synchronome, Gents, Vaucanson, Leroy, Fully restored. C. Roth, 2 Circle Lane, Roslyn Hghts, NY 11577

WANTED: "Junker" early battery clocks, movements, parts, etc. Send details and $ wanted. ELECTRICAL CLOCK LITERATURE for possible reprinting in our Journal.

Electrical Horological Literature of any type. Hahl-Wenzel pneumatic clock face and weights. Will buy entire clock if necessary. M. Feldman, 620 Reiss Place-7e, Bronx, NY 10467

REPAIRS: ALL EARLY BATTERY CLOCKS including Pooles, Barrs, Tiffany Never-Winds, Eurekas, etc. SPECIALIZING IN BULLE CLOCK USING ORIGINAL PARTS. One month maximum time for all repairs. M.Feldman,620 Reiss Pl.7e,Bx.NY 10467

WANTED: Unusual Electrical Clocks, A. Marx, 105 Bayeau Road,New Rochelle,NY 10804

SPECIAL ANNOUNCEMENT

IN THE JUNE ISSUE OF OUR JOURNAL WE WILL RUN ALL ADS FREE ON A TRIAL BASIS! This is to encourage more people to make announcements, buy, sell and trade. Please get all ad copy to me (Marty Feldman,620 Reiss Place-7e,Bx. NY 10467) as soon as possible. Thank you.

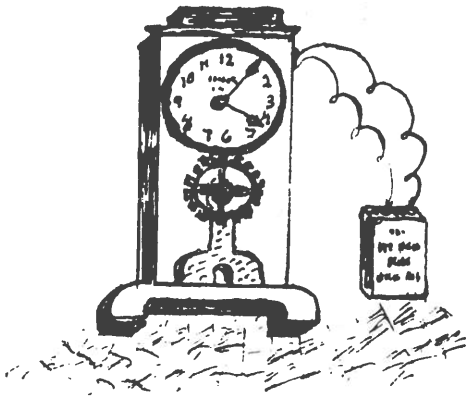
MEETING NOTICE

Ruth Hirschfield
134 Jarlemon St.
Brooklyn, N.Y. 11201
858-3843

FRIDAY-JUNE 3rd @ 7:00 p.m.
RSVP Please call Ruth

The
JOURNAL
OF THE
ELECTRICAL HOROLOGY SOCIETY
Chapter No 78

June, 1983
VOLUME IX---ISSUE #3
Martin C. Feldman, Editor



Hello fellow enthusiasts:

This month we feature two original articles; the first is a brief history of the Self-Winding Clock Co. of New York by John Cammarta and the second is another short description of the life and death of the Sangamo Clock Co. by Harvey Schmidt. The photographs were originally taken at the EHS Electrical Clock Exhibit featured during the 1982 N.Y.Regional Meeting. We then continue with the Magneta Clock Manual reprint to round out the technical section of this issue.

A meeting of the N.Y./N.J. section of the EHS was held at the home of Ruth Hirschfield on Friday night, June 3. It was attended by 12 members, wives and friends of the Society. Interesting electric clocks were brought, as is our custom--these then were avidly discussed with great enthusiasm by members who held opposite views (naturally) as to their origin, mechanisms, use, etc. However, when all was said and done each of us came away with more knowledge and good feelings than we had originally come with. We also held an Executive Board Meeting at which time the nominations for Officers of the EHS were presented. This year there shall be an addition to the Board in the form of six Directors who are located at various geographic points throughout the U.S. It was also felt that since elections in the past have generally brought little response from the membership (8% last election), it would perhaps be more expedient and less troublesome for all involved if the Treasurer cast one vote on behalf of the membership, if there is no opposition from the general membership, after one month has passed from the time of mailing of this June issue. You will note there are many new faces and we hope that this Board will meet with your approval and will democratically represent your wishes and views regarding our Society. We shall publish the appropriate announcement in the August issue of the Journal. The Board Members will hold office for two years. They are as follows:

con't. on Pg.12

Self-Winding Clocks

By: John Cammarata

The development of the old battery operated electrics brought out the ingenuity of clock designers set on achieving better performance than the spring wound/weight driven clocks of their day. These designers driven to the esoteric concepts, used electromechanical means to achieve an electrically driven, independent clock.

These approaches can be divided into three main classes:

(1) Clocks in which the pendulum is kept swinging by forces due to electromagnets.

(2) Clocks in which the impulse to the pendulum is given by the fall of a gravity arm or the release of a spring which is afterwards restored to its original position by an electromagnet. These may be termed "electric gravity escapement."

(3) Mechanical clocks in which the driving weight or spring is rewound at intervals by some form of electric motor.

We are concerning ourselves with the third class of electrically driven clocks in this paper.

An American inventor, Chester Henry Pond (1844-1912) of Brooklyn, New York, followed the more pragmatic approach of taking the best of the mechanical and electrical techniques to conceptually design a simpler electromechanical pendulum regulated clock. His first known clock development, patent #308,521, issued on November 25, 1884, described this electromechanical clock. Herein he employed a D.C. rotary motor to wind up a spring in response to a contact made by the center wheel every hour. Pond used the same segment of a spring, wound it electrically with the automation achieved by the contact on the center wheel and now had an automatic, self-winding clock operated by battery power.

His fame preceded him from his earlier developements and patents related to advancing the state-of-the art in telegraphy applications. These latter developments were well publicized in patents on the subjects issued to him the years following the self-winding clock patent.

The Self-Winding Clock Corporation was founded in 1886 by Charles Pratt in collaboration with Pond to manufacture self-winding clocks. Pratt was the first President. The company continued in operation through to 1968. Pond was active in the first few years of the company's organization. He continued the development, improvement and extension of the self-winding clock applications with further joint patent applications. Pond continued to receive royalties on the production from his patents even after he broke active ties with the corporation.

The further developement of these clocks evolved other methods of winding the spring. The most popular,and found in most clocks today, employ electromagnets with pawl and ratchet wheel to wind the spring. This design cycled more frequently then the original rotary motor design in Pond's first patent.

The built-in electricity source coupled with the know-how of the developers who came up through the telegraphy field, including Pond, soon evolved self-winding clocks with contact assemblies for all types of circuit controls. The most significant development was that which paved the way for Pond's self-winding clock to become the National Time Standard. Pond's key patent #408-846 on this development, was granted on August 13, 1889 for an "Automatic Time Signaling Device for Time Service."

Pond's work on the self-winding clock, his associated signalling applications and the development of the Western Union Time Service Group, founded by James A. Hamblett in 1877, were married to standardize time in the United States. From the 1877 beginning, the "ball dropping" ceremony daily at noontime down the pole of the Western Union Building in New York City, when automatically signaled from Washington, D.C., enforced by the legislation passed by Congress on March 13, 1884, the Western Union Time Service controlled America's activities by providing accurate "Standard Time."

The mechanics of the systems and circuits employed to achieve these accomplishments are too extensive to discuss in this paper. References of the detailed articles describing these developments are available from the NAWCC library. Basically, the systems transmitted hourly signals to their customers' clocks which corrected the clocks hourly to the "Correct Time" of the United States Observatory in Washington. These signals were transmitted over leased lines of the Western Union Time Service.

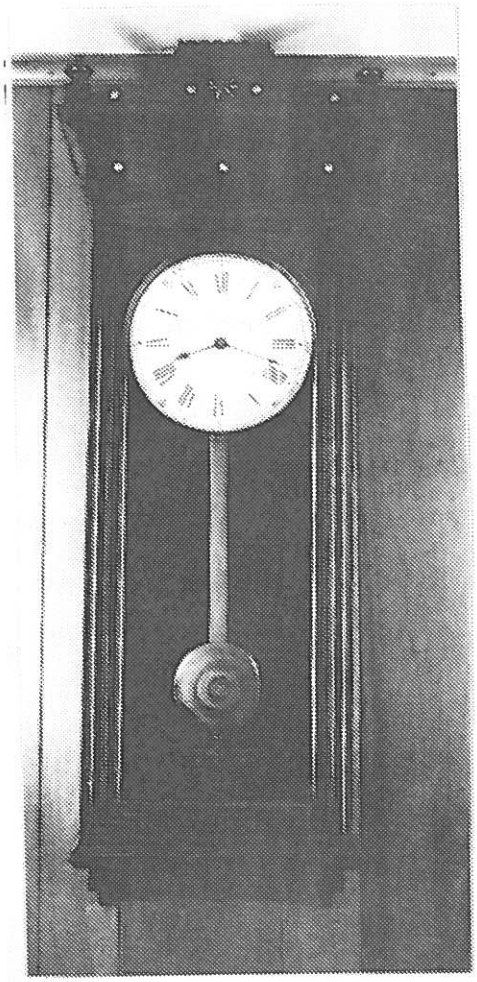
We have illustrated some of the more common self-winding clocks manufactured by the Self-Winding Corporation; see figures---. Many others exist in almost all forms including regulated models with gravity escapements and ornamented cases for the most prostigious locations. Balance wheel type movements were also made in later years, through the World War 11 period for shipboard and other applications.

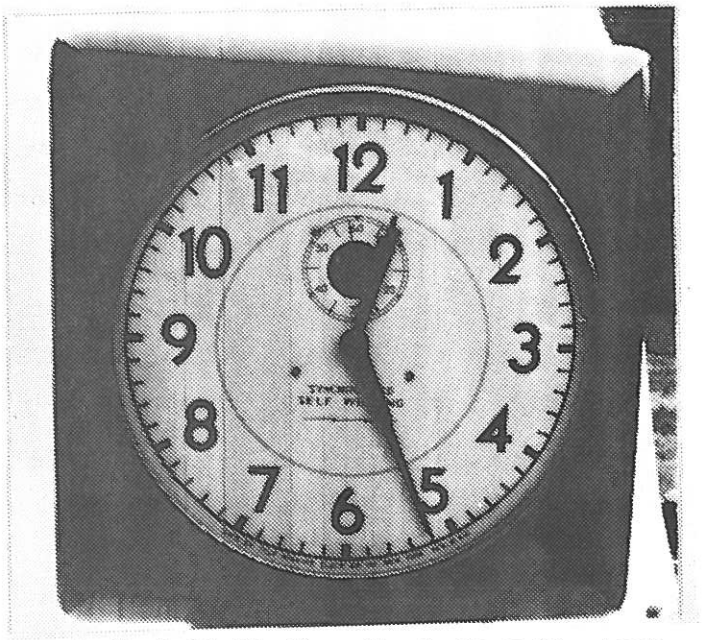
The self-winding concept of Pond's using motor power in some form to wind a spring was refined by many other clock designers to make a near generic self-winding clock. Notable among these clocks are the:

National Self Winding Clock Co., Champagne, Il.

Dr. Herman Aren's Self Winding Clock,Berlin, Germany, c.1892.

Henry Rempe's Self Winding Clock, Rempe Manufacturing Co., Dannville, Pa., c.1903.





Left:Self-Winding Clock Co.wall clock in walnut case with rotary motor.

Right above: SWCC clock in wood case with reciprocating motor and synchronizing mechanism connected to hourly synchronizing signal.

Photos: Robert McGinness

Sangamo Clock Co.

By: Harvey Schmidt

J. Bunn, president of the Illinois Watch Company bought a patent for an electric meter. The meter was a success, and the company manufactured its products in space rented (and later purchased) from the Illinois Watch Company. Sangamo first experimented with clocks in 1924, with their type "A" ball bearing motor.(1) Results of a pilot run were very good, and it was decided to tool up for production the following year. In the Spring of 1926 regular production of a complete line of shelf and wall clocks was begun. The cases were made by Erskine Danforth, the movements were made by Sangamo, and an 11-jewel compensated balance platform was made by the Illinois Watch Company.(2) The first run of clocks were time only and hour and half-hour striking. The striking movements had 2 type "A" motors, one for each train. The clock was basically a mechanical mechanism in which the lever escapement was powered by a spring which in turn was wound by the electric motor which was stopped when the mainspring was fully wound. The spring had a reserve capacity of 24 hours. As the operation of the clock was independent of the type or strength of the electric power source, and the escapement was of a very fine quality, excellent timekeeping resulted. The Sangamo ads of the 1920's stated "It has no batteries, it is not affected by current interruptions, it operates on any frequency, it is a complete independent clock, usable wherever electric current goes, and more dependable than your electric light."(1)

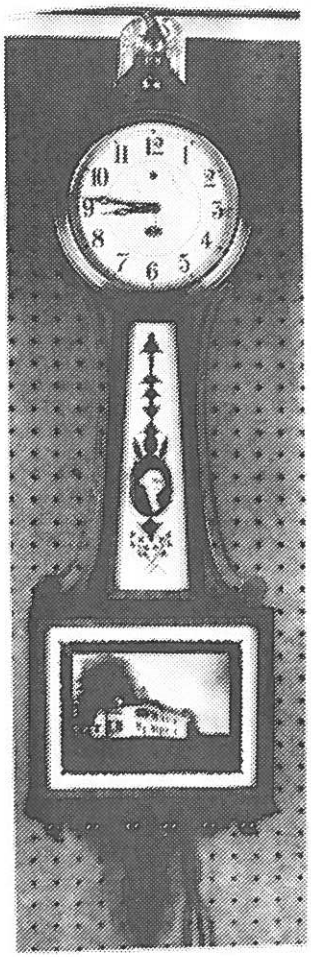
During the 1926 Philadelphia Sesqui-Centennial the clocks received highest awards. Early in 1928 the Illinois Watch Company was purchased by the Hamilton Watch Company who began operating the Springfield plant. Since Sangamo was associated with Illinois through the purchase of their escapements, the suggestion was made by Hamilton that the two companies join forces in the electric clock business. The suggestion became a reality with the formation of the Hamilton Sangamo Corporation on June 1, 1929, in which the two companies were equal partners; Sangamo to manufacture the clocks, and Hamilton to supply the escapements and the sales experience.(2)

Shortly after the emergence of the new company, several design changes were made. The type "A" motor which occasionally became noisy in operation was replaced by the type "C" motor which ran silently. The two-motor system was replaced by a single motor which operated both trains through a differential gear arrangement.

The 11-jewel Illinois and 11-jewel Hamilton escapements gave way to a 7-jewel Hamilton escapement. At the same time the damascening of the movements and escapements was discontinued. These were obviously moves made to effect cost savings. The clocks were relatively expensive compared to their competition in the electric clock field. The clocks ranged in price from $25 for a "time only" simple shelf clock to $85 for an exposed escapement "striking" boudoir clock, and $400 for a grandfather clock. The vogue for synchronous motor clocks with their lower prices made sales of the Sangamo increasingly more difficult, so a type "E" non-self-starting synchronous motor clock was put on the market in August 1930. Later as the need for a self-starting motor became apparent, a type "F" synchronous, self-starting motor was developed. However, the line of "F" clocks was never put into production, as the General Time Instruments Corp. (owner of Big Ben, and Seth Thomas Clock Companies) expressed an interest in using these motors in their own clocks. As the Sangamo Company could not sell their products to any company other than Hamilton Sangamo, General Time offered to buy Hamilton Sangamo in order to obtain exclusive rights to their AC and DC motors. Therefore in April 1931, the Hamilton Sangamo Corp. was sold to the General Time Instruments Corp. and Sangamo was no longer in the clock business.(2)

(1) A. H. Miller and D.M. Miller, Illinois Horology, 1977

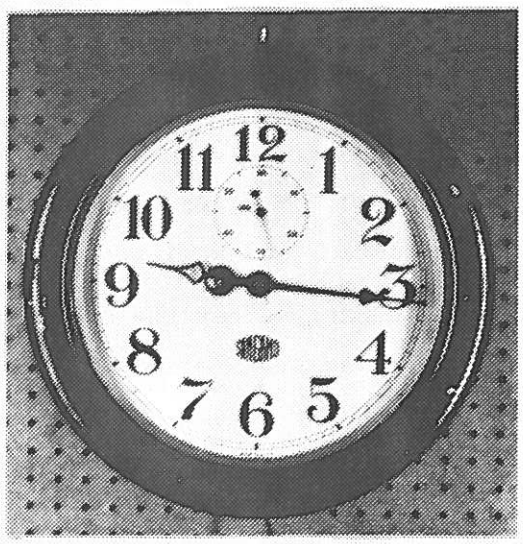
(2) Excerpts from a letter of 5/16/72 to Robert Werff of Lima Ohio from Maxine Dillahaunty, Customer Service Representative of the Sangamo Electric Co.

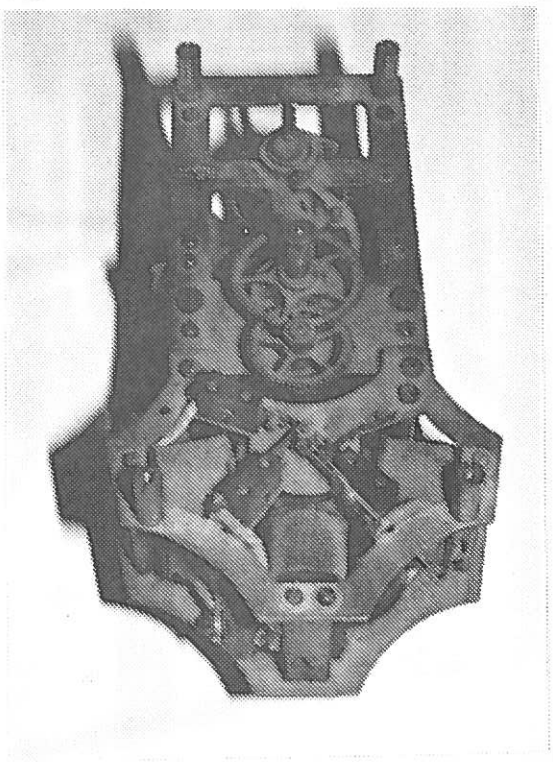


Left:Sangamo in Waltham Banjo style case.

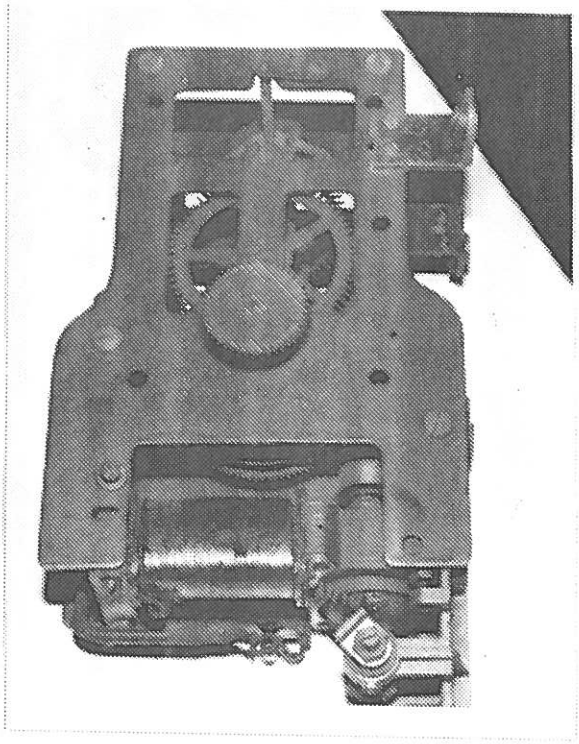
Right:Sangamo in aluminum round case

Photos by: Robert McGinness

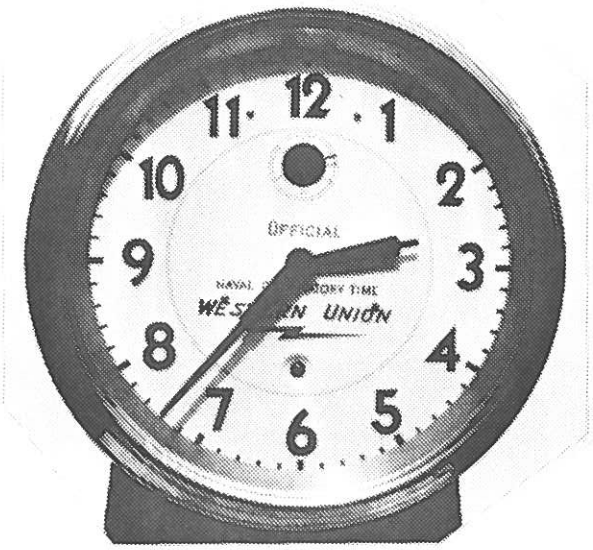




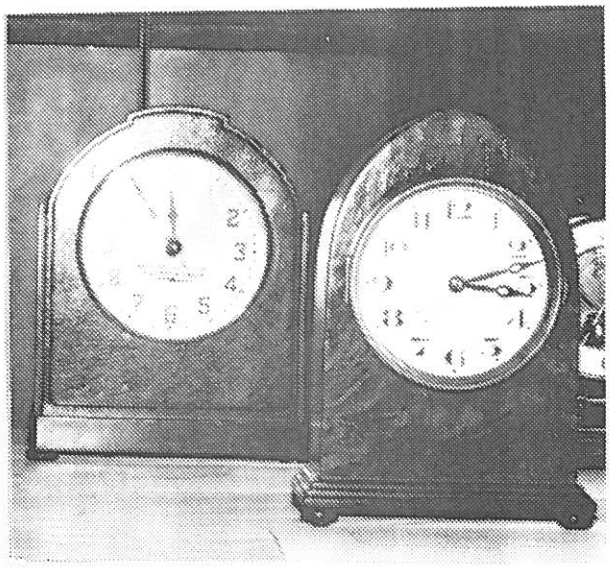
(1) SWCC style "C" rotary motor wind mvt.-1884



(2) SWCC early single pole rotary motor wind mvt.



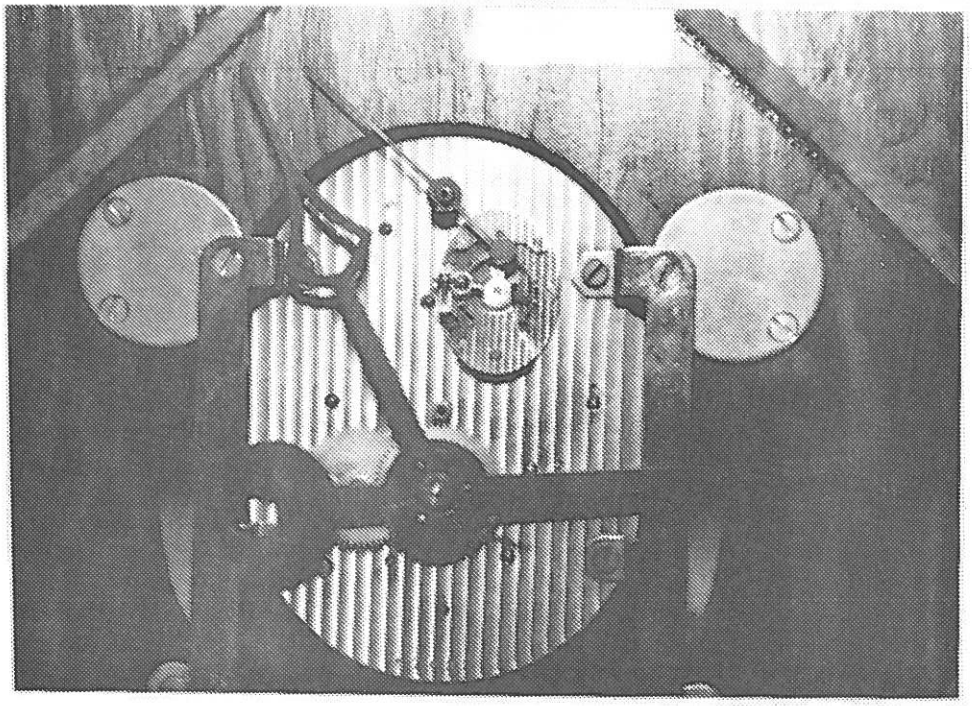
(3) SWCC round case clock with hour indicator light over "6".



(4)(L)SWCC "Dale" model balance wheel escapement rotary motor wind mantel cl.

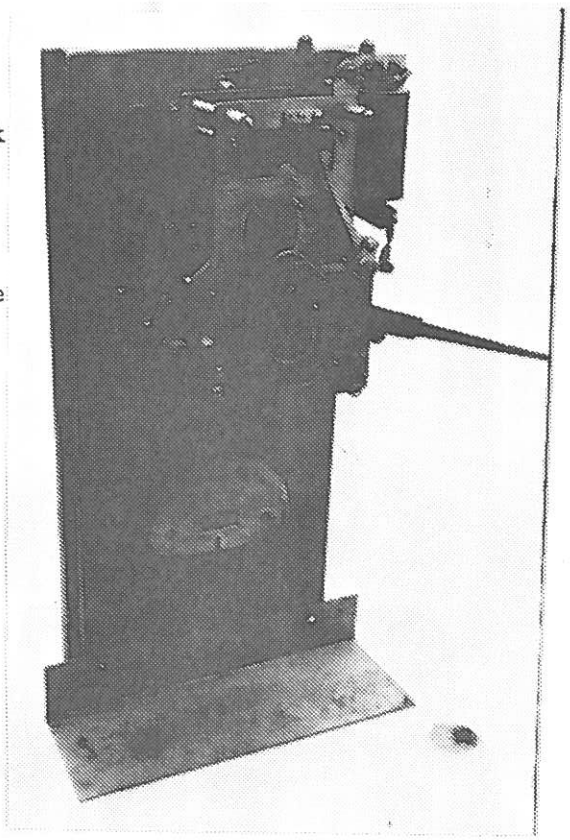
right--ATO cathedral mantel clock

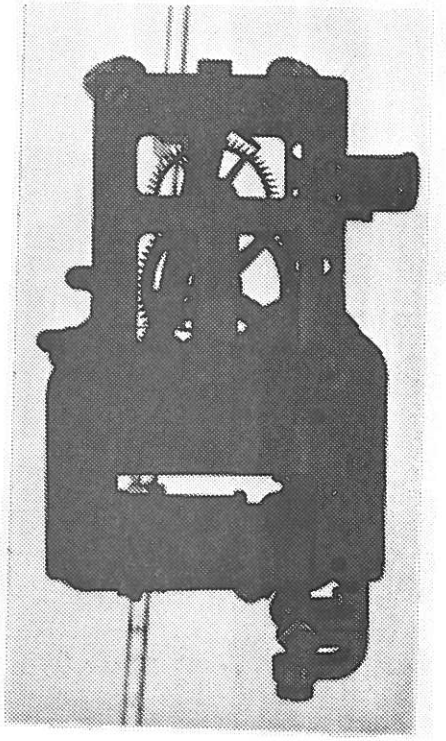
PHOTO CREDITS: 1,2,4--M. Feldman: 3--R. McGinness



(5) SANGAMO "time only" wall clock with 11-jeweled Illinois Watch Co. balance wheel escapement mounted on beautifully damascened movement plates.(Photo:M.Feldman)

(6) SWCC wall clock style "F" with reciprocating motor wind and synchronizing mechanism (upper right of mvt.) and late style pendulum.





(7) SWCC mvt.-same as #2,P.7

SWCC photos--R.McGinness

MAGNETA CLOCK MANUAL CONT'D.

M 10 IMPULSE MOVEMENT

1.

Index No.	GA and SA Nos.	Pand A Nos.	Screws Nuts Washers Sundries	Plate	Description.
1	SA 7629			10	Coil Series D.C.
	SA 7632 A1			10	Coil 4.5 volt D.C.
	SA 7630			10	Coil 20 volt D.C.
	SA 7631			10	Coil 40 volt D.C.
	SA 7632 A2			10	Coil 50 volt D.C.
	SA 7632			10	Coil 110 volt D.C.
2	SA 7565			10	Frontplate Assembly
3	SA 7418			10	Backplate Assembly
4		641 A		10	Intermediate Wheel Assembly
5	SA 7417			10	Armature Lever Assembly
6		644 A		10	Ratchet Spindle (½ min) Assembly
7		654 A		10	Ratchet Spindle (1 min) Assembly
8	SA 8375			10	Minute Spindle (½ min) Assembly
9	SA 8379			10	Minute Spindle (1 min) Assembly
10	SA 8366 A2			10	Hour Cannon Assembly
11		646 A		10	Backlash Pawl Assembly
12		647 A		10	Driving Pawl Assembly
13	SA 7278			10	Cover Assembly (Parallel Working)
	SA 7278 A2			10	Cover Assembly (Series Working)
14			616	10	Main Spring
15			612	10	Pawl Spring
16		P 8117		10	Hing Pin

2.

Index No.	GA and SA Nos.	P and A Nos.	Screws Nuts Washers Sundries	Plate	Description.
17			635	10	Taper Pin
18			636	10	Jump Ring
19			1323	10	Jump Ring
20		P 8199		10	Spring Adjuster
21			637	10	Rubber Grommet
22		P 10612		10	Eccentric Screw
23		P 10611		10	Nut
24			3536 B	10	Screw. 6 B.A. x 1/8" Rd.Hd.Brass
25			3568 S.P.	10	Screw. 6 B.A. x ¼" C/Sk.Hd.Steel
26			3732 S.P.	10	Screw. 8 B.A. x 1/8" C/Sk.Hd. Steel
27			3566 S.P.	10	Screw. 6 B.A. x 3/16" C/Sk.Hd. Steel
28			4205 S.P.	10	Nut. 6 B.A. Hex. Locknut
29			9 - 9	10	Lockwasher. 6 B.A. Shakeproof

MODEL H 501 TYPE MK II IMPULSE CLOCK

1.

Index No.	GA and SA Nos.	P and A Nos.	Nuts Washers Sundries	Plate	Description.
1		P 52093		11	'A' Type 9" Clock Case
		P 52093		11	'B' " 12" " "
		P 52093		11	'C' " 18" " "
2		P 7761		11	9" Backplate
		P 7760		11	12" "
		P 8407 A2		11	18" "
3		P 7765		11	9" Reflector
		P 7764		11	12" "
		P 8406		11	18" "
4		P 51618 C9		11	9" Dial
		P 51618 C17		11	12" "
		P 51618 C21		11	18" "
5		P 51613 A3		11	9" and 12" Mounting Bracket
		P 51613 A2			18" " "
6			2 - 52	11	9" Glass
			2 - 51	11	12" "
			2 - 14	11	18" "
7	GA 7410 A13			11	M 10 ½ minute Impulse Movement
	GA 7410 A15			11	M 10 1 minute Impulse Movement

Con't. from Pg.1

Nominated Officers and Directors of EHS 1984-1986

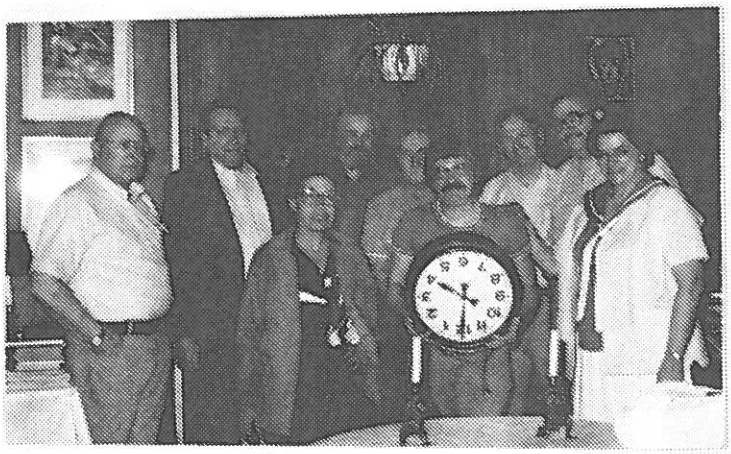
President	Martin Feldman	
1st Vice President	Martin Swetsky	
2nd Vice President	Leon O'Briant	
Treasurer/Membership Secretary	Charles Roth	
Secretary/Recording & Corresponding	Lou(ise) Swetsky	
Directors	Bengt Honning	CA
	Joe Singer	OH
	Elmer Crum	IL
	Bob McGinness	NY
	Steve Kursh	NY
	George Feinstein	NY
Mascot - Smokie (Dog)		NY

Finally, may I take this opportunity to wish you all a very happy, healthy and enjoyable summer until we meet again in the August issue.

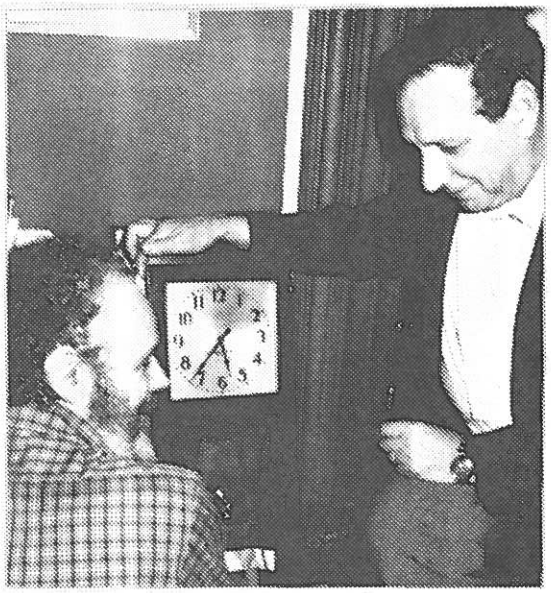
Enjoy this Issue!

Electromagnetically yours,

Martin C. Feldman,FNAWCC



Members at the NY/NJ EHS meeting showing that while time may not stand still it is sometimes upside-down!! L to R--Harvey Schmidt,Marty Swetsky,Ruth Hirshfield,Steve Kursh, Bob McGinness, Marty Feldman,Alan Marx, George Feinstein and Lou Swetsky.



Steve Kursh and Marty Swetsky admiring unusual SWCC Master Clock brought to the meeting for display and discussion.

PHOTOS: JULIE FELDMAN

* * * MART * * *

FOR SALE: JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY-1975-1980 ORIGINAL COPIES 50¢ a copy-minimum $4. Inquiries, SASE or send money payable to EHS. % C. Roth, 2 Circle Lane, Roslyn Hghts. NY 11577

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Electrical Horological Literature of any type. Hahl-Wenzel pneumatic clock face and weights. Will buy entire clock if necessary. M. Feldman, 620 Reiss Place-7e. Bronx, NY 10467

REPAIRS: ALL EARLY BATTERY CLOCKS including Pooles, Barrs, Tiffany Never-Winds, Eurekas, etc. SPECIALIZING IN BULLE CLOCK USING ORIGINAL PARTS. One month maximum time for all repairs. M. Feldman,620 Reiss Place-7e,Bx.NY 10467

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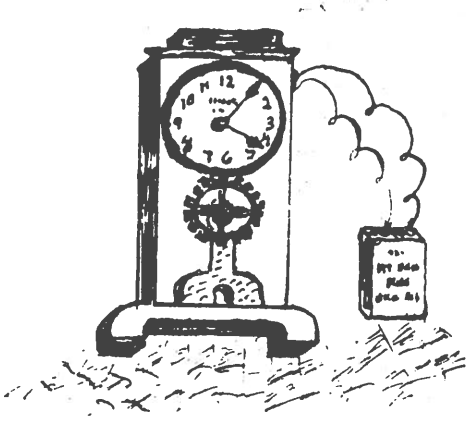
FOR SALE: Magneta Electric,similar to model described in recent series of EHS articles--$700 (no shipping)-Pix & additional info. ($1.00 & SASE) Martin Swetsky, 1910 Coney Island Ave. Bklyn,NY 11230

The JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

Chapter No 78



August, 1983
VOLUME IX---ISSUE #4
Martin C. Feldman, Editor

Hello fellow enthusiasts:

I regret that the August Issue of the Journal is coming this late but the unbearable heat of this last summer made the reality of publishing the Journal on time impossible to fulfill. Chapter 78 is very pleased to have once again been awarded a Presidential Citation for 1983. This is the 3rd such citation for exceptional work by members of our Chapter who have given of themselves and their time to promote electrical horology. Particular mention should be made regarding the electrical horology exhibit at the last New York Regional which Martin Swetsky, Lou Swetsky, Harvey Schmidt, Charles Roth, Bob McGinness, myself and others helped come to fruition. One always risks forgetting someone important when mentioning names and if I have fallen into this pitfall---it is totally unintentional.

I want to take this opportunity to congratulate the following officers who were elected unanimously; the treasurer has cast a single vote on behalf of the membership on September 14. The officers are as follows:

Elected Officers and Directors of EHS 1984-1986

President	Martin Feldman	
1st Vice President	Martin Swetsky	
2nd Vice President	Leon O'Briant	
Treasurer/Membership Secretary	Charles Roth	
Secretary/Recording & Corresponding	Lou(ise) Swetsky	
Directors	Bengt Honning	CA
	Joe Singer	OH
	Elmer Crum	IL
	Bob McGinness	NY
	Steve Kursh	NY
	George Feinstein	NY

We hope that with the new Directors who are located throughout the U.S. we will have a more democratic and diffuse input as to what the membership would like to see the Chapter do in the near future.

A nice reproduction of the Eureka Clock Company catalog has been received and is for sale by Chapter 125 (see last NAWCC Mart for purchase information). This is the same catalog that was printed in the Shenton book and is a valuable addition to the electrical horologist's library as it is easy to carry around so that you can easily identify the numerous Eureka clocks at the various mart tables! Of course the original prices have risen a bit but then again so has everything else.

We shall continue to offer mart space free of charge for selling, buying, wants and other announcements. Please make use of this space; it is yours and this is your Chapter. Send your announcements, etc. to me at 620 Reiss Place-7e, Bronx, N.Y. 10467.

This month we are featuring a very fine listing of American Electrical Clock Makers up until 1930 with dates. Originally we printed a similar listing in the June 1982 issue of the Journal but this new listing has been updated by Dr. George Feinstein which took a considerable amount of research and we are grateful to him for this work. We round out the Journal with diagrams and a parts list of the 60 beat autoset Stromberg Master Clock movement which has been sent to us by good friend and new Director Joe Singer.

Enjoy this Issue!

Electromagnetically yours,

Marty Feldman

Martin C. Feldman,FNAWCC

(Presidential Citations to Chapters)

78. ELECTRICAL HOROLOGY SOCIETY: For outstanding Regional exhibit and programming.

86. CAPE COD CLOCK WATCHERS: For completing a survey of tower clocks in the area and publishing a catalogue of the clocks.

87. GREATER MASSACHUSETTS: For cash gift to NAWCC Headquarters and Building Fund.

88. LONG ISLAND: For exceptional Chapter activities in fostering educational aims through programs and workshops.

93. SOUTH JERSEY: For restoration of a local tower clock.

99. PALM BEACHES OF FLORIDA: For gift of a clock to NAWCC Museum (clock made by Chapter member), and for exhibit activities.

111. OTTAWA VALLEY: For Chapter-sponsored clock exhibit.

112. VALLEY OF THE SUN: For Chapter project to restore a tower clock in a public museum.

116. SANTA ANITA: For restoration of a public street clock, and for donation of a tape/slide program.

121. BRITISH COLUMBIA: For restoration project for a tower clock in a local historical building, and for financial support of NAWCC program production.

American Electric Clock Makers (Up to 1930)

List Compiled by Dr. G. Feinstein

		Dates Active Circa.
1.	American Bank Protective Co.; Minneapolis, Minn.	
2.	American Business Machine Corp; New York, N.Y.	
3.	American Electric Novelty and Manufacturing Co.; New York, N.Y. (Corp. of N.Y.)	1905
4.	American Flyer Manufacturing Co.; Chicago,Ill. (Corp. of Illinois)	1930
5.	Automatic Clock Co.; Danville, Pa.	1906
6.a)	Automatic Electric Clock Co.; Kansas City, Mo., Chicago, Ill.	1898
b)	American Clock Co.; Chicago, Ill. (Corp. of N.J.)	1901-1910
7.	Atlantic Clock Co.	1913
8.a)	Bangor Electric Clock Co.; Bangor, Maine	1899
b)	New England Electric Clock Co.; Bangor, Maine	
9.	Blodgett Clock Co.; Boston, Mass. (Corp. of Maine)	1897-1909
10.	Century Clock Co.; North Berwick, Maine	1894
11. a)	Cincinnati Electric Clock Co.; Cincinnati, Ohio	1882
b)	Cincinnati Time Recording Co.; Cincinnati, Ohio	1882
12.	Collins Electric Clock Co.; St. Louis, Mo. (Corp.of Missouri)	1903-1904
13.	Columbian Clock Co.; Boston, Mass.	1894
14.	Chas. Cory and Son, Inc.; New York, N.Y. (Corp. of N.Y.)	1923
15.	Frank Curtis Co.; Decatur, Ill. (Corp. of Illinois)	1901-1905
16.	Daniel Drawbauch; Eberly's Mills, Pa.	1878
17.	Electric Clock Corp. of America; Chicago, Ill. (Corp. of Illinois)	1930
18.	Electric Time Co.; Grand Rapids, Mich.	1884
19.	Electric Time Recorder Co.; Chicago, Ill. (Corp. of Illinois)	1913
20.	Electro Clock Co.; Baltimore, Md. (Corp. of Delaware)	1911
21.	Electro-Pneumatic Time Co.; New York, N.Y.	1888-1889

22.a) Fred Frick Clock Co.; Waynesboro, Pa. ---------- 1893-1906

b) Landis Clock Co.; Waynesboro, Pa. ---------- 1906-1915

23. General Electric Co. (Corp. of New York) ---------- 1900-1929

24. Gold and Stock Telegraph Co.; New York, N.Y. ---------- 1883

25. Grav-Elec. Clock Co.; New York, N.Y. ---------- 1899

26.a) Hahl Mfg. Co.; Baltimore,Md. ---------- 1883

b) Hahl Automatic Clock Co.; Chicago, Ill. ---------- 1905-1908

27.a) Hammond Clock Co.; Chicago, Ill. (Corp. of Delaware---------- 1928-1932

b) Hammond Clock Co.; Chicago, Ill. (Corp. of Illinois)---------- 1929

28 Hansen Manufacturing Co,Inc.;Princeton,Ind. (Corp. of Indiana)--------- 1930-1932

29. Herschede Hall Clock Col; Cincinnati, Ohio (Corp. of Ohio)---------- 1929

30. Holtzer-Cabot Electric Co.; Boston, Mass ----------

31. E. Howard Watch and Clock Co.; Boston, Mass---------- 1891

32. Howard and Morse ----------

33. Imperial Electric Clock Co.; Granite, Ill.; St. Louis,Mo.
Collinsville, Ill.---------- 1908-1928

34. E. Ingraham Co.; Bristol, Conn. (Corp. of Connecticut) 1929-1933

35.a) International Time Recording Co. of N.Y.; Endicott,N.Y.(Corp.of N.Y.)-- 1918-1929

b) International Business Machines Corp.; New York, N.Y.(Corp. of N.Y.)--- 1929-1948

36. Joliet Clock Mfg. Co.; Joliet, Ill.---------- 1889

37. Kennedy Electric Clock Co.; New York, N.Y.---------- 1870

38. Manhattan Clock Co.; Colorado---------- 1887

39. Manning Bowman Co.; Meriden, Conn.----------

40. Meyer Electric Manufacturing Co.; Houston, Texas (Corp. of Texas)------ 1923

41. Minerallac Electric Co.; Chicago, Ill. (Corp. of Illinois)---------- 1913

42. Monarch Telephone Manufacturing Co.; Chicago, Ill. (Corp. of Illinois)- 1908

43. Mountain State Electric Co., No-Key; Wheeling, W.Va.----------

44. National Clock and Electric Manufacturing Co.; St. Louis,Mo. (Corp. of Missouri)---------- 1910

45. National Display Systems, Inc.; Memphis, Tenn.(Corp. of Tennessee)---- 1912

46.a) National Sel-Winding Clock Co., Elgin,Ill.; Champaign,Ill. (Corp. of Illinois) Jersey City, N.J.;Bristol,Conn.(Corp. of New Jersey)------- 1901-1902

b) Self-Winding Clock Co., Bristol, Conn.

c) Electric Self-Winding Clock Co.; Bristol Conn.

47. New Haven Clock Co., New Haven, Conn. (Corp. of Connecticut)---------- 1906-1938

48.a) New York Standard Watch Co., Jersey City, N.J.---------- 1896

b) Fisher Electric Clock Co., Inc. New York, N.Y. ---------- 1896

49. Perpetual Self-Winding Watch Co. of America,Inc.;New York,N.Y. (Corp. of Delaware)---------- 1930

50. Philadelphia Time Telegraph Co.; Philadelphia, Pa. ---------- 1887

51. Plumb and Marcus; Newark, N.J.---------- 1883

52.a) Poole Manufacturing Co.,Inc.;Wesport, Conn.;Ithaca,N.Y.(Corp.of N.Y.)-- 1924-1928

b) Morse Products Inc.; Ithaca,N.Y.

c) Barr Mfg. Co.; Weedsport, N.Y.

53.a) Prentiss Clock Co.; New York, N.Y.

b) Prentiss Clock Improvement Co.; Jersey City, N.J.---------- 1892

54. Program Clock Co.,Illinois---------- 1895

55. Radio Electric Clock Corp.;New York,N.Y. (Corp. of Delaware)---------- 1924-1927

56. Rempe Mfg. Co., Danville, Pa.---------- 1902

57. Revere Clock Co.; Cincinnati, Ohio----------

58. Rupley Patents----------1905-1908

59.a) Sangamo Electric Co., Springfield,Ill.(Corp. of Illinois)---------- 1924-1938

b) Hamilton Sangamo Clock Co.; Springfield, Ill.----------

60.a) Self-Winding Clock Co.; Brooklyn, N.Y. (Corp. of New York)----------1888-1946

b) American Mfg. and Supply Co., Ltd.;New York, N.Y.

c) Electro-Mechanical Clock Co.

61. Sempire Clock Co.; St. Louis, Mo. Chicago, Ill.----------1900-1910

62. Service Clock Co., Inc. (Corp. of New York)---------- 1914-1924

63.a) Seth Thomas; Thomaston, Conn.----------

b) Thompson Electric Clock Co., Memphis, Tenn.----------

64. Simplex Time Recorder Co.; Gardner, Mass. ----------

65.a) Sohm Electric Signal and Recording Co.; Spokane, Wash. (Corp. of Arizona)---------- 1910

b) Sohm Electric Co.; Chicago, Ill. (Corp. of Illinois)---------- 1917-1919

66. Spellier Electric Time Co., Philadelphia, Pa.---------- 1888

67. Standard Electric Clock Co.; New York, N.Y.---------- 1884-1886

68.a) Standard Time Co.; New Haven, Conn.---------- 1881-1884

b) Standard Electric Time Co.;New Haven, Conn;Springfield,Mass. (Corp. of Connecticut)---------- 1888-1942

69. Sterling Clock Co., Inc. (Corp. of New York)---------- 1924-1926

70.a) Stromberg Electric Co., Chicago,Ill.(Corp. of Maine)---------- 1914-1925

b) Stromberg Electric Co.; Chicago,Ill.(Corp.of Delaware)---------- 1925-1928

71. Synchronous Time Co., Portland, Me., Boston,Mass.---------- 1884-1887

72. Telegraph Supply Co.; Cleveland, Ohio---------- 1876

73. Telegraph Time Co.; New York, N.Y.---------- 1885

74. Telemeter Co.; New York, N.Y. ---------- 1884-1887

75. Thompson Electric Clock Co.; Memphis, Tenn. (Corp.of Tennessee)-------- 1911-1914

76. Thrasher Clock Co.; Manchester, Conn. (Corp. of Connecticut)---------- 1908

77.a) Tiffany Electric Mfg. Co.; Buffalo, N.Y.---------- 1901-1903

b) Tiffany Never-Wind Clock Co.; Buffalo,N.Y.----------

c) Cloister Mfg. Co.;Buffalo,N.Y. ----------

d) Niagara Mfg. Co.; Buffalo,N.Y. ----------

e) National Magnetic Clock Co.; New York, N.Y.----------

78. Time Systems Co.; Detroit, Mich. (Corp. of Michigan)---------- 1916-1924

79. Time Telegraph Co.; New York, N.Y.---------- 1882-1884

80. Trinity Electric Clock Co.; Chicago,Ill.(Corp. of Illinois)---------- 1909

81. United Clock Co.; Chicago,Ill.----------

82. United States Electric Clock Co.; New York, N.Y. (Corp. of New Jersey) -1902

83. Universal Electric Clock Co.; New York, N.Y. (Corp. of New York)------ 1904
UNIVERSAL ELECTRIC CLOCK CO CHICAGO

84. Victor Electric Products,Inc.; Cincinnati,Ohio (Corp. of Ohio)--------- 1930

85. Wallace and Tiernan Products Inc.; Belleville,N.J.(Corp. of New Jersey- 1929

86. Waltham Electric Clock Co.; New Hampshire---------- 1890

87. Warner----------

88.a) Warren Clock Co.; Portland, Maine (Corp. of Maine)---------- 1910-1924

b) Warren Telechron Co.; Ashland, Mass. (Corp. of Maine)---------- 1926-1938

89. Waterbury Clock Co.; Waterbury, Conn. (Corp. of Connecticut)---------- 1930-1932

90. Wenzel Co.; Washington, D.C.; Baltimore, Md.---------- 1873-1877

91. Western Clock Co.; Peru, Ill. (Corp. of Illinois)---------- 1927-1932

92. Westinghouse Electric and Mfg. Co.; E.Pittsburgh, Pa. (Corp.of Penn.)-- 1913-1932

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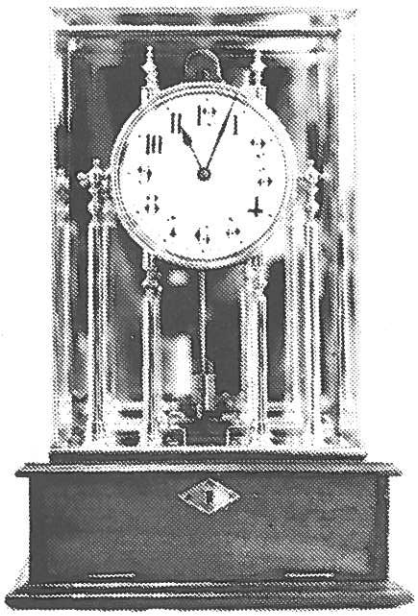
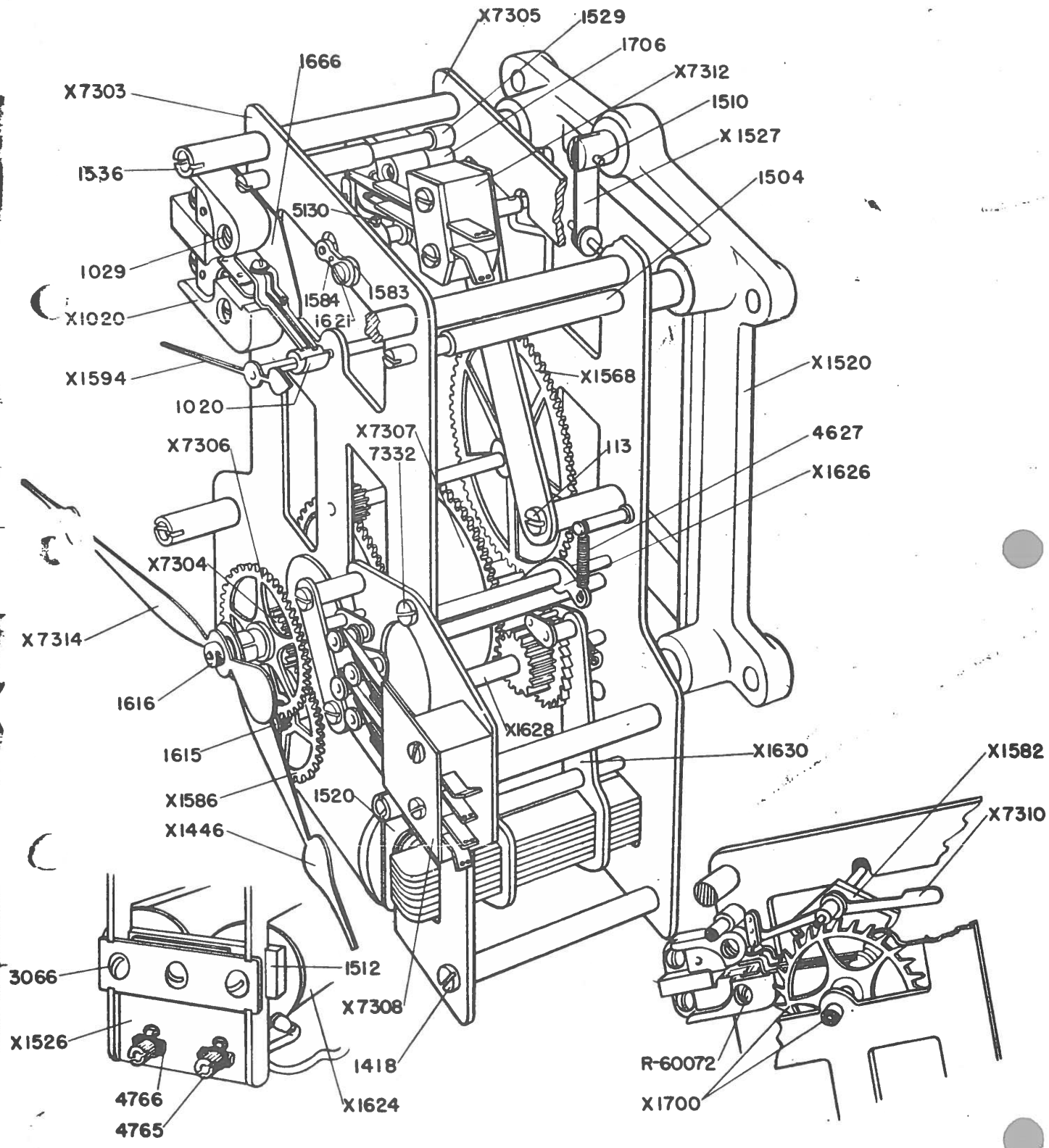
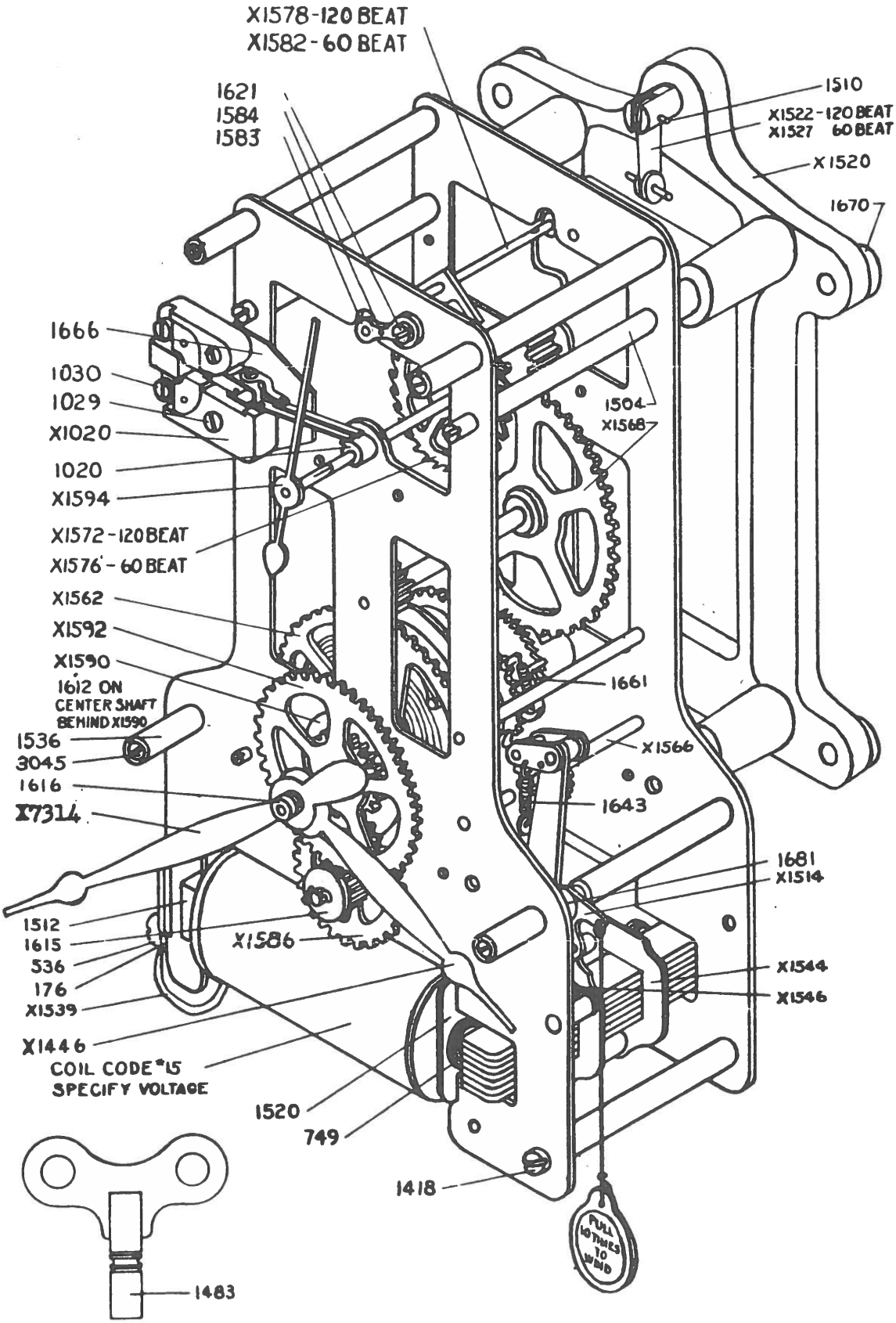
A HERBERT SCOTT CLOCK: ca. 1912



60 BEAT AUTOSET
MASTER CLOCK MOV'T.
70A - 75A



60 or 120 BEAT
MASTER CLOCK MOVEMENT
NON-AUTOSET



LIST OF REPLACEABLE PARTS FOR MASTER CLOCKS

* I - 30B, 40, 45, 60, 65 - Models Non-Autoset

II - 40, 45, 60, 65 - Models Autoset

III - 70A, and 75A - Models Autoset 24 Hour Movement

PART NO.	ILL. ON SKETCH PAGE NO.	NAME	* Used in I	II	III
113	101	Shoulder Screw		*	*
176	100	Terminal Thumb Nut Washer	*	*	*
749	100	Magnet Cap	*	*	*
1020	100/101	Contact Cam	*	*	*
X1020	100/101	Contact - Complete	*	*	*
1029	100/101	Timing Block Screw	*	*	*
1030	100	Binding Screw	*	*	*
1117	N.I.	Pillar Nut		*	*
1355	"	1/2" Conduit Bushing	*	*	*
1418	100/101	Pillar Screw	*	*	*
X1446	100/101	Hour Hand	*	*	*
1483	100	Key (Clock Case)	*	*	*
1504	100/101	Pillar (Binding)	*	*	*
1510	100/101	Suspension Spring Pin	*	*	*
1512	100	Magnet Core Base	*	*	*
X1514	100	Winding Lever	*	*	
1514	N.I.	Spacer (Base Casting)	*		
1516	N.I.	Spacer		*	*
1520	100/101	Magnet Core Yoke (Brass)	*	*	*
X1520	100/101	Master Clock Casting	*	*	*
X1522	100	120 Beat Suspension Spring	*		
X1526	101	Fibre Terminal Plate	*	*	*
X1527	100/101	60 Beat Suspension Spring	*	*	*
1529	101	Pillar			*
1536	100/101	Dial Pillar Posts	*	*	*
X1539	100	Magnet Connector	*	*	*
X1544	100	Armature Lever	*	*	
X1546	100	Armature Lever Spring	*	*	
1552	N.I.	Pendulum Pointer #40 and 45	*	*	
1554	N.I.	Pendulum Pointer - 30 B	*		
1557	N.I.	Screw Escutcheon	*	*	*
X1562	100	Center Shaft	*		
X1566	100	Ratchet Shaft	*	*	
X1568	100/101	Intermediate Shaft	*	*	*
X1572	100	Escape Wheel - 120 Beat	*		
X1576	100	Escape Wheel - 60 Beat	*	*	
X1578	N.I.	Verge Staff - 120 Beat	*		
X1582	100/101	Verge Staff - 60 Beat	*	*	*
1583	100/101	Verge Bridge	*	*	*
1584	100/101	Verge Bridge Pin	*	*	*
X1586	100/101	Minute Wheel	*	*	*

PART NO.	ILL. ON SKETCH PAGE NO.	NAME	PARTS I	II	III
X1590	100	Minute Hand Socket	*		
1592	N. I.	Pendulum Adj. Nut - 60 Beat	*	*	*
X1592	100	Hour Wheel	*		
1593	N.I.	Pendulum Lock Nut - 60 Beat	*	*	*
X1594	100/101	Second Hand	*	*	*
1612	N.I.	Tripod Spring	*	*	*
1615	100/101	Minute Pinion Stud Washer	*	*	*
1616	100/101	Center Shaft Nut	*	*	*
1621	100/101	Verge Bridge Screw	*	*	*
X1626	101	Retaining Pawl Assembly			*
X1628	101	Ratchet Shaft			*
X1629	N.I.	Armature Lever Spring Assembly			*
X1630	101	Armature Lever Assembly			*
1643	N.I.	Push Pawl Spring	*	*	
1661	N.I.	Retaining Pawl Spring - New Style		*	
1666	100/101	Contact Block Insulator	*	*	*
1670	N.I.	Rubber Mounting Washer	*	*	*
1680	N.I.	Pillar (Winding)	*	*	
1681	100	Spacer	*	*	
X1700	101	Escape Wheel Shaft & Duration Contact Cam			*
1706	101	Duration Contact Spacer			*
1718	N.I.	Pendulum Adj. Nut - 120 Beat	*		
1741	N.I.	Upper Master Clock Glass #40 Beveled	*		
1742	N.I.	Lower Master Clock Glass #40 Beveled	*		
3005	N.I.	3" #14 R.H. Brass Wood Screw	*	*	*
3006	N.I.	3½" #18 R.H. Brass Wood Screw	*	*	*
3045	N.I.	Face Screws			*
3066	101	1" #10 X 32 R.H. Steel Machine Screw (Coils)	*	*	*
3081	101	10 x 32 Hex. Brass Nuts	*	*	*
4627	101	Retaining Pawl Spring			*
5130	101	Set Screw (Contact Lever)		*	*
7302	N.I.	Stud (Minute Pinion)		*	
X7302	N.I.	Center Shaft		*	
X7303	101	Front Plate Assembly			*
X7304	101	Minute Hand Socket		*	*
X7305	101	Back Plate Assembly			*
X7306	101	Hour Wheel		*	*
X7307	101	Center Shaft Assembly			*
X7308	101	Control Contact Assembly		*	*
X7310	101	Seconds Contact Lever		*	*
X7312	101	Two Second Contact		*	*
X7314	101	Minute Hand	*	*	*
7332	101	Shoulder Screw		*	*
7335	N.I.	Post (Second Contact)		*	
R60072	101	Duration Contact Mounting Screw			*

*****MART*****

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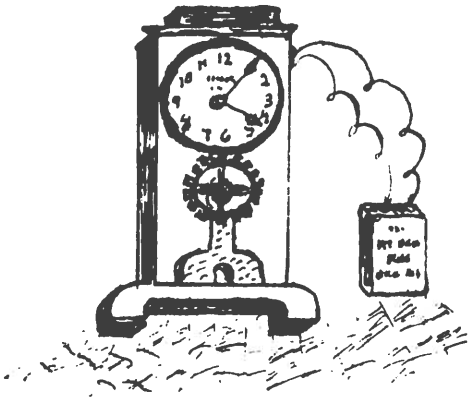
FOR SALE: High grade electrical clocks. Write for further information. J.E. Bosschieter, Zonneveldstraat 6, 23II RV, Leiden, Holland

As is : $600

< $1000

The
JOURNAL
OF THE
ELECTRICAL HOROLOGY SOCIETY
Chapter No 78

October, 1983
VOLUME IX---ISSUE #5
Martin C. Feldman, Editor



Hello fellow enthusiasts:

This Journal comes to you shortly after the August issue but I hope you will agree with me that it is not too soon when you have finished reading it. Our new V.P., Marty Swetsky, has written and illustrated an excellent article which describes the electrical contact--something we have all had to deal with in the restoration of electrical clocks. This article concisely describes the materials used, the reasons for their use, advantages and disadvantages of various materials and ends with some very good practical advice in dealing with the contact as an entity and as a problem (!). The illustrations which Marty has carefully drawn add to the written material rounding out a very fine article of an important subject. Marty is writing an expanded detailed article which will be submitted for publication.

A chart of Common Screw Standards used in master clocks is included this month.

In the December issue we shall be publishing a COMPLETE INDEX of all the material which the EHS has published since 1972. I am sure you realize this entails a great deal of research and work in compilation of such a long index but all members and others wishing to do research using the Journal of the EHS will now have a single reference in which to look, arranged alphabetically as to subject.

Our fiscal year ends with December and it is never too early to send dues for $10 to C. Roth, 2 Circle Lane, Roslyn,NY 11577.

Enjoy this Issue!

Electromagnetically yours,

Martin C. Feldman,FNAWCC

The Electric Contact--Bane of Electrical Horology!

by: Martin Swetsky

From the earliest battery clocks to the 1930's when the contactless, AC line-operated synchronous motor clocks took command of the electric clock market, the contact mechanism, more than any other component, with the possible exception of the battery, enjoyed the dubious honor of being the most troublesome. The following discussion will touch upon the materials used in contacts with a comparison of their characteristics, the troubles that plague contacts and some cures, and the cleaning and maintenance of contact materials.

Materials used for electrical contacts: (see chart 1)

1. Gold
2. Silver
3. Platinum
4. Tungsten
5. Carbon
6. Copper or Brass Alloys

Requirements

1. Low Contact Resistance
2. Durability
3. Resistance to atmospheric & environmental conditions; Oxidation, Tarnish, Corrosion

Advantages & Disadvantages of different materials

1. Gold: Low contact resistance;
   not durable--cannot withstand arcing;
   least atmospheric effects.

2. Silver: Low contact resistance;
   fair durability, can withstand high currents & arcing;
   poor environmental & tarnish resistance.

3. Platinum: Poor contact resistance;
   good durability;
   good environmental resistance.

4. Tungsten: Poor contact resistance;
   best durability;
   good environmental resistance.

5. Carbon: High contact resistance;
   good durability;
   good environmental resistance.

6. Copper: Low contact resistance;
   poor durability;
   fair environmental resistance.

Summary

NO SINGLE MATERIAL IS BEST. The selection of contact material is dependent upon many factors and ALWAYS REPRESENTS A COMPROMISE!

Factors affecting the selection of material to be used

1. Contact pressure: Will the light pressure involved in some applications overcome the tarnish film or resistance of the material to effect the connection?

2. Durability: Are high currents being switched with arcing that would destroy the surfaces of soft materials?

3. Environment: Are our contacts employed in corrosive or gaseous atmospheres, or is dust, lint or other foreign material present?
Will ordinary atmospheric oxidation cause problems, even in a non-hostile environment?

Description of contact problems (see figure 2)

1. Tarnish or Oxidation:

Reaction of the contact surface with the air causes a film to develop on the surface. Each contact material reacts with the environment differently, creating a new surface compound. for example;

Silver + Sulphur = Silver Sulphide, an insulator.

Copper + Oxygen + Cuprous Oxide, a fair conductor.

Copper + Sulphur + Cuprous Sulphide, also a fair conductor.

Platinum + Hydrocarbons (airborne exhause pollutants) = a variety of compounds, all negative to conductivity.

2. Surface Deterioration from Overheating and Arcing:

The breaking of a contact in an inductive curcuit causes arcing accompanied by heating, often enough to melt the surface of the contact, creating irregular peaks and exposing fresh metal. The fresh material oxidizes readily, creating a tarnished surface which contributes to a poor connection, encouraging still more arcing, with the cycle continuously repeating.

Cures for Contact Problems:

1. Choice of better material; best suited for particular conditions,
2. Circuit design for less frequent operation,
3. Employ wiping type contact construction for self-cleaning action,
4. Use arc-suppression circuitry,
5. Employ mercury type sealed switch (conditions permitting in design),
6. Employ contactless transistor switching (design conditions permitting).

Arc Suppression: Why and When does the arc take place?

WHEN: At the BREAK of the contact in an inductive circuit.

WHY: Let us first describe some theory of magnetic circuits; When a current flows through an inductor (coil with a ferrous core) the magnitude of the magnetic field is proportional to the current flow.

When the switch is opened, the current immediately starts to decrease towards zero, causing a declining magnetic field which causes a voltage to be developed across the coil. This voltage is proportional to the rate of change of the magnetic field. The greater the rate of change, the higher the voltage developed!
Since the rate of change is quite rapid, an extremely high voltage could be developed which causes the air in the gap between the switch contacts to ionize, creating a conductive condition and allowing an arc to take place, thus melting some of the contact material.
The voltage developed across the coil is in opposite polarity to that when normal current flows, and this fact contributes to one of the more successful arc suppression methods-utilizing a diode for contact protection.

WHAT TO DO: Methods of Suppressing an Arc: (see figure 3)

1. Employ a RESISTANCE, non-inductive, low value, placed across the coil, permitting a current path for the induced voltage developed when the switch opens. This low resistance path "short circuits" the induced voltage, preventing the arc at the switch contacts. Disadvantage: Additional current flows in the circuit, shorten-battery life--if batteries are used for the power source.

2. Place a CAPACITANCE across the switch terminals, providing a path for the current to flow by charging the capacitor instead of permitting arcing across the switch. This approach, however, may have undesirable side effects such as unwanted resonance with the inductive components leading to possible higher peak voltages! Careful selection of component values is recommended in order to avoid the likelihood of this type of problem.

3. Employ a combination of RESISTANCE & CAPACITANCE, in series with each other to create a more favorable time constant and more effective by-pass path for the induced voltage.

4. A DIODE is placed across the coil in opposite polarity to the applied voltage so that during the "on" periods of the switch no current can flow through the diode. When the switch is opened and the opposite polarity induced voltage across the coil is developed, the diode will conduct and provide a by-pass for the current flow! (see figure 4)

Contact Cleaning & Maintenance

1. Liquid & Chemical Cleaning Compounds:

   a) Freon TF: A liquid form of Freon used as a cleaner/degreaser that has the advantage of not affecting the enamel insulation used on the coil's magnet wire. An entire clock may be immersed for degreasing aside from the contact cleaning, without

harm to the coil. Freon TF is expensive and volatile and has very rapid evaporation; the effectiveness varying with the type of material and contamination.

b) FD Type Products: Another type of cleaner/degreaser containing Freon TF along with other solvents. Slightly less volatile than TF alone, but possibly less safe to coil insulation, depending upon the other materials used in the particular mixture.

c) Alcohol, Ammonia, Acetone, and other solvents & cleaners: Most commercial cleaners employ a combination of materials including solvents, emulsifiers, and wetting agents in their own formulas, with varying effectiveness. The cleaners which contain silicones or lubricants should be avoided in clock contact cleaning, with the choice confined to the category of zero-residue types.

2. Burnishers:
Properly used where space permits, the burnishing tool can be effective. Commercial burnishers used on large contact points or large relay contacts may be too abrasive for the delicate contacts in clock mechanisms. An extremely fine abrasive deposited on a thin flexible metallic strip can prove very handy, but caution is mandated. CONTACTS OF PRECIOUS METAL CAN BE COMPLETELY REMOVED WITH A SINGLE CARELESS SWIPE.

3. Ultrasonic Contact Cleaning:

It would appear that the marriage of an appropriate solvent to a mechanical scrubber would provide the ultimate in contact cleaning technology, and this very combination exists in the modern Ultrasonic Machine. The cavitation effect; the creation of millions of tiny bubbles on the surface of the immersed material and their continuous bursting and regeneration produce an effect similar to miniature explosions providing the desired cleaning action. Used with appropriate cleaning agents, this instrument is capable of producing the best results obtainable in consideration of the state-of-the-art.

Conclusions:

1. There is no "BEST" material for use in contact applications. Specific applications dictate the ultimate choice.

2. There is no ideal method of insuring good contact. Environmental hazards, light contact pressure and other factors combine to create continuing maintenance requirements.

3. Cleaning of contact materials requires careful consideration of materials to be used and judicious application.

4. The diode form of arc-suppression circuitry appears to offer the maximum protection with the least negative effects...at the present!

WHAT ABOUT THE FUTURE?

1. Contactless Circuitry:

The increased use of solid-state devices including Transistors, Triacs, Silicon Controlled Rectifiers, to name just a few, all act as switches with the complete elimination of contacts. Note the ATO type clocks made by Kundo and others, that have become so popular in recent years, and are controlled by a transistor switch, without any form of conventional contact.

2. Improved Arc and Transiet Suppression Devices:

Most modern electrical devices that employ mechanical contacts use some form of protective device including Zener Diodes, Selenium Cells, Silicon Carbide Varistors, and Zinc Oxide MOV's, and of course, our old friend, the basic silicon Diode.

3. Continuing Metallurgical Improvements in Contact Materials:

It should be noted that contact makers now offer close to ONE HUNDRED different alloys and compositions for use in the myriad of applications demanded by modern industry, each one with specific advantages for a single application. Continuing research combined with a degree of selectivity hitherto unavailable will speak well for the contact of the future.

****

CHART 1

Comparison of Relative Conductance of Materials Used as Clock Contacts, and Respective Hardness and Melting Points of Each:

CONDUCTANCE

1. Silver	100
2. Copper	97.67
3. Gold	76.71
4. Tungsten	31.
5. Platinum	14.43

HARDNESS & MELTING POINT

1. Tungsten	6170^{o}
2. Platinum	1790
3. Silver	1760
4. Copper	1600
5. Gold	1950

FIGURE 2

Various Types of Contact Faults

Contact Surface with film of Tarnish or Oxygen.

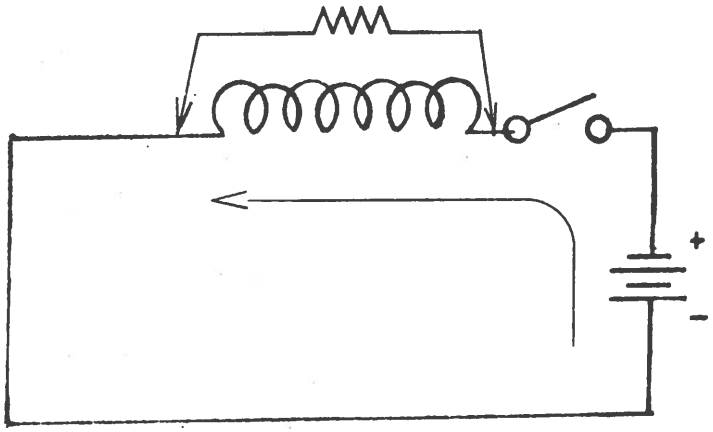
Pitted, irregular surfaces resulting from arcing.

Wiping type contact, 2 long flexible arms with sliding, self-cleaning action.

FIGURE 3

Methods of Suppressing an Arc

Resistance:
Low value, non-inductive
resistor ACROSS the coil.



Capacitance
Capacitor placed ACROSS
the switch.

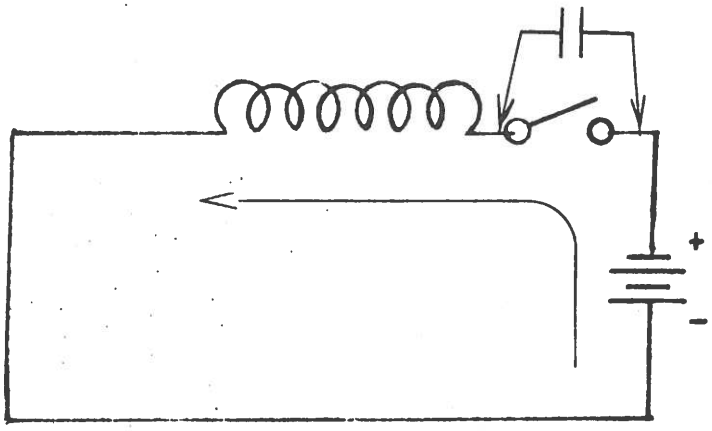
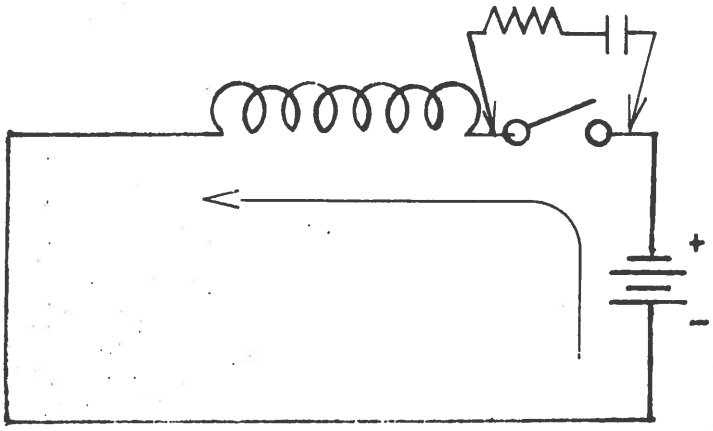


FIGURE 3 CONTINUED

Resistance & Capacitance
in series with each other
ACROSS the switch.



Diode
ACROSS the coil, Cathode
terminal to positive battery
terminal.

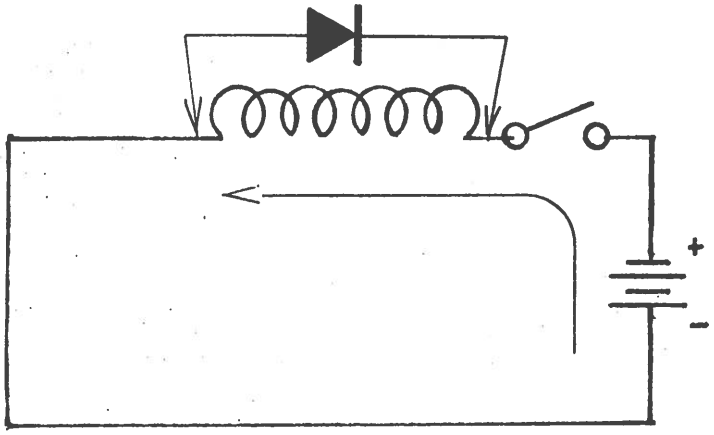


FIGURE 4

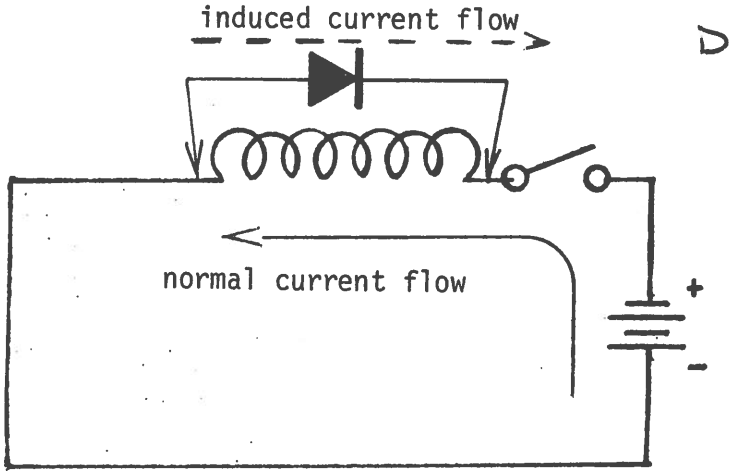
Diode Theory:

A diode, a 2-element semi-conductor, will conduct and act as a closed switch when its Anode terminal is positive. When the Cathode terminal is positive the resulting action is similar to an open circuit---no current can flow.

Circuit with Diode Protection:

Note the direction of normal current flow, from positive battery terminal through the circuitry, and back to the negative terminal. In this case the diode does not conduct, and acts as though it weren't present at all until the switch opens and the reverse polarity voltage is developed across the coil. The Anode now "sees" a positive polarity and allows conduction, by-passing the unwanted induced current around the coil.

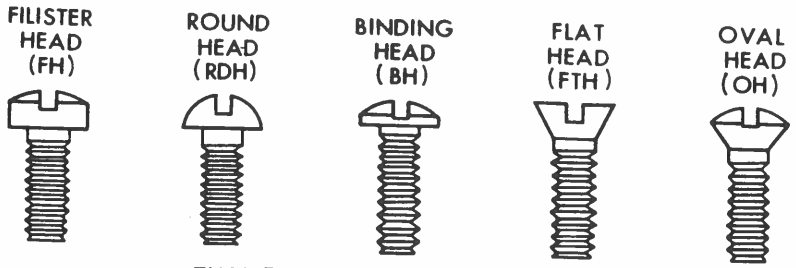
PUT THE DIODE BAND TOWARDS THE POSITIVE TERMINAL.



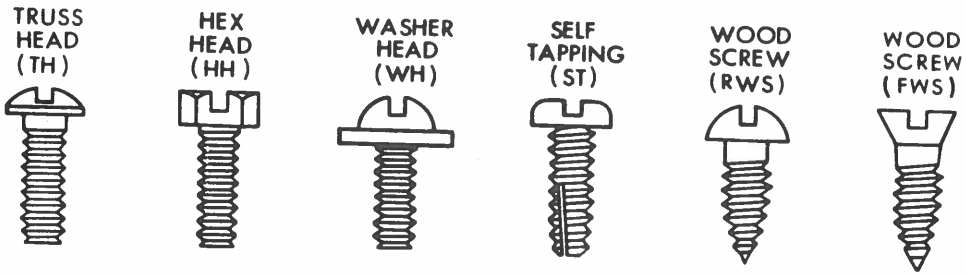
DIODE IN4007 AS HIGH A PIC (PEAK INVERSE VOLTAGE) AS POSSIBLE.

COMMON SCREW STANDARDS

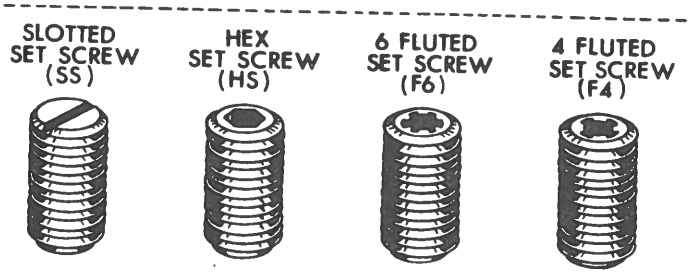
THE ABBREVIATIONS LISTED BELOW ARE USED IN INDEXING SCREW SPECIFICATIONS THROUGHOUT THE CATALOG.



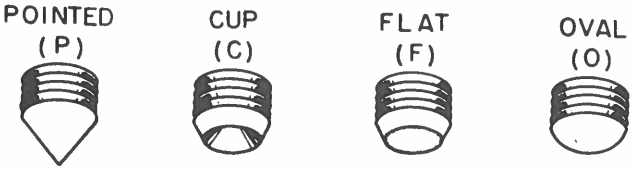
EXAMPLE: SCREW, 5-40 1/2" FH



CED1490C



SET SCREW POINTS



EXAMPLE: SCREW, 10-32 3/8" F6P

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Electrical Horological Literature of any type. Hahl-Wenzel pneumatic clock face and weights. Will buy entire clock if necessary. M. Feldman, 620 Reiss Place-7e, Bronx, N.Y. 10467

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FOR SALE: High grade electrical clocks. Write for further information. J.E. Bosschieter, Zonneveldstraat 6, 23II R.V, Leiden,Holland

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7/64 .109375	2.778
1/8 .1250	3.175
9/64 .140625	3.572
5/32 .15625	3.969
11/64 .171875	4.366
3/16 .1875	4.763
13/64 .203125	5.159
7/32 .21875	5.556
15/64 .234375	5.953
1/4 .2500	6.350
17/64 .265625	6.747
9/32 .28125	7.144
19/64 .296875	7.541
5/16 .3125	7.938
21/64 .328125	8.334
11/32 .34375	8.731
23/64 .359375	9.128
3/8 .3750	9.525
25/64 .390625	9.922
13/32 .40625	10.319
27/64 .421875	10.716
7/16 .4375	11.113
29/64 .453125	11.509
15/32 .46875	11.906
31/64 .484375	12.303
1/2 .5000	12.700

DECIMALS	MILLIMETERS
33/64 0.515625	13.097
17/32 .53125	13.494
35/64 .546875	13.891
9/16 .5625	14.288
37/64 .578125	14.684
19/32 .59375	15.081
39/64 .609375	15.478
5/8 .6250	15.875
41/64 .640625	16.272
21/32 .65625	16.669
43/64 .671875	17.066
11/16 .6875	17.463
45/64 .703125	17.859
23/32 .71875	18.256
47/64 .734375	18.653
3/4 .7500	19.050
49/64 .765625	19.447
25/32 .78125	19.844
51/64 .796875	20.241
13/16 .8125	20.638
53/64 .828125	21.034
27/32 .84375	21.431
55/64 .859375	21.828
7/8 .8750	22.225
57/64 .890625	22.622
29/32 .90625	23.019
59/64 .921875	23.416
15/16 .9375	23.813
61/64 .953125	24.209
31/32 .96875	24.606
63/64 .984375	25.003
1 1.000	25.400

MM	INCHES	MM	INCHES
.1	.0039	46	1.8110
.2	.0079	47	1.8504
.3	.0118	48	1.8898
.4	.0157	49	1.9291
.5	.0197	50	1.9685
.6	.0236	51	2.0079
.7	.0276	52	2.0472
.8	.0315	53	2.0866
.9	.0354	54	2.1260
1	.0394	55	2.1654
2	.0787	56	2.2047
3	.1181	57	2.2441
4	.1575	58	2.2835
5	.1969	59	2.3228
6	.2362	60	2.3622
7	.2756	61	2.4016
8	.3150	62	2.4409
9	.3543	63	2.4803
10	.3937	64	2.5197
11	.4331	65	2.5591
12	.4724	66	2.5984
13	.5118	67	2.6378
14	.5512	68	2.6772
15	.5906	69	2.7165
16	.6299	70	2.7559
17	.6693	71	2.7953
18	.7087	72	2.8346
19	.7480	73	2.8740
20	.7874	74	2.9134
21	.8268	75	2.9528
22	.8661	76	2.9921
23	.9055	77	3.0315
24	.9449	78	3.0709
25	.9843	79	3.1102
26	1.0236	80	3.1496
27	1.0630	81	3.1890
28	1.1024	82	3.2283
29	1.1417	83	3.2677
30	1.1811	84	3.3071
31	1.2205	85	3.3465
32	1.2598	86	3.3858
33	1.2992	87	3.4252
34	1.3386	88	3.4646
35	1.3780	89	3.5039
36	1.4173	90	3.5433
37	1.4567	91	3.5827
38	1.4961	92	3.6220
39	1.5354	93	3.6614
40	1.5748	94	3.7008
41	1.6142	95	3.7402
42	1.6535	96	3.7795
43	1.6929	97	3.8189
44	1.7323	98	3.8583
45	1.7717	99	3.8976
		100	3.9370

1 mm = .03937"

.001" = .0254 mm

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cont'd.from Pg.1

This issue is designed to be used in a working sense and can be pulled apart for each individual's needs. For those saving the Journals, xeroxing the Index may be more convenient.

On behalf of the Officers and Directors of the EHS may I wish all of you a very Merry Holiday Season and a Happy and Healthy New Year.

Enjoy this Issue!

Electromagnetically yours,

Martin C. Feldman,Editor

THE ELECTRICAL HOROLOGY SOCIETY OF THE NAWCC

CHAPTER 78

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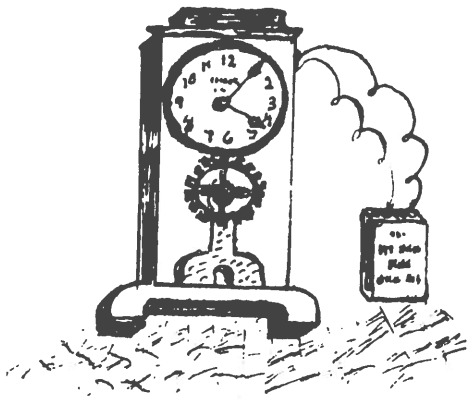
Chapter No 78

December, 1983
VOLUME IX---ISSUE #6
Martin C. Feldman, Editor



Hello fellow enthusiasts:

As is the case at this time of every year the sixth issue of our Journal brings the year's volume to a close.

We have been fortunate in many ways in that we shall be entering our 12th year of publication, having started in November 1972, and continuing to publish regularly over these many years. I feel it should be mentioned that a vote of thanks is due to all the contributors who have sent original manuscripts as well as those who have sent material to be reprinted,--to Charlie Roth,(our Sec'y./ Treas.) and his office staff who have had the Journal printed and put into an acceptable form for mailing and, last but not least, the dedication and skill of my secretary, Mrs. Mary Sambrato. I am sure many of you realize that a publication does not come together on its own and we must all take time to appreciate the efforts of these wonderful people.

In order to continue publishing we need your support in sending material to me as your Editor as well as the financial support of your membership in our Chapter. Yes, once again dues have to be paid. To make it a bit easier, this year we have included a handy form to send in along with your dues. So, please---do it now. Beat the Christmas Rush!

This month the Journal features a complete Index of all the articles published by the EHS since 1972. The 150+ subjects listed in the Index reveal the vast amount of information about electrical horology which the Newsletter and then Journal have made available to you and to the horological community as a whole. I would surmise that this incredible amount of data may be just the tip of the iceberg! It also gives us a good feeling to know that others, not related to the horological community as such, are interested in our work. We are proud and privileged to count the Smithsonian Institution in Washington, D.C. as one of our subscriber members.

cont'd on Pg. 10

INDEX, INCLUSIVE OF ALL JEHS NEWSLETTERS AND JOURNALS 1972-1983,

Compiled by: Martin C. Feldman,FNAWCC

Elix Reform Movement, reprint Data	JEHS Vol V #5	Oct, 1979
Eureka, Clock Survey, compiled by A. Mitchell, reprint Electrical Horology Group (Br.)	JEHS Vol IV #6	Dec, 1978
FEDCHENICO'S Electronic-Mechanical Pendulum Astronomical Clock, trans. by Dr. G. Feinstein, illust.	JEHS Vol III #1	Feb, 1977
Grav-Electric Clock (Advertisement)	JEHS Vol VI #1	Feb, 1980
Hamilton Sangamo Electric Clock Service Bulletin (reprinted)	JEHS Vol V #6	Dec, 1979
Hayden Century Clock-descritpion 7/1896 Jewelers' Circ. & Horo. Rev.	JEHS Vol IX #2	April 1983
Hipp, Contact System, Electric Master Clocks use of., illust. trans. M. C. Feldman	JEHS Vol III #6 cont'd JEHS Vol IV #4 end	Dec.1977 June 1978
Hoggson's Patent, description of elect. by Richard Depuis	Newsletter #10	Sept, 1974
Holtzer-Cabot Electric Co. Manual--Part II	JEHS Vol VII #3	June, 1980
Holtzer-Cabot Electric Co. Manual--Part II	JEHS Vol VII #4	Aug, 1981
Howard, E. Model 89 Self-Winding Master Clock, illust., by M. C. Feldman	JEHS Vol IV #5	Oct, 1978
IBM Parts Manual--Type 25 Master Clock--Part I	JEHS Vol VI #6	Dec, 1980
IBM Parts Manual--Type 25 Master Clock--Part II	JEHS Vol VII #2	April, 1981
IBM Time Recorders--Production Dates/Serial Numbers	JEHS Vol VI #6	Dec, 1980
Index, articles in all EHS Newsletter and Journals, Newsletters 1-10; Journals-Vols. I-IV issues 1-6; Vol V, issues 1-5 inclusive	JEHS Vol V #5	Oct, 1979
Index, Elect. Horo. Art. in Amer. Hor. & J.	JEHS Vol V #5	Oct, 1979
Index, JEHS Dec. 1979- Dec. 1981	JEHS Vol VIII #1	Feb, 1982
Index, inclusive of all JEHS Newsletters and Journals 1972-1983, compiled by M. Feldman	JEHS Vol IX #6	Dec, 1983
Index of articles of Electrical Horology as Published in the Model Engineer (Br) by A. Mitchell, Abr. by M. C. Feldman	Newsletter #3 cont'd Newsletter #4 end	Dec, 1972 Feb,1973
Kennedy Clock, patents Nos. 71624,illust. 99,321	JEHS Vol IV #4	July, 1977
La Bulle-Clock, by H. Belmont, book review by M.C. Feldman	JEHS Vol II #2	April, 1976
Literature, Electric Clock, index of same at Franklin Inst. Library, Phila, PA., compiled by F.G.A. Shenton	JEHS Vol II #4	Aug, 1976

Magneta Clock Manual-reprint (Part 1)	JEHS Vol VIII #6	Dec, 1982
Magneta Clock Manual-reprint (Part II)	JEHS Vol IX #1	Feb, 1983
Magneta Clock Manual-reprint (Park III)	JEHS Vol IX #2	April, 1983
Magneta Clock Manual-reprint (Part IV)	JEHS Vol IX #3	June, 1983
Magneta Electric Clock System trans. by M. C. Feldman	JEHS Vol I #1	Nov, 1974
Magneta Master Clock, trans. from Fr. by Charles Aked	JEHS Vol 1 #1	Nov, 1974
Magnetic Escapement by Arthur Tremayne (reprint)	JEHS Vol VI #1	Feb, 1980
National Self-Winding Clock-tech.by Ed. Hanff	JEHS Vol I #1	Nov, 1974
New York Standard Watch Co., A Battery Powered Clock by Bill Burnham, reprint from NAWCC Bulletin	JEHS Vol 1 #3	April,1975
New York Standard Watch Co. (Advertisement & Prices)	JEHS Vol VI #3	June,1980
Niagara Clock Co., question,ELECTRIC TIME MACHINE Dr. G. Feinstein	JEHS Vol II #4	Aug, 1976
Patent: ALARM, device absurd invention, #256,265-April 11, 1882	JEHS Vol IV #4	June, 1978
Patent: ELECTRIC CLOCK, earliest American, #11,723, Sept. 26, 1854	JEHS Vol IV #2	April, 1978
Patent: ELECTRIC CLOCK #120,185, Oct.24,1871 W.M.Davis	JEHS Vol IV #4	June,1978
Patent: ELECTRIC CLOCK #345,292,R.E.Fenner	JEHS Vol III #3	May, 1977
Patent: ELECTRIC CLOCK,Menns & Dudley-1891 (Mercury Switch)	JEHS Vol VIII #3	June,1982
Patent: Ethridge & Eastman Electric Clock Winding Mechanism	JEHS Vol VIII #2	April,1982
Patent: New York Standard Watch Co. #555,313, S.Fischer	JEHS Vol IV #2	April,1978
Patent: Rempe, H., #737,019, 1903	JEHS Vol II #3	May, 1976
Patent: Self-Winding Clock Co., #308,521, Chester Pond	JEHS Vol III #2	March,1977
Patent: Tiffany Never-Wind, #754,398	JEHS Vol 1 #5	Aug, 1975
Patent: Tiffany Never-Wind, #754,397	JEHS Vol II #2	April, 1976
Patent: Warren Battery Clock #1,160,346	JEHS Vol III #1	Feb, 1977
Pendulum, about Isochronous oscillation of., by F.M. Fedchenko, trans. by Dr. G. Feinstein	JEHS Vol III #3 cont'd JEHS Vol III #5 end	May,1977 ✓ Oct,1977 ✓

Pendulum, Free, clock with liquid escapement by John F. Wright, reprint Horological Journal	JEHS Vol IV #5	Oct, 1978
Pendulum, In search of a Friction Free, by S. J. Wise-1957, UHAA Tech,Bull.Repr.	JESH Vol VIII #6	Dec, 1982 ✓
Perret, David, A Remontoir Clock, translation by M. C. Feldman	Newsletter #8	Feb, 1974
Perret, David, Electric Clock System,trans. from Farvager by S. Samuel	JEHS Vol IX #1	Feb, 1983
Power Supply, ELECTRIC TIME MACHINE, question Dr. G. Feinstein	JEHS Vol II #4	Aug, 1976
Printed Circuit Board Production for the Craftsman, W.H.Bussons, reprint Horological Journal	JEHS Vol V #3	April, 1979
Quartz, crystal-A venerable clock is made highly accurate by equipping it with Quartz-crystal works THE AMATEUR SCIENTIST, Scientific American (Sept, 1974) ed. C.L. Stong	JEHS Vol 1 #2 cont'd JEHS Vol 1 #3 end	Feb,1975 April,1975
Reclus, Victor Q & A by George Feinstein (Electric Time Machine)	JEHS Vol VII #3	June, 1981
Rempe Mfg. Co. - An Interesting Self-Windinc Clock by Ed. Hanff (illust.)	JEHS Vol II #1	Nov, 1975
Ritchie Clock, contact system, photo	JEHS Vol IV #3	June, 1978
Sangamo Clock Co. by H. Schmidt (illust)	JEHS Vol IX #3	June 1983
Scott, H.-Clock-photo	JEHS Vol IX #4	Aug, 1983
Screws- Common Standard (Chart)	JEHS Vol IX #5	Oct, 1983
Self-Winding Clock Co.,Adv. Jewelers' Circular & Horo. Rev. - 12/1886	JEHS Vol IX #1	Feb, 1983
Self-Winding Clock Co.,Blueprint of Program Circuit and Clock Circuit-1/30/39	JEHS Vol VIII #2	April,1982
Self-Winding Clock Co.,Bklyn, N.Y.Dir.for.removing and installing Self-Winding Clock movements	JEHS Vol 1 #4	June, 1975
Self-Winding Clock Co.,Bklyn, N.Y. illust. question,ELECTRIC TIME MACHINE,Dr.G.Feinstein	JEHS Vol III #2	March,1977
Self-Winding Clock Co. of Champagne, Ill. (illust.) Ed. Hanff	Newsletter #10	Sept, 1974
Self-Winding Clock Co. of Champagne, Ill. illust. question,ELECTRIC TIME MACHINE, Dr. G. Feinstein	JEHS Vol III #2	March, 1977
Self-Winding Clock Co.-Comparison of "Schedules of Parts" for "F" Mvt. by J.J. Singer	JEHS Vol VIII #4	Aug, 1982

Self-Winding Clock Co. Description of an Electric Desk Clock "Dale model" by J.J. Singer	JEHS Vol VIII #3	June 1982
Self-Winding Clock Co.-Mounting Brackets & Rotary Motor Diagrams	JEHS Vol VII #6	Dec, 1981
Self-Winding Clock Co.-Reprints Report,Book	JEHS Vol V #5	Oct,1979
Self-Winding Clock Co.-Self Winding Clocks by J. Cammarata (illust)	JEHS Vol IX #3	June 1983
Sempire Clock Co. Elechrometers-Advertisement Descriptions, Half-Tones and Prices	JEHS Vol VII #6	Dec, 1981
Seth-Thomas Electric Clock--Model 86AF (Partial patent & Descriptive material)	JEHS Vol VII #1	Feb, 1981
Siemens Clock, master, repair of, from Elektro Uhrentechnik by G. Schindler, trans. by H. Fleck, M.D., ed. by M.C. Feldman	JEHS Vol 1 #6	Oct, 1975
Siemens Clock, master, trans. from Horlogerie Electrique by M. C. Feldman, (illust)	JEHS Vol 1 #6	Oct, 1975
Siemens-Halske Master clock, photo	JEHS VOL IV #3	June, 1978
Slave Distribution Panel by Richard Warburton	JEHS Vol 1 #5	Aug, 1975
Standard Electric Time Co.,Schematic of wiring	JEHS Vol 1 #1	Nov, 1974
Standard Electric, 60 Beat Master Clock movement, schematic of parts	JEHS Vol II #5	Oct, 1976
Standard Electric set-up instructions for Master Clock Slave system, program clocks Reprinted	JEHS Vol V #1 JEHS Vol V #2	Feb, 1979 Apri, 1979
Standard Electric Time Systems (Master & Slave Clock Descriptions)	JEHS Vol VII #2	April, 1980
Stromberg Autoset System--Instructions for installing and operating--Part I	JEHS Vol VII #4	Aug, 1981
Stromberg Autoset System--Instructions for installing and operating--Part II	JEHS Vol VII #5	Oct,1981
Stromberg Clock Co.-parts catalog for Model #50 (Part 1)	JEHS Vol VIII #4	Aug, 1982
Stromberg Clock Co.-parts catalog for Model #50 (Part II)	JEHS Vol VIII #5	Oct, 1982
Stromberg Clock Co.-parts list-Model #6C Drum Program	JEHS Vol VIII #5	Oct, 1982
Stromberg Clock Co.-60 Beat Autoset Mvt. diagram and parts list	JEHS Vol IX #4	Aug, 1983
Stromberg Time Corporation-Unispeed Recorder (Directions for the installation & setting of)	JEHS Vol VII #5	Oct, 1981

Synchronome Master Clock by Charles Aked	Newsletter #6	July, 1973
Synchronome Master Clock by Charles Aked (reprinted from JEHS July 1973)	JEHS Vol VI #2	April, 1980
Telefonbau & Normalzeit of Berlin and Frankfort Q & A by George Feinstein (The Electric Time Machine)	JEHS Vol VII #3	June, 1981
10th Anniversary Issue	JEHS Vol VIII #4	Aug, 1982
TIMER, Article Addendum, electronic adaptation of timer to rating standard pendulum master clocks, by Paul Hopkins	JEHS Vol V #4	Aug, 1979
TIMER, A timer for checking an Electrically Impulsed Clock Against Radio Station WWV, illust. by Paul Hopkins	JEHS Vol V #2 cont'd JEHS Vol V #3 end	April, 1979 June, 1979
TIME SIGNAL, device, illust.	JEHS Vl III #4	July, 1977
"Unknown Electric" (1894)	JEHS Vol VIII #4	Aug, 1982
Waltham Electric Clock Co.-catalog excerpts	JEHS Vol VIII #2	April, 1982
Warren Battery Clock, H.R. Cramer, illust. article	JEHS Vol II #6	Oct, 1976
Warren Battery Clock, reprinted from Electrical Experimenter, Oct.1916	JEHS Vol I #3	April, 1975
Western Union Telegraph Co.,A History of the Time Service- SWCC,1934	JEHS Vol VII #6	Dec, 1981
Western Union Time & Messenger Service by Joseph J. Singer	JEHS Vol VII #1	Feb, 1981
Zenith "CALORA" Clock Manual-(Part I) Dr. G. Feinstein	JEHS Vol VIII #1	Feb, 1982
Zenith "CALORA" Clock Manual-(Part II) Dr. G. Feinstein	JEHS Vol VIII #2	April, 1982