THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78
NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXIX #1, MARCH 2003

MARTIN SWETSKY

It is with much sorrow that we report the passing of Martin Swetsky, FNAWCC #31665. He was a past president of New York Chapter #2, Brooklyn Chapter #114, current president of the Electrical Horology Society, Chapter #78 and assisted in the organization of the New York Regional meetings. In addition to being one of the experts for the Answer Box, Marty also authored an as yet unpublished book on battery clock history and their repair.

During the past few years, his activities were diminished by physical ailments, but on those few occasions when he could arrange to attend a meeting, it was as though a king were holding court. He was constantly surrounded by friends and admirers who could not visit him at home, but still wanted to maintain contact. Where Marty was concerned, a simple question did not have a simple answer. He gave of his knowledge freely and sometimes at great length, but when he was finished, you knew the answer and the reasoning behind it.

Marty was also an innovative gardener. Lacking acreage and the ability to bend, he could grow a veritable produce stand in pots on every step, using a stool to sit on to tend his precious seedlings. His greatest achievements were miniature tomatoes and full size stalks of corn growing in containers.

Marty will surely be missed by all who knew him.
Our sincerest condolences to his wife Lou, his sons Mitch and Fred and their families.

Messages of sympathy may be addressed to:
Mrs. Lou Swetsky
15 Hummingbird Lane
Whiting, NJ 08759-2222

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

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

Continued from December, 2002 issue.

Regular Secondary Clocks

The types and sizes of Secondary Clocks listed on pages 30 to 35 and 38 to 42 have proved so popular and effective for various service that their manufacture is regular and does not involve the time nor expense required in building clocks according to special designs, or the special ones shown on pages 43 to 49.

Wood case Secondary Clocks are regularly furnished in oak cases of standard finishes. Other woods and special finishes can be furnished to order to match any wood-trim desired. A sample should be sent when a perfect match in material and finish is desired.

Secondary Clocks are regularly wired in series, but may be specially wound to operate in parallel when so ordered.

Definite styles of hands are regular for each size Secondary Clock. See pages 66, 67, and 70.

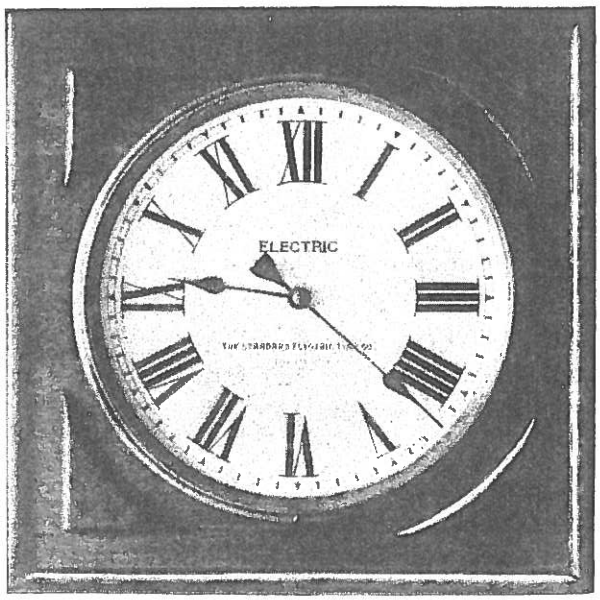


Fig. 22. List No. 261

WOOD CASE SECONDARY CLOCK

SQUARE PATTERN

List Numbers		Extreme Dimensions		
Roman Numerals	*Dial*	*Square*	*Depth*	*Bezel*
257	8″	11¼″	3⅞″	Metal
253	8″	11¼″	4⅜″	Wood
259	10″	15″	3⅞″	Metal
260	10″	15″	4⅜″	Wood
261	12″	17¼″	4″	Metal
262	12″	17¼″	4½″	Wood
263	14″	20½″	4½″	Wood
264	18″	24″	5⅞″	Wood
265	24″	30″	5⅞″	Wood

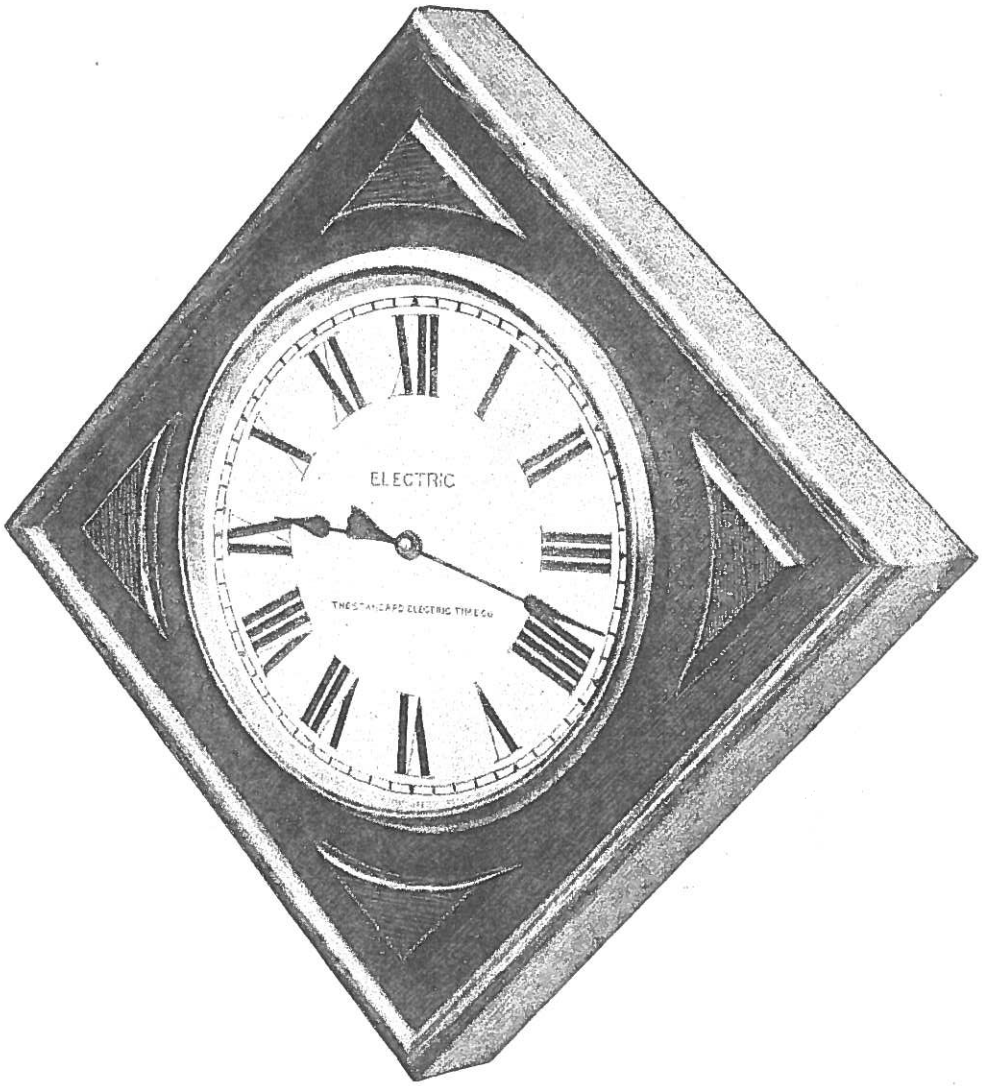


Fig. 27. List No. 279

WOOD CASE SECONDARY CLOCK

DIAMOND PATTERN

List Numbers	Extreme Dimensions			
Roman Numerals	*Dial*	*Diagonal*	*Depth*	*Bezel*
275	8″	16″	3⅞″	Metal
276	8″	16″	4⅜″	Wood
277	10″	21¼″	3⅞″	Metal
278	10″	21¼″	4⅜″	Wood
279	12″	24¼″	4″	Metal
280	12″	24¼″	4½″	Wood
281	14″	30″	4½″	Wood
282	18″	34″	5⅞″	Wood
283	24″	42½″	5⅞″	Wood

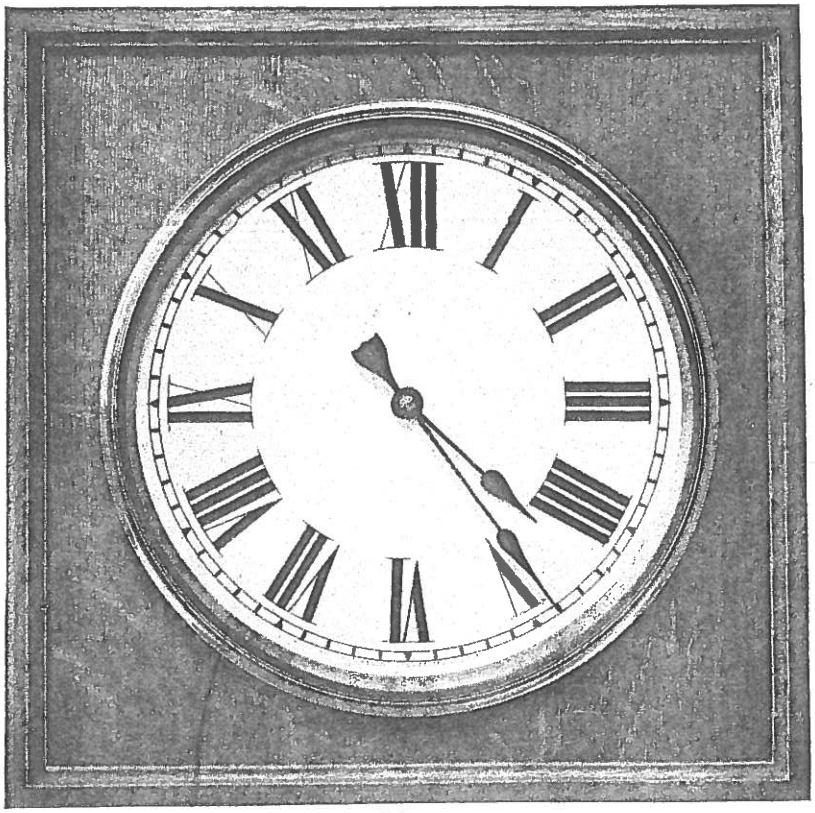
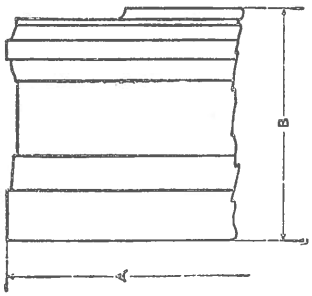


Fig. 18. List No. 293

WOOD CASE SECONDARY CLOCK

SIDE VIEW



	Extreme Dimensions		
Dial	*A*	*B*	*Bezel*
12″	17¼″	5⅛″	Metal
12″	17¼″	5⅝″	Wood
14″	18¼″	5⅝″	Wood
18″	22¼″	6″	Wood
24″	28¾″	6″	Wood

Diameter of Dial	*Bezel*	List Numbers *Roman Numerals*
12″	Metal	**293**
12″	Wood	**294**
14″	Wood	**295**
18″	Wood	**296**
24″	Wood	**297**

The Standard Electric Time Co.

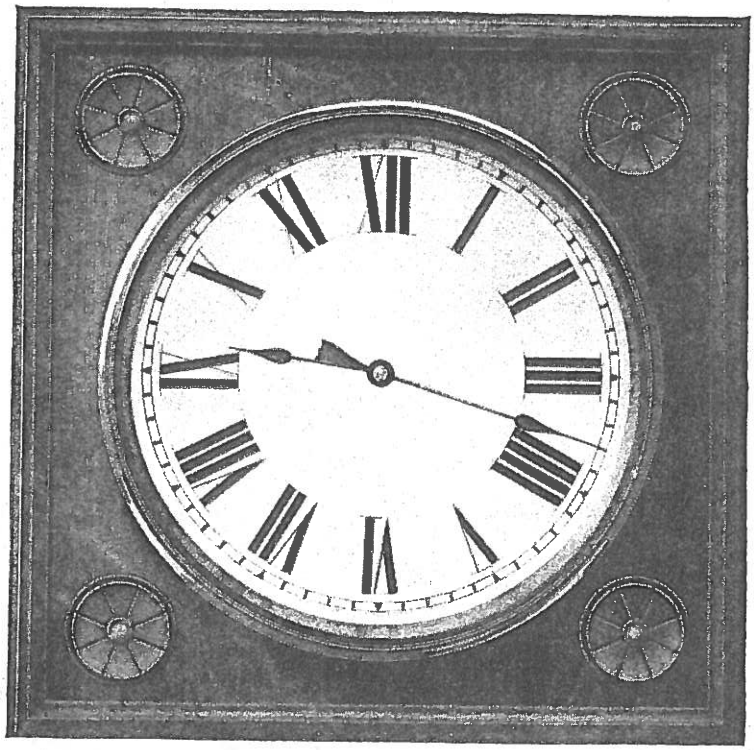
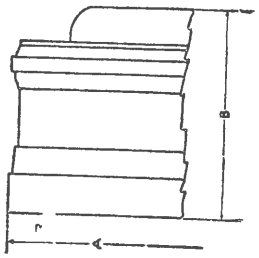


Fig. 589. List No. 303

WOOD CASE SECONDARY CLOCK

SIDE VIEW



	Extreme Dimensions		
Dial	*A*	*B*	*Bezel*
12″	17¼″	5⅛″	Metal
12″	17¼″	5⅝″	Wood
14″	18¼″	5⅝″	Wood
18″	22¼″	6″	Wood
24″	28¾″	6″	Wood

Diameter of Dial	*Bezel*	**List Numbers** *Roman Numerals*
12″	Metal	**303**
12″	Wood	**304**
14″	Wood	**305**
18″	Wood	**306**
24″	Wood	**307**

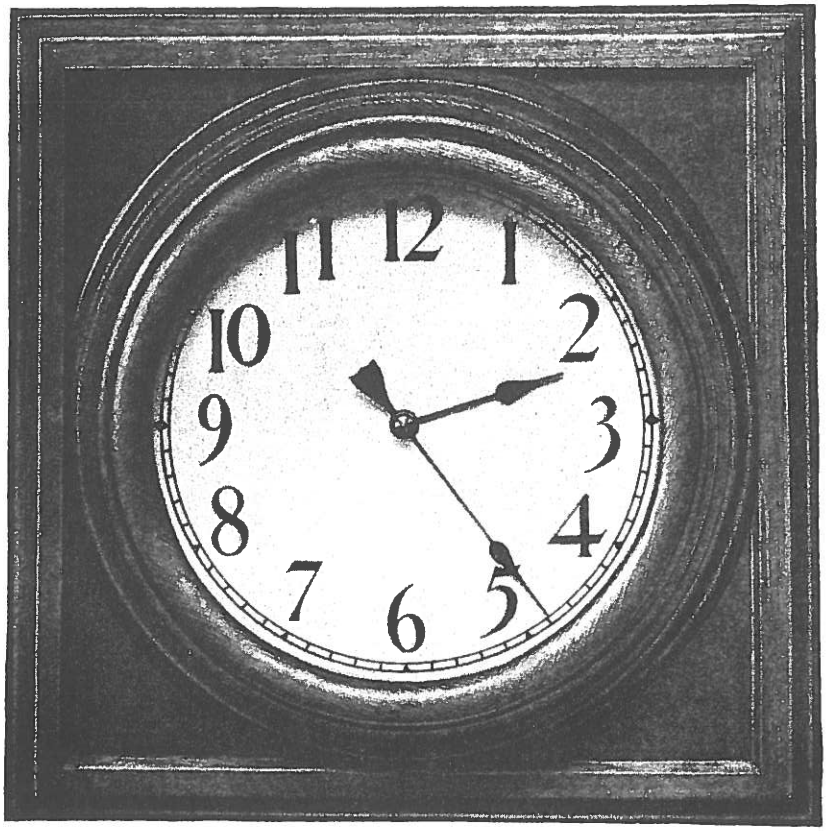
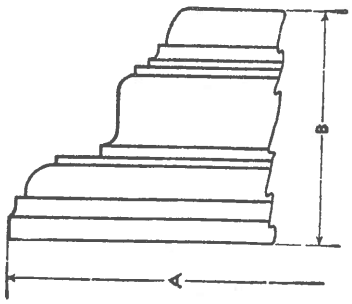


Fig. 17. List No. 319

WOOD CASE SECONDARY CLOCK

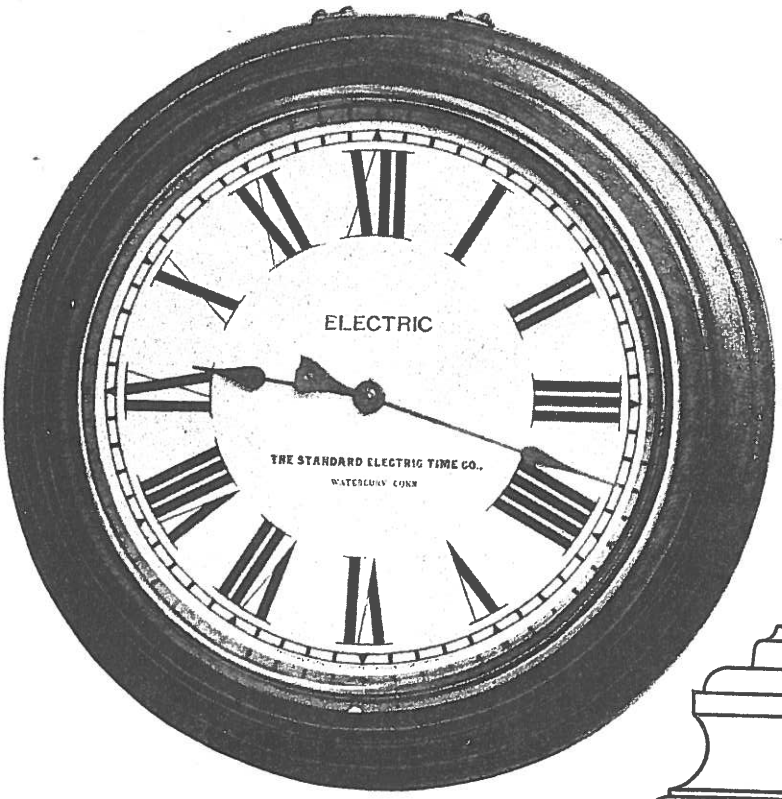
SIDE VIEW



EXTREME DIMENSIONS

Dial	*A*	*B*	*Bezel*
12″	20″	4½″	Metal
12″	20″	4⅞″	Wood
14″	22″	4⅞″	Wood
18″	26¼″	5⅝″	Wood
24″	32¼″	5⅝″	Wood

Diameter of Dial	*Bezel*	List Numbers *Roman Numerals*	*Arabic Numerals*
12″	Metal	**313**	**318**
12″	Wood	**314**	**319**
14″	Wood	**315**	**320**
18″	Wood	**316**	
24″	Wood	**317**	



SIDE VIEW

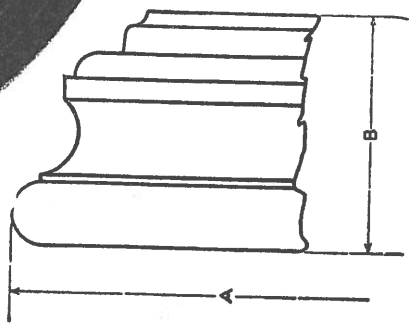
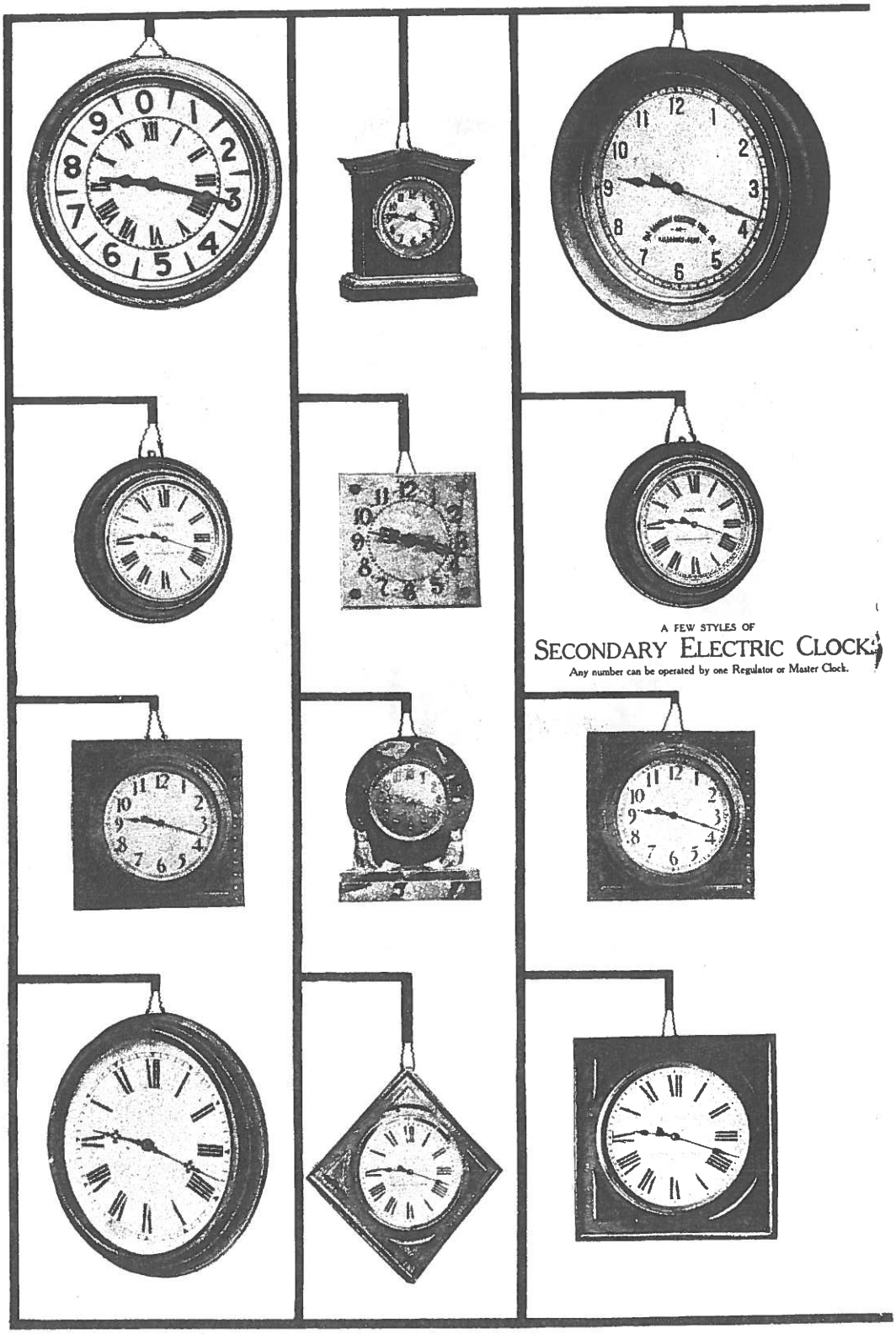


Fig. 21. List No. 327

WOOD CASE SECONDARY CLOCK

List Numbers *Roman Numerals*	*Dial*	Extreme Dimensions *A*	*B*	*Bezel*
323	8″	11¼″	3½″	Metal
324	8″	11¼″	4″	Wood
325	10″	14½″	4⅛″	Metal
326	10″	14½″	4⅝″	Wood
327	12″	16½″	4¼″	Metal
328	12″	16½″	4⅝″	Wood
329	14″	18½″	4⅝″	Wood
330	18″	25″	5⅝″	Wood
331	24″	31″	5⅝″	Wood



A FEW STYLES OF
SECONDARY ELECTRIC CLOCKS
Any number can be operated by one Regulator or Master Clock.

Fig. 588

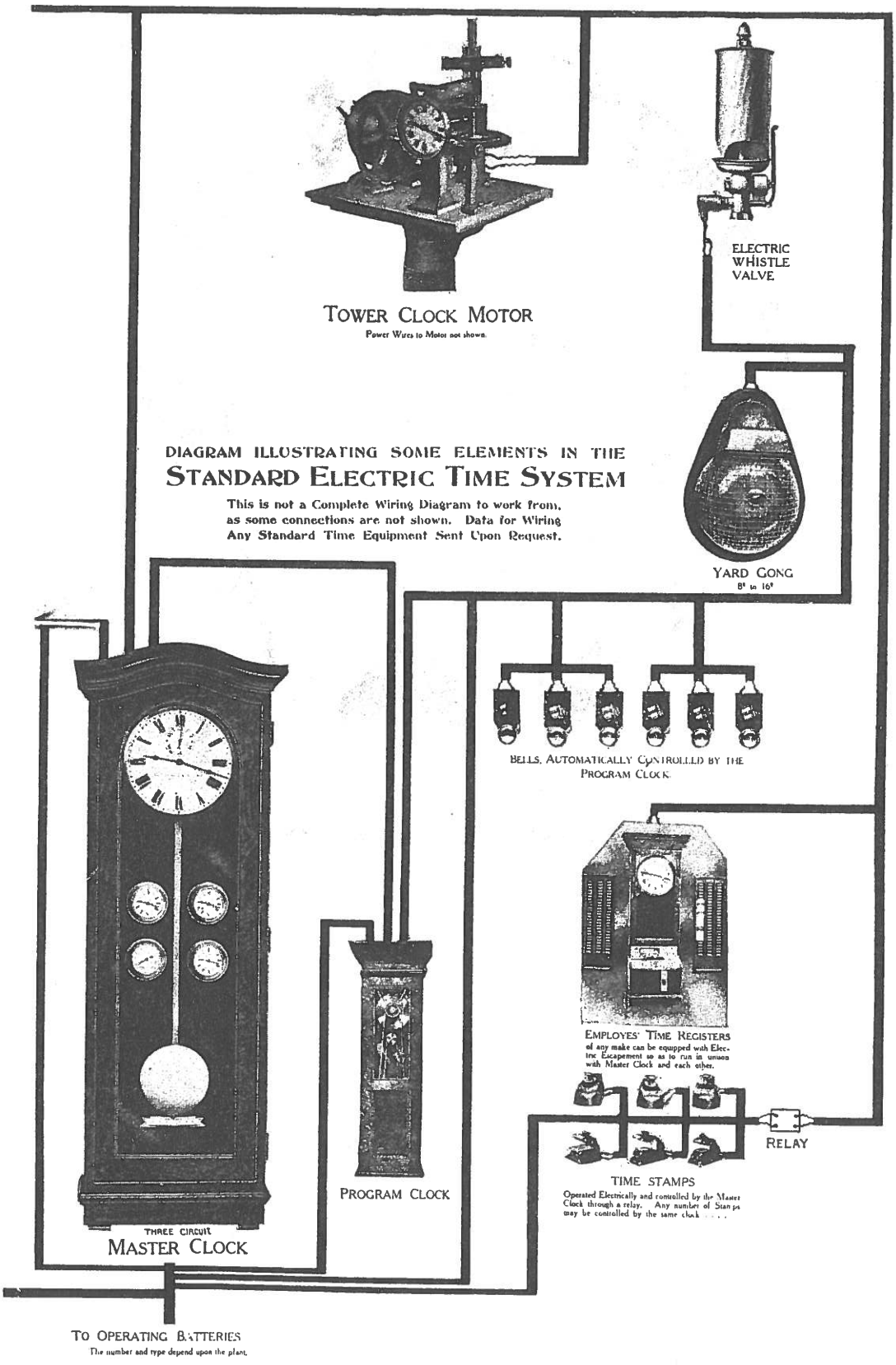

TOWER CLOCK MOTOR
Power Wires to Motor not shown.
ELECTRIC WHISTLE VALVE
DIAGRAM ILLUSTRATING SOME ELEMENTS IN THE
STANDARD ELECTRIC TIME SYSTEM
This is not a Complete Wiring Diagram to work from, as some connections are not shown. Data for Wiring Any Standard Time Equipment Sent Upon Request.
YARD GONG
8" to 16"
BELLS, AUTOMATICALLY CONTROLLED BY THE PROGRAM CLOCK
EMPLOYES' TIME REGISTERS
of any make can be equipped with Electric Escapement so as to run in unison with Master Clock and each other.
RELAY
TIME STAMPS
Operated Electrically and controlled by the Master Clock through a relay. Any number of Stamps may be controlled by the same clock
PROGRAM CLOCK
THREE CIRCUIT
MASTER CLOCK
TO OPERATING BATTERIES
The number and type depend upon the plant.

Fig. 588

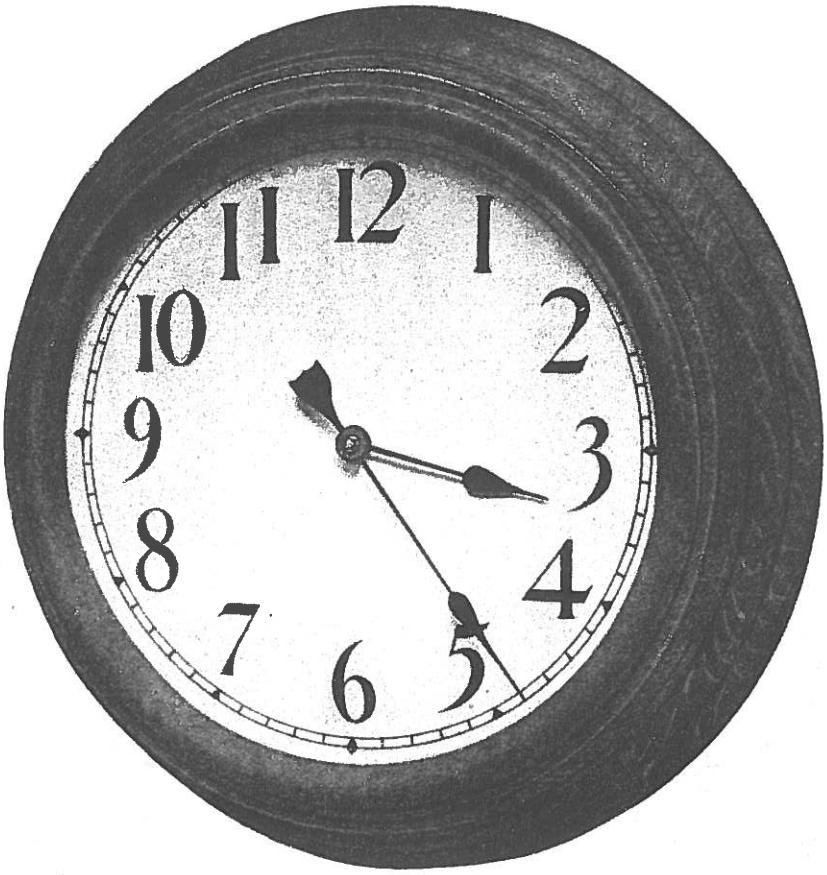
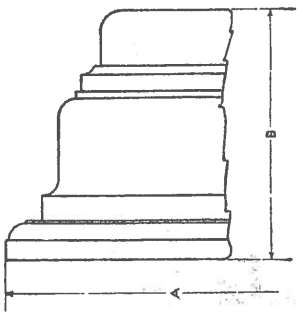


Fig. 20. List No. 347

WOOD CASE SECONDARY CLOCK

SIDE VIEW



EXTREME DIMENSIONS

Dial	*A*	*B*	*Bezel*
12″	18″	4½″	Metal
12″	18″	4⅞″	Wood
14″	20″	4⅞″	Wood
18″	24″	5⅝″	Wood
24″	30″	5⅝″	Wood

Diameter of Dial	*Bezel*	List Numbers *Roman Numerals*	*Arabic Numerals*
12″	Metal	**341**	**346**
12″	Wood	**342**	**347**
14″	Wood	**343**	**348**
18″	Wood	**344**	
24″	Wood	**345**	

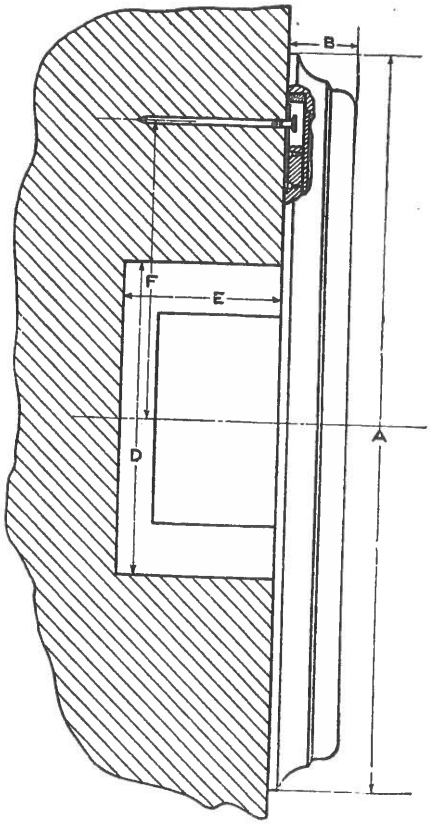


Fig. 620

Side view, showing method for mounting

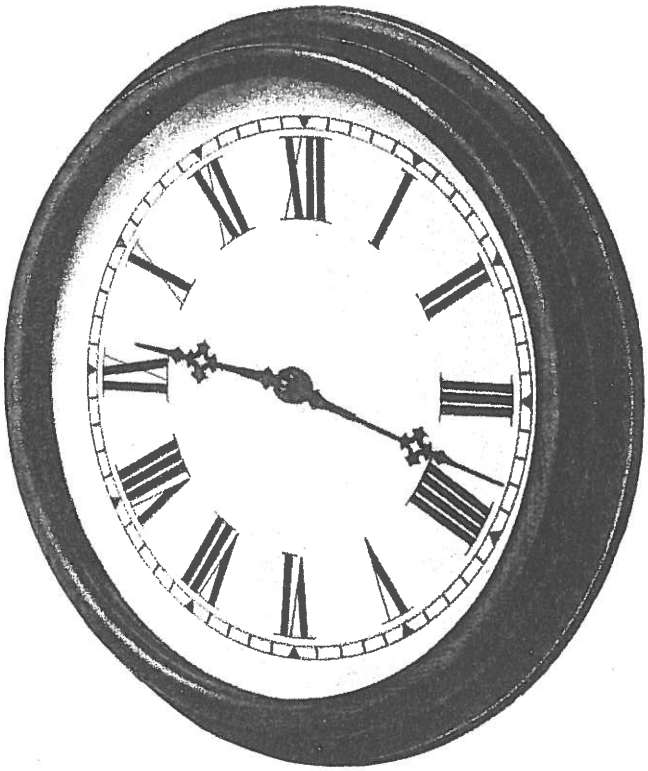


Fig. 590. List No. 352

FLUSH TYPE CLOCK

WOOD RING

List Numbers		Outside and Drilling Dimensions				
Roman Numerals	*Dial*	*A*	*B*	*D*	*E*	*F*
351	6″	$7\frac{7}{8}$″	$1\frac{3}{16}$″	6″	3″	$3\frac{1}{2}$″
352	8″	$10\frac{3}{8}$″	$1\frac{1}{4}$″	6″	3″	$4\frac{1}{8}$″
353	10″	$11\frac{7}{8}$″	$1\frac{1}{4}$″	6″	3″	$4\frac{1}{2}$″
354	12″	$14\frac{1}{4}$″	$1\frac{3}{8}$″	6″	3″	$5\frac{1}{16}$″
355	14″	$16\frac{3}{4}$″	$1\frac{3}{8}$″	6″	3″	$5\frac{11}{16}$″
356	18″	$20\frac{1}{4}$″	$1\frac{7}{8}$″	$7\frac{1}{2}$″	$3\frac{1}{2}$″	$6\frac{15}{16}$″
357	24″	$26\frac{1}{4}$″	$1\frac{7}{8}$″	$7\frac{1}{2}$″	$3\frac{1}{2}$″	$8\frac{7}{16}$″

To be continued.

Continued from December, 2002 issue.

their demands were ridiculous, that "one couldn't squeeze blood out of a turnip," and that Sangamo would *not* go out of business.

We wrangled with them until lunch time, and I always felt that the appearance of Mr. George Westinghouse himself during these hours, and some conciliatory remarks he made, had a helpful effect for us. At any rate, when Mr. Bunn, Mr. Meyer and I went down to lunch in the old "Savarin" cafe, Mr. Meyer said, "We will pay them $15,000.00 or about fifty cents per meter, if you say so, but not a cent more." Mr. Bunn said we had no such sum, but that if I felt we could build a meter to get around the situation, he would find the money. So, somewhat rashly, I said we could, and we went up after lunch, Mr. Meyer made the offer, and, after some argument, Mr. Neave told our opponents to accept it. They did so, then again urged Mr. Bunn to get out of the meter business, offering him to cancel the indemnity, to buy all tools, equipment, material, etc., so as to leave the company a nice profit, and to provide positions for Mr. White and myself.

To most men this would have been a tempting "out" on a bad situation, but not Mr. Bunn, for he politely declined, and we took the next train to Chicago. The next afternoon Mr. Bunn, Mr. Low, Mr. Meyer and I were at the Chicago Athletic Club, when he received a telegram from the attorneys of Westinghouse again urging him to consider a still more liberal offer. He handed it to me, and said,

"Those fellows seem mighty anxious, and now it's up to you, for you have a good offer from them, whereas if you stick with Sangamo, we may eventually have to go under, and I don't want to stand in your way. Besides, I can come out all right, and with some profit, if I take their offer." Of course I said I would stay with him, if he wanted to keep on, so Mr. Meyer and Mr. Low both urged him not to give in, we all shook hands, had a wee bit to celebrate, and Mr. Bunn wired back that he respectfully declined the offer.

Payment of indemnity to Westinghouse and rearrangement of Sangamo stock holdings.

ON return to Springfield, the first question was about the $15,000.00 we had to pay, and, as the company had no money, and as Mr. Gutmann, the principal stockholder besides Mr. Bunn, was unable to pay an assessment on his stock, Mr. Bunn offered to buy his interest at par, which Mr. Gutmann accepted in March, 1905, and then terminated his connection with Sangamo. Mr. Bunn then furnished the money to pay Westinghouse, and we turned our thoughts entirely to mercury meters, realizing that we could not again make induction meters until after expiration of the Telsa patents. By this time, the Schieffer Company had quit, and the Stanley Company had been enjoined after suit on the Tesla patents, leaving Westinghouse and General Electric (including their Fort Wayne meter) meters alone in the induction meter field until these patents expired in December, 1910.

Suit on mercury motor meters by General Electric—April, 1905.

NO sooner had we settled with Westinghouse than we were sued, in April, 1905, by General Electric on our D.C. mercury meter, under four or five of their patents, the principal one being a patent of Halsey's, who had made a few mercury ampere hour meters in Chicago from 1900 to 1903, and had then sold his patents to General Electric. The only claim of serious concern to us was one covering the complete amalgamation of the disk, and on this, after three years litigation, conducted for us by Mr. C. E. Pickard, of Bond, Adams, Pickard & Jackson, —we were defeated, but won on all other counts, and caused one of the G. E. patents to be invalidated, because of incorrect practice in connection with its issue.

We then resorted to partial amalgamation of the disk, but after a short time, early in 1909, entered into a mutual license agreement with General Electric, permitting us to utilize their patents as well as our own, and thus began the friendly and co-operative relations we have had with them ever since.

The mercury chambers that leaked—November, 1905.

IN the meantime, going back to 1905, we had a severe jolt that fall, just as the type "C" was being superseded by the type "D," for one day Bert Brinkerhoff, who had come with us after graduating at Cornell the previous June, came to me with a type "C" meter returned on account of mercury leaking, and called my attention to the contact ears showing amalgamation *outside* the

mercury chamber. We broke the ears out, and my heart sank when I saw them both completely amalgamated, the mercury having slowly worked its way across the copper from inside, for this meant that every type "C" meter we had sent out in the ten months of their production, must inevitably develop the same trouble sooner or later, *and they did.*

The trouble was due to my having stupidly overlooked the fact that the copper ears should have been enameled, or nickel plated, to avoid this obvious danger, and it was cured at once by nickel plating, so that very few type "D" meters got out with the leaky ears.

I went over to tell Mr. Bunn that we faced the prospect of replacing or taking back all the type "C" meters we had made, expecting some strong remarks on the blunder I had made, but, characteristically, he merely said, "Well, now what do you think of that! Those things will happen, and I hope your scheme of nickel-plating will do the trick." And that's all he ever said about it, even after hundreds of meters came back.

The condenser type alternating current mercury meter—1906.

BY this time, the Electric Appliance Company was pressing us to get up an A.C. meter that would not infringe any patents, and early in 1906, I had the temerity to build a meter, the idea of which had occurred two years before, and on which we obtained patents, the scheme being to put a condenser in series with the shunt coil of the "Type D" meter, adjusted to make a resonant circuit at the

desired frequency, and thus giving a true A.C. watthour measurement at *that* frequency.

Unfortunately, frequencies were not well regulated in those days, variations of 3 or 4 percent being the usual thing, except on a few large 60 cycle systems, which frequency was then just coming into more general use, so after sending out a few hundred of these "condenser type" meters, in the spring of 1906, we soon had many complaints. I went up to Hammond, Indiana, where they then had 133 cycles, to investigate our worst complaint, and then realized that what we were making was rather a frequency meter than a watthour meter, so another hope was blasted, and nearly all these condenser meters came back.

Our sulphur impregnated condenser.

HOWEVER, we did one interesting and satisfactory job in developing this meter, a sulphur impregnated cylindrical paper condenser, of which we later sold quite a large quantity.

The transformer type alternating current mercury meter—1906.

WE now sought some other way of operating a mercury meter on alternating current, and after a short time, hit on a really correct idea, namely, what we later called our "transformer meter," in which the mercury chamber was connected across a very low potential secondary (about 1/30 volt) of a small potential transformer in the meter, and series coils, carrying the load current, were placed on the electromagnet, instead of the shunt coils of the Type "D" meter. This meter had some really remarkable

characteristics, being inherently correct on inductive load, and, when built for 25 cycles, had practically the same accuracy on any frequency up to 80 or more cycles.

Years later, and long after we again made induction meters, we built some of these A.C. mercury meters for use on circuits where the frequency was varied over wide limits for motor speed control, a condition for which no induction meter could be used.

We had a hard time convincing the patent office that the mode of operation of this meter was workable, and I finally spent three days in Washington with Mr. Pickard, arguing with the examiner. However, after taking the examiner to the Willard Hotel and operating a meter, he allowed our claims.

We brought out the first transformer meters, which we called the type "E," soon after the demise of the condenser meter, in June, 1906, and thought we were at last out of the woods, especially as the meter sold well, almost from the start.

Beginning of our own production of molded mercury chambers—1906.—Bakelite, 1912.

IT was also about this time that we began making our own mercury chambers, having worked out a shellac-mica-asbestos mixture that gave us a harder and more heat resistant chamber than those supplied us by the Electrose Manufacturing Company, and we continued to use this material until we went over to Bakelite early in 1912, the year after Dr. Baekeland announced this material. We were thus one of the first three companies to use

Bakelite, and I believe no other piece has been made of Bakelite, unchanged in design, as long as our D-5 mercury chamber.

Agency arrangements—1906 and 1907.

SHORTLY before this, in the early spring of 1906, we made our second agency arrangement outside of Electric Appliance Company and H. C. Roberts (excepting the short ill-fated connection with Western Electric), with the Wesco Supply Company, of St. Louis, who became very active for our meters, and did a very effective business for us throughout the Southwest during the next six years, standing by us splendidly through the troubles and disappointments of that period, as, in fact, all our agents except one, did.

That exception was Machado and Roller, who began selling our meters in the New York territory in 1905, and were very helpful until 1910, when Mr. Roller decided Sangamo's future looked dark, and assumed the agency for another meter, which, in a few years, disappeared from the market.

Early in 1906 we were very fortunate in making a sales arrangement for the Pittsburgh territory with Mr. Ludwig Hommel, which has continued ever since with mutual satisfaction, so we take very great pride in this connection.

A little later, in May, 1906, Mr. Bunn had a letter from two young fellows who had just started out for themselves in Boston "on a shoestring"—Bruce Wetmore and Hanson Savage—and how they made

that shoestring grow! So Mr. Bunn and I went to see them, finding Bruce in their tiny office on Oliver Street, while "Hans" was out selling.

It didn't take long to decide we wanted each other, so that evening, when "Hans" got back, the contract was signed with suitable celebration, and for nearly twenty years Wetmore-Savage did a remarkable business for us in the New England territory. Later, following the death of Hans Savage in 1923, Bruce Wetmore, to our great regret, decided to sell the business. We have never had finer relations with any one than with these two men. However, we were fortunate in having had with them, as our expert, since 1911, Staff King, who came with us January first, 1925, to handle the New England territory, which he has done so successfully ever since.

And in the spring of 1907 we made one of the most important sales connections in our history, when I went to Philadelphia and met George Rumsey. He and his brother had established the Rumsey Electric Company there some ten years before, and had already gained a fine reputation for energetic and honest sales work, so we were glad to enlist them as our agents for the Philadelphia territory, and on south to the Carolinas. This connection, I am happy to say, continues most satisfactorily to this day.

Thus, during 1906 and 1907, we formed many of our most valuable and lasting agency connections.

The episode with Mr. William Stanley—1906.

RETURNING now to our factory history, I have to tell of one of the most unexpected and interesting experiences we ever had, which occurred in the spring of 1906. One day I had a telegram from Mr. William Stanley, sent from the train at Albany, asking me to meet him the next day at a hotel in Chicago. Of course, his name, one of the greatest in the electrical history of this country, was well-known to me both from his early connection as the first electrical engineer of the Westinghouse Company, as founder, in 1890, of the Stanley Electric Company, and later, as inventor of the Stanley meter, but I had never met him. So I went, and found him to be one of the most interesting and delightful men I had ever met, full of ideas, the principal one at the moment being the plan he put before me, of saving what was left of his company, which, like ourselves, had been enjoined under the Tesla patents, by combining it with Sangamo. With him was that truly remarkable man, Guiseppe Faccioli, who had invented a reciprocating type meter for A.C. and D.C., and who had also worked out an induction type meter of Mr. Stanley's own invention, which he felt would escape the Tesla patents, and thus, with our mercury meters, give the nucleus of a meter business that could maintain itself.

This meter of Mr. Stanley's had two disks, one responding to a shaded pole driving field carrying a flux equal to (a+b), "a" being current, and "b" voltage, the other disk operating in an (a−b) field,

so that the resultant effect, at the spindle, was equal to "4 a b," in other words, watthours.

That night, until a very late hour, I sat spell-bound listening to those two brilliant men, as they planned how we were going to work together, but after Mr. Stanley had spent a week in Springfield, then made a second visit a few weeks later, the plan did not seem practicable to Mr. Bunn, Mr. Pickard (our patent attorney) and to me, and we so advised Mr. Stanley. Soon afterward he became a consultant of the General Electric Company, so continuing to the end of his life, while Faccioli went with them at Pittsfield, and, notwithstanding great physical suffering, became one of the greatest—probably *the* greatest—transformer engineer in the world.

More mercury meter trouble, —sinking armatures. 1907.—My trip to Texas—the "yellow dog" story.

SHORTLY after this interesting episode, we ran into a new and serious trouble with our mercury meters, as all of our product was then, consisting in loss of buoyancy of the moving system, and consequent stopping, even on heavy load. This came about through my having failed to realize that the necessary flotation of the armature could be obtained by the use of a small cylinder of wood, or composition, attached to the armature disk, instead of which Otis White had gone to much trouble to develop a hollow copper dome, riveted over a raised groove in the disk. This worked fine for a time, but eventually, in many meters, the mercury amalgamated its way through this joint, the float chamber filled with mercury, and the moving sys-

tem became a "sinker," as we called these after the trouble developed.

Again, as in the case of leaking contact ears a year before, it required only the simple change to a wood float (later replaced by bakelite, as still used) to eliminate the trouble, but, again, we had hundreds of meters out in which armatures eventually had to be replaced.

The worst of this trouble, for some reason, occurred in the type "E" alternating current meters, and to a great extent in Texas, probably due to average higher temperatures there which hastened the leakage into the floats. By the spring of 1907, the situation there was so serious that both Electric Appliance Company at Dallas, and Wesco, at Ft. Worth, insisted I come down to try to pacify some of their customers, so I went, and never have I forgotten that harrowing trip! First I went down to Del Rio, on the Rio Grande River, to repair some sixty meters that had gone bad, and what with terrific heat, Mexican food, and poor facilities for testing, I was glad to leave after nearly a week's work.

Then I went to Dallas, and Bill Upham, branch manager there for Electric Appliance Company, told me he had several customers for me to see, but that the most irate was a big fellow named Brown at Ennis, not far from Dallas, and that he didn't know what Brown might do if I went there. So, of course, we went, and Bill introduced me, not as a Sangamo factory man, but as "a young fellow who is with us

at Chicago." Bill had warned me, above all, not to refuse a drink if Brown offered it, which he promptly did, and after one or two more, got around to "those damned Sangamo meters" and what he said was finally topped off by the remark, "if I had a poor yaller dog named Sangamo, I'd drown the damn' thing!" Well, then I had to summon up courage to tell him I was responsible for those meters, and that we now had them fixed up all right. For a minute I thought he was going to throw me out, then he grabbed the bottle and said, "Boy, have another, you're all right!" We parted sworn friends, and Mr. Brown stuck with us thereafter.

Permanent magnets for Schebler Carburetor Co.—1907.

EARLY in 1907, we got our first business outside of meters, when the Wheeler and Schebler Carburetor Company of Indianapolis asked us to make the permanent magnets for a magneto they were just bringing out, and during the next two years this developed into a good-sized and profitable business. To meet this demand, we required more space than we then had in one of the Watch Company sheds, just south of our No. 1 building, where we started making our own magnets in 1906, so the Watch Company built for us, in 1907, our present forge shop, where, for many years, we used oil furnaces for hardening as well as forming.

Our experiments with magnetos—1908.

LATE in that year, we began to think of making a high tension magneto ourselves, to compete with Bosch and others then on the market, and dur-

ing 1908 Bert Brinkerhoff, Dutch Hodde, Otis White and I made a number of experimental models of a high tension magneto without the customary "make-and-break," but by the middle of 1909 it seemed best not to continue this effort, and it was dropped.

Type F for A.C. and type D-5 for D.C. mercury meters—1909.

DURING the early part of 1908, we greatly improved the construction of our mercury meter, and in 1909, brought out the type "F" for A.C., shortly followed by the D-5 for D.C., practically the same, in all respects, as our present D.C. meter, and we then thought we would never go back to an induction meter.

The birth of the amperehour meter.—Ernest Lunn—1908.

ABOUT this time, at the N. E. L. A. Convention in Chicago, in May, 1908, I had the good fortune to meet Mr. Ernest Lunn, then Superintendent of Storage Batteries of the Commonwealth Edison Company, through our good friend of so many years, Mr. O. J. Bushnell, Superintendent of the Meter Department of that company.

He had been trying to get, or develop, an amperehour meter for use with their great standby batteries, and, when Mr. Bushnell told him we made mercury motor meters, Lunn said he would like to see what we could do for him. So we quickly produced a model by substituting a powerful permanent magnet for the shunt field of our watthour meter, and submitted this to him in August.

He was so pleased with it that he asked for several

more to try out on electric trucks of the Edison Company, as well as for use with several of their stand-by batteries. We delivered the meters in October, and thus the amperehour meter business was born, so valuable to us ever since.

Mr. Lunn then suggested to us that the amperehour meter should have a valuable application with batteries on electric lighted railway cars, and in December we submitted meters to the Pennsylvania, Wabash, and several other roads, with the result that they were immediately applied on a number of cars with straight storage systems, that is, without charging equipment on the car, such batteries being charged between trips at terminal points. However, the majority of railroad cars then, and practically all a few years later, had full automatic equipment, the battery being charged, above a certain train speed, from a generator driven from the car axle, and therefore discharging at one moment, and charging at another. This necessitated an amperehour meter arranged to run slower on charge than on discharge, in order to give the battery the necessary overcharge, but it was not until 1912 that we solved this problem, as related later.

In the meantime, for meters used on electric vehicles, or wherever the cycles of charge and discharge were entirely separated, the necessary difference in speed was obtained by the "differential shunt," developed early in 1909, and successfully used for several years. Again, as with the "transformer type" A.C. mercury meter, we had a struggle

with the patent office, as our claims on the "differential shunt" were, at first, rejected on the ground that the arrangement of divided circuits described in our application constituted an ordinary Wheatstone bridge arrangement, and furthermore, would not accomplish the result we claimed. Again I went to Washington, this time with Mr. John L. Jackson, who, I am happy to say, still handles our patent matters. He had taken over our patent work after the death of his partner, Mr. Pickard in 1909.

Mr. Jackson and I found the examiner reasonable, but very dubious, but as before, we set up a differential shunt meter with a battery, proved it would do what we claimed, and soon got our patent.

Sales problems —1909–10.— I. A. Bennett's connection with us.

SO, with the amperehour meter safely launched, I turn back to our principal product, watthour meters. The market for D.C. meters, never large as compared with A.C. meters, steadily decreased. By 1909 we had to rely principally on our Type "F," A.C. mercury meter, and we found it a big task to sell it against General Electric and Westinghouse induction meters. These meters were the only ones on the U. S. market from 1905 to 1911, as all other manufacturers were stopped by litigation until the Tesla patents expired in December, 1910.

Feeling the need for the best sales direction, in this situation, we turned to our old friend, I. A. Bennett, formerly Sales Manager of E. A. Company and now in business for himself in Chicago, and during the latter part of 1909 and through the

summer of 1910, he spent half his time in Springfield, putting much able and ingenious effort on the task of selling our mercury meters, but his dual responsibilities were too great a strain, and he discontinued his work for us about the time that we realized, in the summer of 1910, that we must develop a new induction meter, and get ready to put it on the market after the expiration of the Tesla patents. So we started on this development at the same time the Watch Company was erecting for us our present No. 3 building, the first of many designed for us by Mr. George Helmle, which was completed in the late fall of 1910.

H. W. Young comes with us in charge of sales—1911.

ABOUT this time I met Mr. Herbert W. Young, who had been a very successful salesman for the Westinghouse Company in New England, especially on meters, and who had recently started his own company, Delta-Star Electric of Chicago, to manufacture high tension switch-gear. I proposed to him that he devote part of his time to our sales, as Delta Star was then far from the great company it became later, so Young had time to give our affairs, and decided to accept our proposition.

Development of the type H meter—Fall of 1910.—The Hartford order Production of first meters—January, 1911

WE then hastened experimental work on what became the original type "H" meter, in which I was assisted by Hodde, most of our work being done at night in the old testing room at the east end of the second floor of No. 1 building, as we had no engineering department, and, in fact, few experi-

mental facilities up to this time. In November, 1910, we had just completed and tested a rather crude model, when Herb Young had the bright idea of going to Hartford, Conn., where he had close friends through his old connection in New England, and trying to get a small trial order for the new-born "H" meter. So we went, our sole "evidence" being a couple of blueprints, and some data I had taken on the one model—I didn't dare to show our "prospect" the model itself! Never shall I forget that visit, which, as it turned out, meant so much to Sangamo, for, after meeting Fred Prince, then Meter Superintendent of the Hartford Electric Light Company, we all went together to see Mr. Matthew Dunham, President of the Company, and one of the most remarkable figures the electrical industry has ever had. He was then 82 years old, almost totally blind, a majestic and kindly man with a long white beard, a true patriarch in appearance and character, and, notwithstanding his advanced years, one of the most progressive and far-seeing men in the electric light and power business. He was the first in this country to use long distance transmission commercially, the first to use stand-by storage batteries, the first to offer free lamp renewals, and first in numerous other steps important to the company and its customers.

As soon as Fred Prince told him Herb Young was there, he was friendly and interested, having developed a great liking for Herb when the latter was selling in New England. Herb introduced me with

the remark that I had gone to Yale, of which Mr. Dunham was one of the most distinguished alumni (and to which he gave the Dunham Laboratory of Electrical Engineering about this time), so the old gentleman remarked that with *that* recommendation and Herb's and Fred Prince's statement to him that we would have a good meter, he thought they ought to try some. Herb and I fairly jumped with joy, expecting a trial order for perhaps twenty four meters, when Mr. Dunham took us completely off our feet by saying, "Now, boys, I'm taking you at your word, and believe you will give us good meters, and I like to encourage good competition, so I guess Fred had better give you an order for a thousand meters!" How we got out of his office without collapsing I don't remember, but as soon as Fred Prince, Herb and I could get over to Heublein's, I wired Mr. Bunn, and then we did a little celebrating.

As I had promised Mr. Dunham to deliver some meters on the order within three months, and as the drawings for the parts of the type "H" hadn't even been started, it was *very* imperative to work fast, so we hastened home the last week in December, and within ten days, Otis White and I, working frantically, had drawings completed and tool work started. The necessary tools for the entirely new meter were completed by the latter part of January, 1911, faster than we ever did any job before or since, and we shipped the first meter to Hartford on February 5, 1911, well ahead of our

promise to Mr. Dunham. Fortunately, it did all we had claimed for it, and thus began our association with the Hartford Electric Light Company, which has continued unbroken ever since, a record of which we are very proud.

Compensation of induction meters. Arrangement with Westinghouse under Shallenberger patent—Spring of 1911.

ON account of the Shallenberger patents of the Westinghouse Company, covering the method of obtaining quadrature of the shunt field in an induction meter, which would not expire until October, 1912, we were obliged to build these early type H meters without compensation for inductive load accuracy, but we put on the shunt magnet, from the very first, a winding arranged to be closed, so that these meters could be readily compensated by the customer, but were careful to put on each meter a tag stating that compensation should not be effected until after October, 1912, in order to avoid patent infringement.

The Westinghouse Company soon claimed that this was a subterfuge, and threatened to sue us, so in May 1911 I went to New York to see Mr. Charles A. Terry, Vice President in charge of patent matters, who was very fair and reasonable, and soon told me they were willing to license us under the Shallenberger patents, at a royalty that I considered entirely fair, and so reported to Mr. Bunn. After a little further discussion, Mr. Terry and I agreed on a lump sum, to be paid at once, covering the royalty on our estimated production of meters to October, 1912, when the Shallenberger patents would expire,

and including polyphase meters, which we could not have made unless compensated. So the money was paid, and the next week we began shipping compensated singlephase meters, and immediately started on the design of our first polyphase meter, under the direction of Jacob W. Bard, who had come with us from the Peoria Electric Light Company in April, 1911, to develop an engineering department. The first polyphase meters were completed and shipments started in the early fall of 1911, essentially the same in design as our two disk polyphase of today.

Warren Noble—Development of distant dial amperehour meter—1911.

WHILE we were thus so occupied with the type "H" development, other interesting and important matters came up in the fall of 1910 to tax our development and manufacturing facilities, the first being concerned with Mr. Warren Noble, whom Barela Southwick, then one of our principal and most energetic salesmen, had met in Detroit in September. Noble, one of the most brilliant and interesting men it has ever been my fortune to meet, had come to this country from England in 1906, a very young man, but even then with extensive experience in motor car design, and, after being connected with several companies, had gone with Mr. Walter Flanders in the summer of 1910 to develop a radically new type of electric pleasure vehicle.

He heard of our ampere-hour meters, and decided he must use them in his new cars, so after a

preliminary talk with Southwick, came breezing down to Springfield, and soon had all of us, from Mr. Bunn down, completely "sold" on his ideas, and especially, on the *very* special and expensive amperehour meter he wanted us to get up for him. His idea was to have the meter proper concealed down under the seat, and arranged with contacts to operate a separate dial mechanism located on the steering arm column of the car. It sounded simple enough, but before we got what Noble wanted, what a headache *we* had!

For three or four months that fall of 1910 Otis White, Carl Struck and I worked four or five nights a week, trying to get up a contact mechanism that would meet the severe requirements put on it, and a corresponding dependable dial mechanism. We finally developed schemes, largely due to Carl Struck's ingenuity (as shown so frequently in all the years since) for these devices that worked, although some slight changes in details were made later, and early in 1911, delivered the first distant dial meters to Flanders. For a year this business looked very promising, but the Flanders design and sales plans were too advanced and ambitious, so it all "folded up." However, other manufacturers of electric pleasure vehicles, such as Woods, Rauch and Lang, and Anderson, became interested in the distant dial meter. A particularly interesting type was developed for Woods, in which a Weston ammeter and the distant dial were housed in an oblong case.

Our first contact with Charles F. Kettering—November, 1910.—Development of Delco amperehour meter for Cadillac cars.—April, 1911

JUST after we had gotten well started on the distant dial experiments, one day in November, 1910, a tall, lanky, kindly faced man walked into my tiny office, over in the No. 1 building, and said "My name is Kettering, from Dayton. I need an amperehour meter for a job I'm working on, and our mutual friend, Frank Tait (then, as now, President of the Dayton Power and Light Company) told me to come over and see you." Thus began a most interesting and delightful association, which has extended unbroken through this more than a quarter of a century, and has meant to me more of inspiration and high ideals in engineering and research than I have had from any other man. No one could have a better friend than I have had in "Ket" since that winter day so many years ago.

He sat down and told me of his association with the National Cash Register Company, and of having quit them a few months before to go with Mr. Edward A. Deeds in organizing the Dayton Engineering Laboratories Company to make ignition systems for motor cars. This had led "Ket" to the conception of an electric starter for motor cars, and when he came to Springfield, he had built some models in Mr. Deeds' barn, near Dayton, and was now trying to get some storage battery manufacturer to have enough faith in his scheme (and in the battery) to supply him the necessary batteries, and was also seeking sources of supply for ignition coils, and for the starter motor and generator.

Mr. Kettering felt it was absolutely essential to

To be continued.

Sangamo and **Hamilton Sangamo** movements, motors, platforms, and other parts. Send SASE for list.
"Electrical Timekeeping", by F. Hope-Jones. 2nd Ed, 1949 Dust jacket a little ragged, contents are fine $35.
Harvey Schmidt, 75-80 179th Street, Flushing, NY 11366 or wwlathlot @AOL.com.

New publication: 60-page booklet with facsimiles of instructions and drawings re: **FAVAG** clocks with Hipp-toggle, period 1930-1960 (all in French). $25 including postage. Rare French book on CD-Rom, easily printable (in .tif format: "Horlogerie electrique-1ere partie-Horloges-meres et installation horaires" by **Ch. Poncet**, Cluses, 1905, 227 pages. 25 USD or 25 EUR. Order email, viredazepal @bluewin.ch, or address Michel Viredaz, Chemin du Raidillon 48, CH-1066 Epalinges, Switzerland.
Send money in banknotes, no checks please.

CD containing animations of 40 different electric clock systems (such as **ATO, Brillie, Bulle, Campiche, Eureka, Garnier, Gent Hipp, Lowne, Poole, Shortt, Synchronome, Tiffany, Wagner**) and 20 slave movements. Included are some biographies and portraits of inventors and a large reference list to relevant literature. Price $20, includes shipping. J. E. Bosschieter, contact me at BoscoClocks @Zonnet.nl

BARR cylindrical pendulum assembly. Brass bob 1 3/4" long, 1" diameter, overall length 6.5". $10.00
Sal Cabibbo 345 Summit Ave., Hackensack, NJ 07601. Phone/FAX (201) 489-8176

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

Quest for Information

Dear JEHS,

In the last Journal (Dec. 2002), I found the two letters commenting on the article "Electrifying the Self Winding Clock" interesting, practical, and full of good technical information.

In fact, when articles are being published, requests could be made for information on how to repair, adjust, electrify, etc. This could include coils, rotors, motors, Bakelite, and more. I found the article on veneer repair in the NAWCC Bulletin (Feb. 2003) extremely helpful.

The repairs mentioned above may be basic knowledge to many, but not to those with few technical skills like myself.

I would have greatly appreciated that type of information, and it would have stopped Bill and me from providing DC current with our method.

Thanks for publishing my article.

Sincerely, Jerry C. Harman

--- MART ---

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

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

Junker **EARLY BATTERY CLOCKS**, Movements, Parts, etc, send details.
Martin C. Feldman, 6 Stewart Pl., Spring Valley, NY 10977

D.E.H.O. slave; please send size, condition and price.
Kenneth Erlenbusch, 124 North Avena Ave., Lodi, CA 95240, e-mail kene_lodi@gotnet.net

Gents or **Synchronome** slave movements.
Jon Carpenter, 17436 S.R.I., Spencerville IN 46788 – email: JON6313@AOL.COM

REPAIR: ALL EARLY BATTERY CLOCKS Specializing in **BULLE** using orig. parts.
Martin C. Feldman, FNAWCC, 6 Stewart Pl., Spring Valley, NY 10977

HARD TO FIND PARTS AVAILABILITY:
BULLE suspension assemblies, fabric type, just like the originals. **TIFFANY** Single Contact suspension springs (0.004") The Horolovar Co., Box 264, St. Clair Shores, MI 48080 (313)882-9380

TIFFANY Double Contact Suspension Springs: Use a **Hamilton** Ladies Watch Mainspring, Specification: **HAMILTON** 6/0 #2521, 1.40 mm x 0.12 mm x 11¼". Available from:
Bill Schroeder @ $3.00 each + postage. 6033 N. Sheridan Rd., #31H, Chicago, IL 60660,
(773)275-2563. Also available from most Watch Parts Suppliers.

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

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

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

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

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

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

THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78

NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXIX #2, JUNE 2003

Fellow Horologists:

Please allow me to introduce myself. I am Bill Ellison and I have the privilege of service as President of NAWCC Chapter #78, The Electrical Horology Society. I have been a member of NAWCC since 1973 and have collected electrical clocks since I jointed the Association. I particularly enjoy the large precision electric clocks such as Synchronome, Gents, and the larger Self-Winding Clock Company clocks. I also enjoy studying the various approaches taken by the designers of electrical clocks in the quest to develop dependable electric clocks. As a consequence of this second interest, I spend a great deal of time looking in "junk boxes" under the tables at marts.

Chapter 78 has been successful for a long time, in large part due to the high quality of The Journal of the Electrical Horology Society. The current editors of the Journal, Harvey Schmidt and George Feinstein have agreed to continue and we all look forward to receiving their excellent issues of the Journal. Speaking of the Journal, this present issue continues the "Sangamo, a History of Fifty Years" by Robert C. Lanphier and Benjamin P. Thomas. Sangamo Clocks still are available at our Marts and these clocks are a pleasure to own. They are made to very high quality standards and represent a time period when the electrical power delivered to our homes was not always dependable enough for time keeping. This issue also continues the Catalog #32 of the Standard Electric Time Co., of Januaty, 1910. We also have an article on Alexander Bain that was originally printed in the June 1847 weekly magazine entitled "The Massachusetts Plowman". It is worth noting that in 1847, magazines such as The Massachusetts Plowman were the prime methods of achieving technology transfer and articles such as the one on Bain served to inspire experimenters and scientists.

Enjoy this issue of the Journal and thank you for the opportunity to serve as your President.

Yours very truly, Bill Ellison

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

MASSACHUSETTS PLOUGHMAN.

PUBLISHED WEEKLY, FOR THE BENEFIT OF FARMERS AND MECHANICS, AT QUINCY HALL, SOUTH MARKET STREET.—WM. BUCKMINSTER, OF FRAMINGHAM, EDITOR.

VOL. 6. BOSTON, SATURDAY MORNING, JUNE 19, 1847. NO. 38.

PUBLISHED BY
WILLIAM BUCKMINSTER,
AND
WILLIAM J. BUCKMINSTER.

TERMS, $2.00 in advance—if payment is delayed six months $2.50 will be charged.

☞ Papers not discontinued without a personal or written notice from the subscriber or postmaster, and all arrears paid.

☞ All communications should be addressed to the Editor or Publishers.

☞ Advertising on reasonable terms.

AGRICULTURE.

THE HONEST POOR.—BANKRUPT LAWS.

We have at least two classes of poor people. We feel for honest poor as well as the poor rogues. What is to be done for them? The rich have the means of providing for themselves, and it is the honest poor who deserve our consideration. It is a good policy to drive them "to the wall," say the very men of the justice of it.

We are unfortunate and fail in business. Their creditors, to multiply, or is destroyed by the head of the caterpillar, more leaves are actually found than the tree can well support.

But all theories must bow to facts and to the experience of practical observers. They have given a verdict nearly unanimous, in favor of trimming limbs, briar, suits, heads—in any nothing of trimming children; or the trimming of candidates for office.

APPLE WORMS.

Gen. J. Newhall of Lynnfield tells us he has destroyed the worms, that have for a number of years rendered worthless his apples on a russet tree, by strewing salt on the earth under the tree in the fall of the year. His fruit last fall was free from worms, and his russet tree comes out this season with new life, and seems to relish the salt on its roots. Three or four quarts were applied.

BREAK THE CRUST.

Stirring the ground often among growing vegetables is of the utmost importance to cultivators. As prices now are we shall be likely to be well repaid for all proper attention to growing crops. Every farmer must have noticed that a crust is soon formed

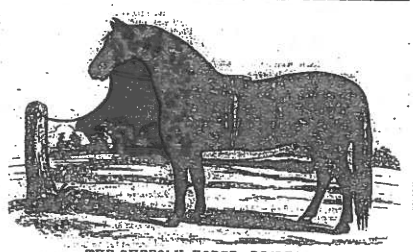
Our correspondent puts her bread in pans, for baking. We are curious to know if her whether a loaf is not on the bottom of the oven, or is in the plate, will not turn out as well as a loaf in a closed pan?

We have a strong fancy for the old mode of baking, placing the loaf on the bottom bricks of the oven. We incline to the notion that the superheated moisture of the loaf is let off' bitter when not confined in a pan or a dish. We may be prejudiced. Our bayish appetite relished supremely the open crust at the sides of such a loaf. [Editor.

CROWS, HOW TO SCARE.

Mr. Editor,—Being a subscriber and a constant reader of your paper, I have noticed a number of communications by different authors expressing their disappointment of the common practice of destroying *birds*; with most of the sentiments expressed, I most heartily coincide, inasmuch as I will not countenance or encourage the killing of such birds as do no injury.

But I noticed an article in your paper a few weeks since bearing the signature of *Farbearance*, in which the writer endeavors to prove that the Crow, the Hawk and the Owl, do quite as much good as hurt,—for my own part, I have yet to



THE SUFFOLK HORSE—BRITTON.

GOOD PROSPECTS OF THE FARMER.

Three weeks later than usual, up to the 29th May, to the farmers of this region every thing looked unpropitious: the frost threatened an invasion of the mastery of summer. There seemed to be no time left to plant, and of consequence little prospect to reap in after summer. We found the grass even more backward in the vicinity of Boston than it was here planting land three late in May had not yet been ploughed. Within the last ten days a surprising "change has come over our dreams;" the growth of vegetation has been rapid almost beyond example. Never have we seen, on the first day of June, so much grass upon the ground as on our Merrimack river intervales. The warm summer days, the genial showers, the cooled atmosphere sometimes almost unpleasant, has each contributed its share to burst and expand the budding ceremonies, and promote a healthy growth of grass and grain. Although we planted early potatoes last year full a month sooner than it was possible to plant them this year, yet now our potatoes are more forward than they were then. A large part of the corn has been planted the last week in May, and is not yet out of the ground; but it is coming. the earliest planting promising no more than the latest. The rapid growth of vegetation, after

MECHANIC ARTS.

ELECTRIC CLOCK.

Among the inventions we have an *electric clock*—emanating from Scotland. The *London Universe* gives the annexed description:

"The clock is enclosed in a neat oak case, about four and a half feet in height, and one foot four inches wide. Its face is of ample dimensions, very plain in appearance, and is furnished with second, minute, and hour hands, in all respects similar to those of the usual construction. The pendulum is the same length as that of the ordinary old fashioned eight day clocks. Here, however, analogy ceases. It is true, there are some wheels and pinions to move the hands, and afford accurate indications of the divisions and progress of time; but these are few in number, and do their work in a manner totally different from those in other kinds of clocks. The electric clock has neither weight nor spring, nor power of any other kind, within itself, to keep it in motion; and it therefore never requires winding up.

Whence, then, does the electric clock derive its power of continuous notion? Wait a little—we will try to explain it.

There are two very small copper wires fixed in the angles of the clock-case, which communicate with similar wires at the back of the pendulum bar, and are thence continued to a coil of the same kind of wire enclosed in a circular brass box, which box constitutes what is usually termed the bob of the pendulum. The box being hollow, in the direction of its axis, the cavity thus formed admits of the insertion of two sets of permanent magnets, whose similar poles are placed near to, but not in contact with, each other. These magnets are kept in their places by being enclosed in brass boxes secured to the sides of the clock case. The pendulum is so adjusted that it has, of course, perfect freedom of motion; whilst in its oscillations it passes alternately the poles of the magnet just mentioned.

Leaving the clock for a few minutes, we now observed two copper wires, the ends of which are in contact with those within the case. Continuing their course along the wall, these wires pass out of doors, descend below the surface of the earth, and, at a short distance from the house are connected, the one with a few bushels of coke, and the other with five or six plates of zinc. These materials are buried in a hole in the earth, about four feet square, and five feet deep, the coke being placed at the bottom with a layer of earth above it, and then the zinc plates are laid thereon, and the whole covered up, thus forming a galvanic battery. Here consists the power which imparts motion to the clock; a current of electricity being induced by the coke and zinc, which, although of low intensity, is unlimited as to quantity, the source whence it is derived being the earth itself. The pendulum being set in motion and the current of electricity through the wires established, a beautiful arrangement of simple mechanism immediately comes into operation, by means of which the circuit is broken, and renewed at each alternate oscillation. Thus by the skill of the inventor, the combined agencies of galvo-electricity, electro magnetism, and permanent magnetism, are made to produce an uniform and, so to speak perpetual motion of the pendulum; and we obtain a time measurer of such extraordinary accuracy that we believe it will bear comparison, in this respect, with the best constructed chronometer.

If it be desired to have other clocks in different parts of the house, that we have been describing requires only to be connected with them by a copper wire, and the circuit completed to the battery; and they will all be kept going by the motion of one pendulum, and record exactly the same time. So also the public clocks in a town, could, by similar means, be made to synchronise

Such is the electic clock, invented by Mr. Alexander Bain, of Edinburgh—a gentleman deservedly known in the scientific world."

Continued from March, 2003 issue.

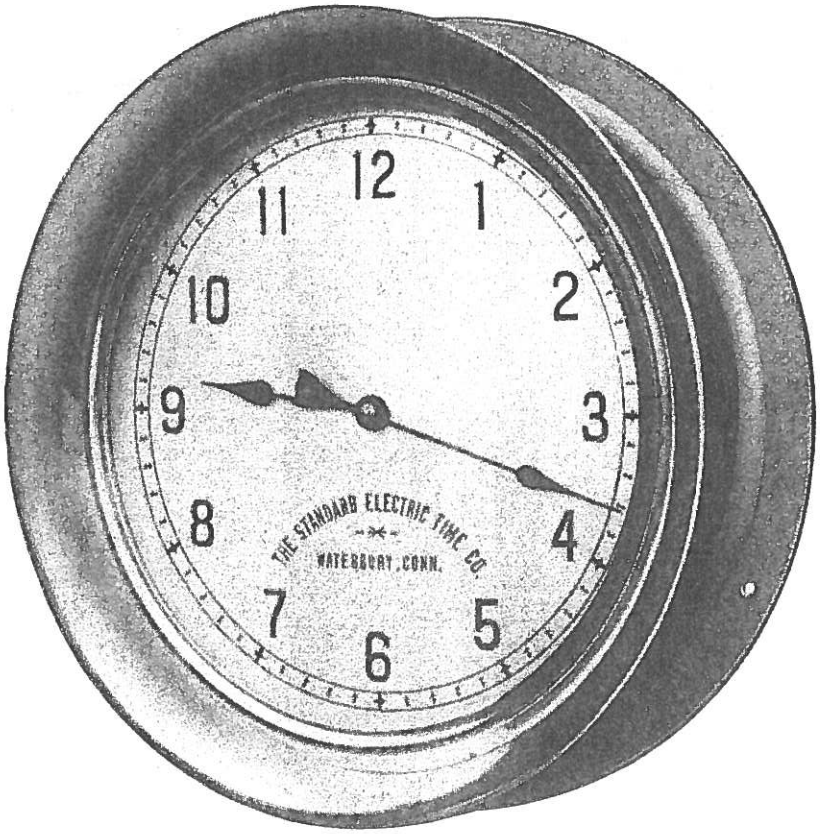


Fig. 457. List No. 377

SECONDARY CLOCK. CAST METAL CASE

DUST PROOF MOISTURE PROOF

List Numbers

Case Iron-Japanned Bezel Brass-Nickel Finish		*Case and Bezel Brass-Polished Finish*				
Roman Numerals	*Arabic Numerals*	*Roman Numerals*	*Arabic Numerals*	*Dial*	*Outside Diameter*	*Depth*
373	**376**	**34**	**37**	$8\frac{1}{2}''$	$10\frac{5}{8}''$	$3\frac{13}{16}''$
374	**377**	**35**	**38**	$10''$	$12\frac{1}{8}''$	$3\frac{3}{4}''$
375	**378**	**36**	**39**	$12''$	$14\frac{11}{16}''$	$3\frac{3}{4}''$

Case and bezel can also be furnished in brass with polished nickel finish

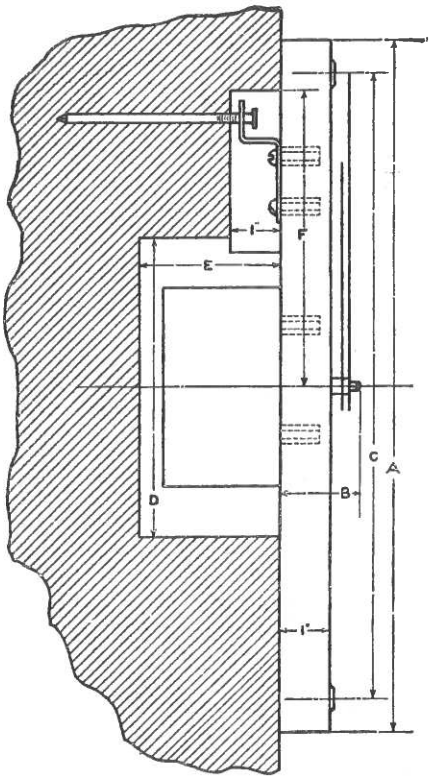


Fig. 628
Side view, showing method for mounting

Fig. 26

Marble Secondary Clock

Raised Arabic Numerals
Rustless movement enclosed in metal case

List Numbers	Extreme and Drilling Dimensions				
	A Dial	*B*	*D* Diam.	*E*	*F*
369	14″	$1\frac{7}{8}$″	$7\frac{1}{2}$″	$3\frac{1}{2}$″	6″
370	16″	$1\frac{7}{8}$″	$7\frac{1}{2}$″	$3\frac{1}{2}$″	7″
371	18″	$1\frac{7}{8}$″	$7\frac{1}{2}$″	$3\frac{1}{2}$″	8″
372	20″	$1\frac{7}{8}$″	$7\frac{1}{2}$″	$3\frac{1}{2}$″	9″

Additional Information Required

Kind of Marble: White Italian, Sienna, Red Numidian, or Special

Finish of Hands and Numerals: Bronze, Verde Antique, Gilt, Dull Black or Special to Sample

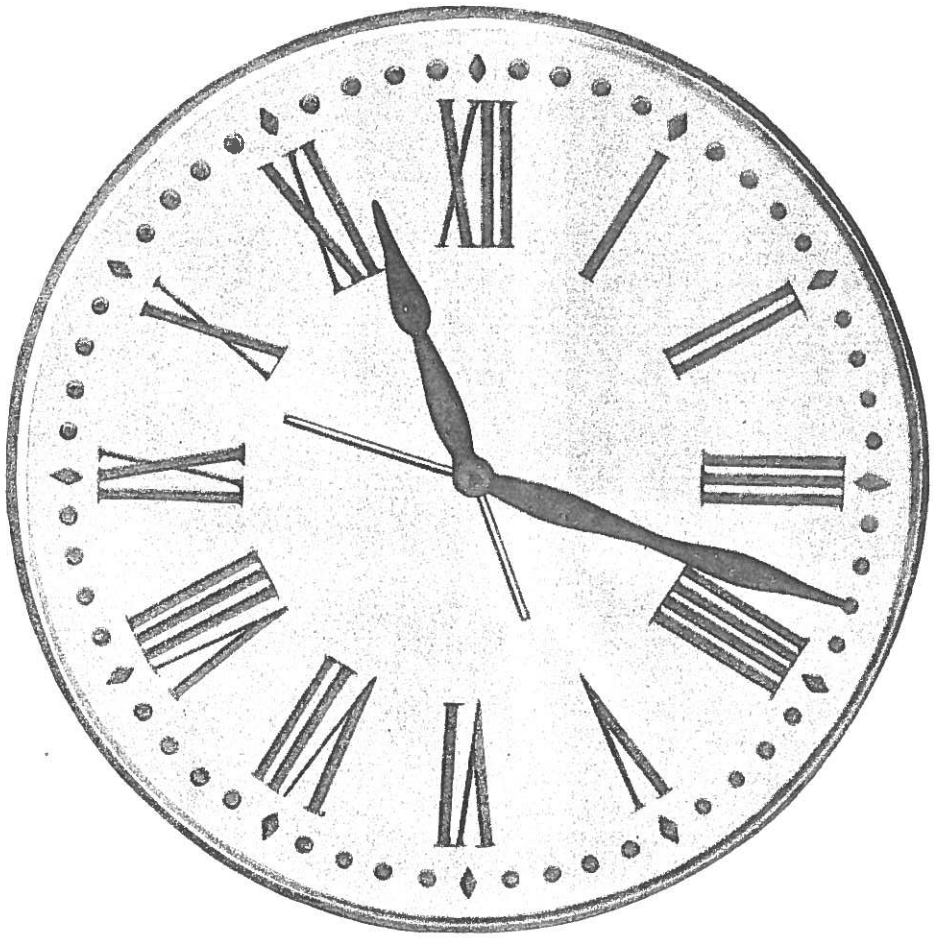


Fig. 29

MARBLE SECONDARY CLOCK

RAISED ROMAN NUMERALS

RUSTLESS MOVEMENT ENCLOSED IN METAL CASE

List Numbers	*A* Dial	*B*	*D* Diam.	*E*	*F*
	Extreme and Drilling Dimensions See Fig. 628, page 41				
40	18″	1⅞″	7½″	3½″	8″
41	24″	1⅞″	7½″	3½″	11″
42	36″	2½″	8½″	4½″	17″

Additional Information Required

Kind of Marble: White Italian, Sienna, Red Numidian, or Special

Finish of Hands and Numerals: Bronze, Verde Antique, Gilt, Dull Black, or Special to Sample

Special Secondary Clocks

The various Secondary Clocks shown on pages 44–49 have been made — often in several different sizes — and cover a wide range of special purposes, forms, or finishes.

A vast number of other special Secondary Clocks have also been developed which space does not permit showing in this Catalogue.

If, however, none of the clocks shown seem to meet requirements, new ones will be developed and manufactured upon request.

Architects and engineers are referred to page 70, embodying suggestions relative to designing special clocks.

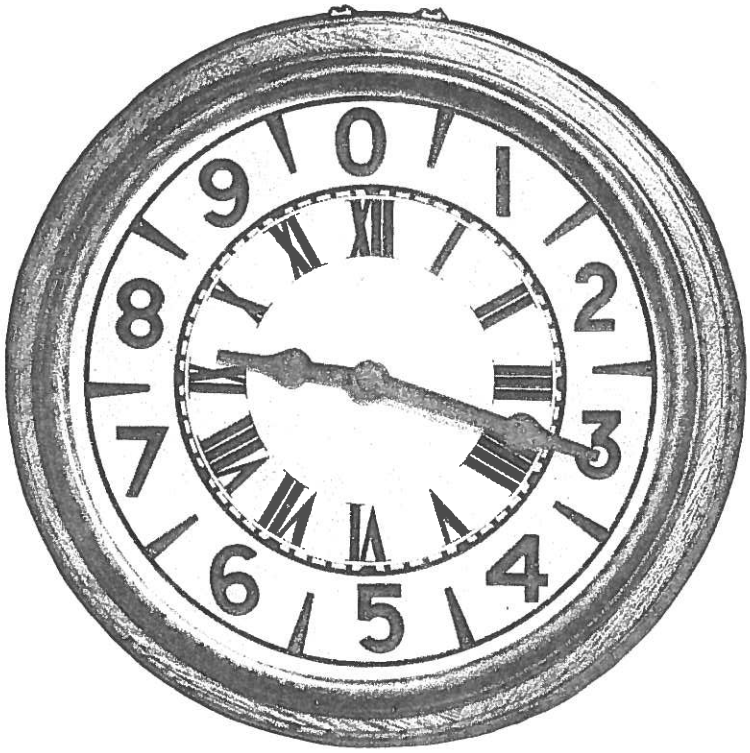


Fig. 572

DECIMAL DIAL FACTORY CLOCK

Diameter of Dial 8″, 12″, and 24″

Extreme dimensions same as those of corresponding sizes for Fig. 21, page 35

This clock is arranged with an outer scale divided into tenths of hours, so that the decimal system for keeping time may be used to facilitate calculations of elapsed time. Note the large, conspicuous hands, figures, and divisions, which make it easy to read the time at a long distance. The outer scale is so laid off that the minute hand cannot stop on a division. No chance for uncertainty as to which tenth is indicated.

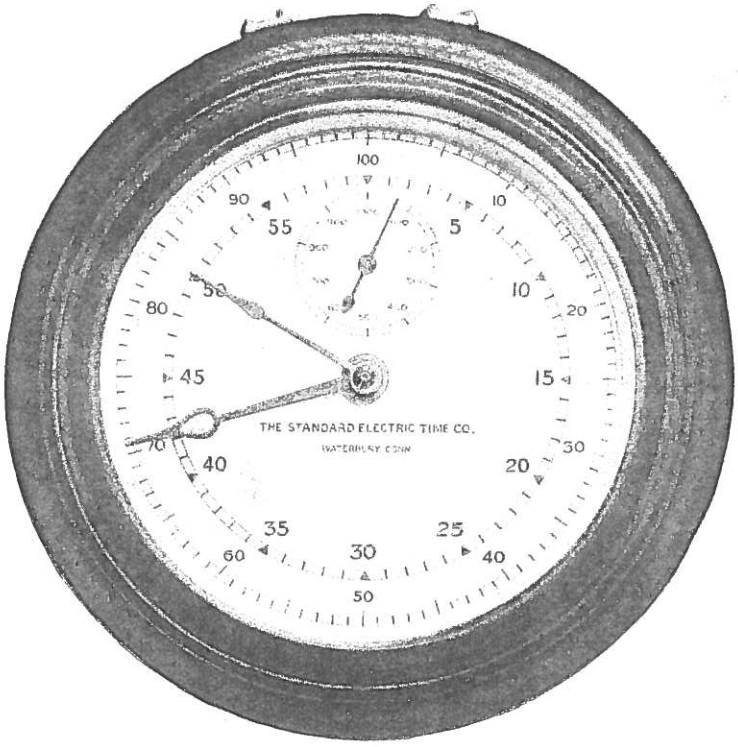


Fig. 569

ELAPSED TIME CLOCK

Operated as Secondary from Master Clock

EXTREME DIMENSIONS

Dial	*Diam.*	*Depth*
8″	11¼″	3½″

This clock was designed for Government use in testing the life of incandescent lamps. It of course has many other uses.

The smallest scale reads in hundreds of hours, from 0 to 1,000 hours; the next one reads in minutes, from 0 to 60; and the outer scale reads in hours, from 0 to 100. The cut shows the clock indicating 70 hours and 50 minutes.

In practice it is started when the test begins and integrates time until it is automatically stopped at the end of the run.

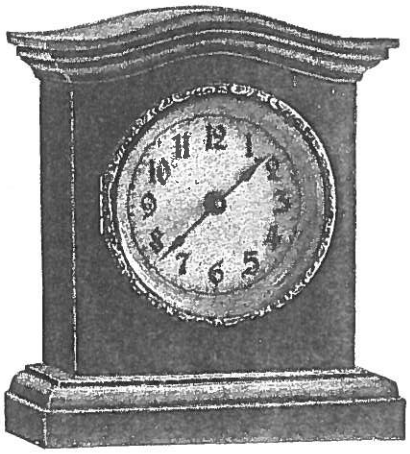


Fig. 452

MANTEL CLOCK

Handsome wood case and 5″ dial

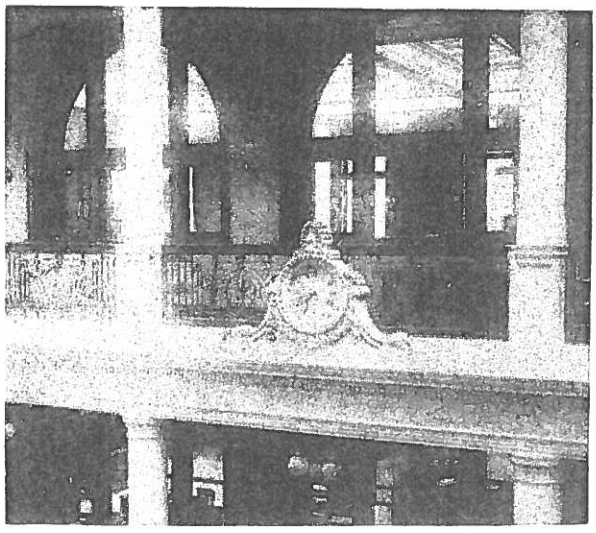


Fig. 451

SPECIAL ARCHITECTS' DESIGN FOR BANK BUILDING ROTUNDA

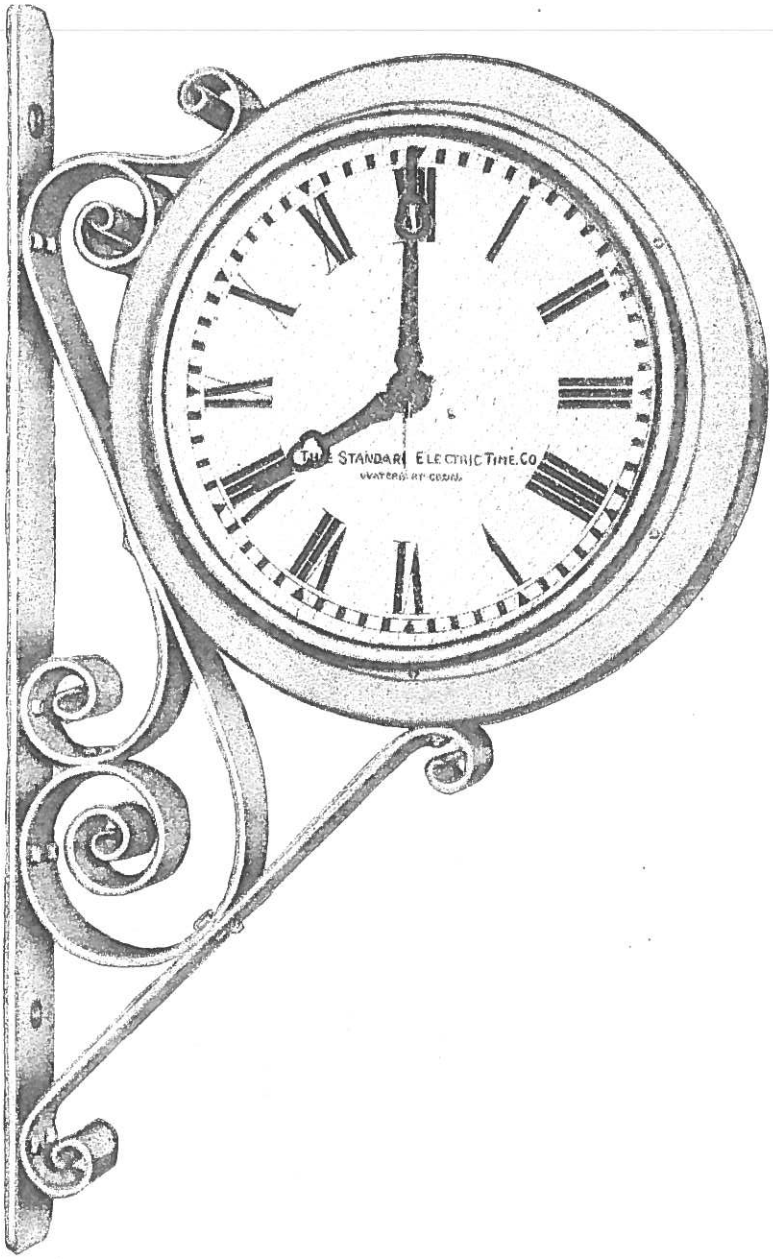


Fig. 564

DOUBLE DIAL BRACKET CLOCK

Made for 24″, 30″, and 36″ Dials

The ornamental bracket and case are of iron. Special wired glass is used, for strength and safety. This clock is just the thing for street signs, jewelers' stores, etc. Finished in black, verde antique, or imitation bronze.

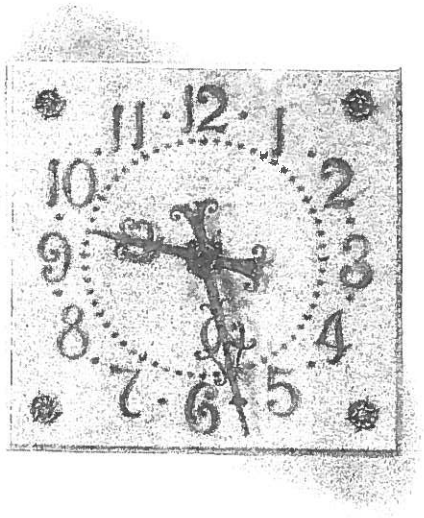


Fig. 32

SIENNA MARBLE CLOCK WITH FANCY HANDS AND RAISED NUMERALS

Size, 26″. Hung like Fig. 26, page 41

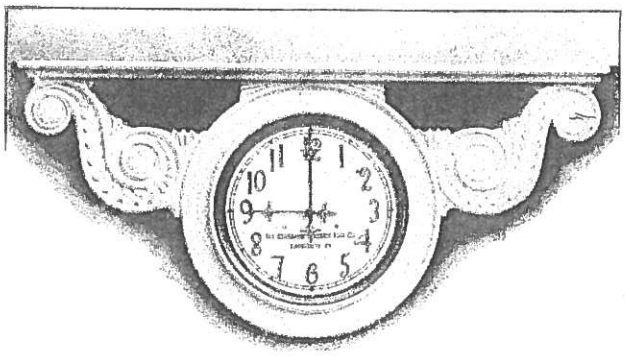


Fig. 30

ITALIAN MARBLE DOUBLE DIAL BRACKET SECONDARY CLOCK

Dial, 14″

Fig. 618

TYPE OF CLOCK USED OVER DOORWAYS, ARCHES, ETC.

To be continued.

Continued from March, 2003 issue.

the success of his system to keep the battery fully charged, and also protected against overcharge, so naturally turned to the amperehour meter. At first, his scheme sounded almost fanciful to me, but he soon had me convinced, and in December, 1910, busy though we were on the type "H" development, we succeeded in making two models of an amperehour meter, very different in design from our regular meter, to meet "Delco" requirements, and I took them over to Dayton, where, by this time, "Delco" had a small floor in a downtown building.

These meters, with some slight changes, proved satisfactory, and we thought we might get an order for a few more samples to be tried out with starters on cars, when one day in February, 1911, "Ket" telephoned me to come to Dayton at once, and there he gave his several suppliers the astounding news that Mr. Henry M. Leland, then president of Cadillac Motor Car Company, had decided to put "Delco" starters on *all* Cadillacs, beginning with the "1912" cars to be brought out in July, which meant we must start delivery of Delco meters in Dayton early in May. So, right after our rush to tool up and produce the type "H," we had to start in and do the same thing on the Delco meter. So the next few months were not enjoyable, but we made it, and sold many thousands of meters to Delco that year, still more in 1912, when Hudson, as well as Cadillac, used Delco starters, and then this business ended in 1914, as electric starters had

been simplified by that time so that the battery could be protected without an ampere-hour meter, and also, with competition greatly reducing the price of a starter, the meter was too expensive to be used.

MS amperehour meter for Delco-Light plants—1914.

HOWEVER, the connection thus started with Mr. Kettering and his company led us the next year, 1914, into a still more important amperehour meter business, through the development by them of the famous "Delco-Light" farm lighting plant. For this Ket considered an amperehour meter absolutely essential, but it had to be smaller, more accurate, and less expensive than the "Delco" meter, so, after several months effort, we produced the "MS" meter, soon thereafter adopted by Delco-Light, and later, by practically every manufacturer of farm lighting plants in the United States. This business reached a peak after the war of nearly five hundred "MS" meters per day, then suddenly, in less than two weeks, stopped short when the "farmers' buying strike" came on in September, 1920, and never came back, but it was great while it lasted.

Opening of first district office at New York—December, 1910.

NOW, going back to the fall of 1910, when so many things of importance happened to us, we opened our first branch office, at 50 Church St. New York. Mr. M. B. Chase, whom we met and secured through Herb Young, was appointed district manager, thus taking over the territory formerly handled by Machado and Roller, who had "dropped us" a few

months before. We stayed in this space a few years, then moved to larger quarters higher up in the same building, Mr. Chase continuing with us until succeeded by T. B. Rhodes in 1917.

Advertising arrangement with Ray D. Lillibridge, New York—1911.

IN the spring of 1911, realizing the need of better looking technical bulletins and advertising than we had been able to prepare ourselves, we made an arrangement with Ray D. Lillibridge of New York, who had successfully handled the Wagner Electric Company's advertising for several years, and this continued, to our mutual satisfaction, for many years, until Mr. Lillibridge sold his business to his associates, Otis Kenyon and Henry Eckhardt, who continued to handle our account until the depression. The long connection with Mr. and Mrs. Lillibridge (who was most active and successful in the business) and Mr. Kenyon is one of the pleasantest experiences of my years with Sangamo.

Sumner Rogers comes with us as Production Manager—April, 1911.

IT was also in the spring of 1911 that Sumner B. Rogers ("Blackie") came with us, after several years at Western Electric Company,—as Production Manager, and so continued until he left for war service in May, 1917—more about him later.

Our order for the great 60,000 ampere shunt—May, 1911.

ONE day in May, 1911, I had a telephone call from Omer Brasher, formerly meter superintendent at Galveston, one of the most energetic and determined sales engineers we ever had, who was then travelling in western New York. He said, "Boss,

I'm at Niagara Falls, and have just come from a talk with Mr. John Harper, General Superintendent of Niagara Falls Power Company, and he gave me an order for a 60,000 ampere D-5 meter, so I guess we will have to make it." I nearly collapsed, and told Brasher he was crazy, and ought to be fired, as we had never attempted a shunt for more than 10,000 amperes, and, so far as I knew then (or now) no one had ever tried to build a 60,000 ampere shunt. However, Brasher said we just had to back him up, so I said I would go that night to Niagara Falls, and, on arrival there, found that the big shunt, and two smaller ones (merely 25,000 amperes each) were to be used in measuring energy sold to the Aluminum Company of America for producing the metal. Mr. Harper stipulated a lot of conditions as to the shunts and meters, which made the job look even worse, but we tackled it, and came out all right, as the big shunt has been in successful operation now for a quarter century, and we have built many more big ones for the Aluminum Company, including several of 50,000 amperes rating. Brasher never could see why I should have been disturbed about that order!

My first meeting with Mr. Edison through interest in ampere-hour meters—1911

SOON after the introduction of the ampere-hour meter, the Edison Storage Battery Company manifested a keen interest in it, as it was even more necessary with the Edison nickel-iron battery, owing to its characteristics on charge and discharge, than with lead batteries, where voltage gives a rough idea of the battery condition. Mr. Edison himself was

very much pleased with the amperehour meter, and promptly had one put on Mrs. Edison's electric car, and also wrote a number of his friends in this country and abroad, strongly recommending Sangamo meters. One day early in 1911 we had a letter over his own signature saying that the meter on his car needed some repairs, and asking where to send it. At that time we had no service department at New York, so I wrote him to send it to Springfield. He sent it, and asked us to hurry it back, so, as I happened to be going to New York, I took the meter with me to East Orange, and thus met Mr. Edison for the first time. His son Charles took me up to see his father, whom we found in his laboratory, with his head against a phonograph case, for, owing to his deafness, this was the only way by which he could hear, or rather, *sense* records. When his son introduced me as "the fellow who makes those Sangamo meters," Mr. Edison looked up and said, "Young fellow, Mrs. Edison can't run her electric without your meter, so why couldn't you fix it up nearer than out there near Alaska! You must have a service department at New York." So we started one there.

Then followed a most interesting talk about his early work on meters, not only his famous chemical meters, but others with which he had experimented. I went to see him several times in later years, and always found him kindly and interested, but that first meeting with him stands out as one of the great experiences of my life.

Beginning of our connection with Federal Electric Co. and erection of No. 4 Building—Fall of 1912

BY the spring of 1912, type "H" and amperehour meter business had increased to a point where we needed more space, so No. 4 building was erected that summer, and occupied in October, the same month that we formed a sales connection with the Federal Electric Company, of Chicago, which has continued most satisfactorily ever since.

This connection came about through Mr. John F. Gilchrist, Vice President of the Commonwealth Edison Company, one of the finest and truest friends that Sangamo and Mr. Bunn and I personally ever had, following a very satisfactory report to him on type "H" meters from Mr. O. J. Bushnell, to whom I have referred before as our long time critic, friend and advisor.

The variable resistor for amperehour meters.—Hodde puts one over on us

GOING back to amperehour meters for use with "floating" batteries, as in axle generator train lighting, it was evident, by the spring of 1912, that our field would be greatly limited unless we could find some way of getting the necessary difference in speed on charge and discharge, in a two-binding post meter, in other words, one that could be put in the battery line, and which would automatically go slower on every change from discharge to charge. I had all sorts of schemes, none practical, until one day in May "Dutch" Hodde came to me with a suggestion that Jake Bard and I said wouldn't "work." Dutch didn't say anything more *then*, but one day about a month later he came in and said "I've got a freak meter on the rack out here, and wish you would

come see what's the matter." So when I arrived, here he had an amperehour meter all fixed up according to his scheme, and as he threw the switch back and forth from charge to discharge, and the meter changed speed each time, Dutch grinned, and said, "Well, now, does it work?" Thus was born the "variable resistor," which met every requirement, and which has been so successfully used in every amperehour meter since that time. This experience taught me a lesson about condemning too quickly any engineering suggestion, until thoroughly investigated and tried out.

With the development of the variable resistor, the application of the amperehour meter with axle-generator train lighting equipment became possible, and our success in this field was greatly aided by Edward Wray, who was then editor of the principal technical magazine in this field, and who had become interested in the amperehour meter when it was first announced, following extensive experiments he had made with train lighting equipment while a student at the University of Wisconsin a year or so before. A few years later he came with Sangamo as Assistant General Manager, continuing with us until 1921, when he returned to the field of technical publication, after devoted and successful service to us.

Again Ernest Lunn—

ERNEST LUNN, to whom I have referred as the "father of the amperehour meter," left the Commonwealth Edison Company towards the end of

1912, to take charge of car lighting for the Pullman Company, and, following his successful experience of several years with our meters, and now having available the "variable resistor" meter, he recommended to the Pullman officials that these meters be installed on their electric lighted cars, practically all of which were equipped with axle generator devices. They had experienced much trouble with proper charging of the batteries with these equipments, often resulting in loss through too frequent battery renewals, so early in 1913, Mr. Lunn began installing meters on their cars, and during the next two or three years equipped nearly all Pullman cars, then numbering some 6000, with Sangamo meters. He estimated that within two years they thus saved on batteries more than the cost of the meters. In later years, improvements in axle-generator control devices rendered amperehour meters less necessary, but many of them, after more than twenty years, are still in regular use on many Pullman cars, and on other cars of the principal railroad systems.

Amperehour meters for the Pullman Company.

THE spring of 1913 was marked by an event that meant much to Mr. Bunn and me, when we paid Mr. John W. Bunn in full the amounts he had so generously and willingly advanced Sangamo, which enabled us to carry on through the losing years from 1904 to 1911, in which year we at last began to get on our feet financially, and reached a sound condition within another year.

Repayment of loans which carried us through the lean years.

The H-2 meter—1914. First improvement on the original type H.

THE next year we brought out the H-2 meter, based on the general design of the original "H," but greatly improved through the inventive genius of Jake Bard, to whose ability and hard work Sangamo owes so much.

Sales arrangements abroad.

IN the same year we made one of the most important export connections of our history, when Warburton, Franki & Co., became our agents for Australia, an arrangement which has continued most happily to this day, and which is now about to be further strengthened by Mr. Warburton's decision to undertake the partial manufacture of type "HM" meters at Sydney.

The next year we formed a sales arrangement for Japan with the Ashida Engineering Company of Osaka, and soon afterward Mr. Ken Ashida came over for his first visit with us. This connection continued with mutual friendship and esteem until Mr. Ashida's death in 1927, and his company, now headed by his brother, still continues as our agent in Japan. I shall tell later of our manufacture of meters at the Ashida plant.

Thus, 1915 marked important progress for us in the export field, as 1906, '07 and '12 had in the domestic field and our business with Warburton, Franki and Ashida throughout the years since, testifies to the value of these fine representatives.

Our venture in the domestic refrigeration business—1915–1919, The Springfield Refrigeration Co.

IN the spring of 1915, a Capt. Alfred Girard, formerly in the Army medical corps, came to Springfield to visit relatives, bringing with him a small refrigerating machine, for household use, which he had conceived while serving in the Philippine Islands some years before, and had built the model shortly before his visit to Springfield.

Mr. Ernest J. Bechtel, Vice President and Chief Engineer of Hodenpyl, Hardy and Co. (now the Commonwealth and Southern Corporation) happened to be in Springfield at that time, so he, Arthur Mackie and I went to see the machine, and were so impressed by its possibilities and "Cap" Girard's enthusiasm that we discussed with other men in Springfield and New York the idea of forming a small company to develop Girard's machine, and shortly thereafter incorporated the Springfield Refrigeration Company.

This company made a contract with Sangamo to do the necessary experimental work, and we started off with high hopes. During the next two years we made many changes and improvements in Girard's original machine, most of this under his direction, retaining, however, ammonia as the refrigerating medium, which was a mistake, as this was never really suitable and safe for a household machine.

After Captain Girard returned to the service in 1917, and as we were very busy during the war, our experiments with the refrigerating machine became very sporadic, and finally in 1919, the Springfield Refrigeration Company "folded up," and Girard

took back his patent rights, and built some machines with a company in Chicago. Unfortunately, he was several years too early in this field, especially as the little company we organized did not have a fraction of the capital necessary to carry the machine to commercial success.

Sangamo came out of this undertaking with a considerable loss, but it was valuable experience.

Our exhibit at the Panama-Pacific Exposition, San Francisco—1915. Highest award given us.

OUR first exhibit at a great exposition was at the Panama-Pacific, at San Francisco, in 1915, where we had a very handsome booth, adjacent to our good friends, the Bristol Company of Waterbury. Although neither this, nor subsequent expositions where we have exhibited, were commercially valuable to us, yet we had the satisfaction of receiving at San Francisco the highest award given for devices of the general type that we exhibited. It was during my visit to our exhibit in June, 1915, that I met J. G. Monahan, who some years before had been with the Ferranti Company in Canada, and who had gone to Los Angeles to live, shortly before we met. It didn't take us long to make an arrangement for "Jerry" to represent us at Los Angeles, and we have always felt happy over it, as it has proved most satisfactory for both Jerry and us.

Development of Economy street railway meters—Larry Gould—1917.

ABOUT this time we became interested in the development of a special type of direct current watthour meter for use on street railway cars, and soon thereafter, arranged with L. E. Gould, of Chi-

cago, a man of long experience in the street railway field, to sell these meters for us. The next year, 1917, "Larry" and we organized a separate company, the "Economy Electric Devices Company," to devote its efforts to the sale of "Economy" meters, and through Larry's ingenuity in adding important features to these meters, and his ability and energy as a salesman, we soon equipped many important street railway systems. Eventually, the job was so thoroughly done that most of the important systems in this country, and many in foreign cities, Paris, Rio de Janeiro, Amsterdam, Yokohama, etc., were equipped with these meters, and we found few worlds left to conquer with them. So a few years later we turned the "Economy Electric Devices Company" over to Mr. Gould and some of his associates, who broadened their line to include other devices used by street railways and it so continues to this time.

No. 5 Building erected—1916. No. 6 Building—June, 1917

AS our business thus increased, we again faced the need for more space, so in the spring of 1916 started the erection of No. 5, our main building, which was occupied in October of that year. Then, with further demand imposed by the war, we had the Austin Company erect one of their standard buildings, our No. 6, which was done in record time, as they broke ground early in June, 1917, and we started operations in the building just *six weeks* later!

Scott Lynn came with us 1910—Beginning of Canadian manufacturing under him—1916.

EARLY in 1910, a young fellow came to us soon after leaving the Naval Academy at Annapolis, Scott Lynn, who soon became one of the most valuable men in our organization, and, after some years in engineering work at Springfield, represented us for a short time at Salt Lake City, his home, and then took charge of our office at Rochester, N. Y. The year after he came with us, and about two years after Mr. Alfred Collyer became our agent for Canada, we organized the Sangamo Electric Company of Canada, Ltd., at that time purely as a selling medium for Canadian business. By 1916, our business there had grown to a point, and Canadian duty restrictions on U. S. meters were such, that Mr. Collyer strongly urged that we begin manufacturing on a limited scale in Canada, so, as Scott Lynn seemed the logical man to take charge of this work, we sent him to Toronto in December, 1916, and the next month started operations in one floor of a loft building on Adelaide Street, West. Under Scott's able direction, our Canadian business rapidly increased, so, within a year, we were obliged to take another floor, and considerably extended the manufacturing work done there, although still supplying many parts from Springfield. By the end of 1918, it was evident that we were in Canada to stay, so, on the urgent recommendation of Mr. Collyer and Scott Lynn, Mr. Bunn went to Toronto and purchased the building at 183 George St. This, extended and enlarged several times in later years, we still occupy.

The Weston Company and Sangamo send W. B. Hale to South America—1916. Arrangement with Newbery and Rodriguez Buenos Aires.

DURING this period, in 1916, we met Mr. Wm. B. Hale, through Mr. Edward Weston and Mr. Caxton Brown, Mr. Hale having been the Weston representative in Mexico City for some years, and, as Weston and we were anxious to extend our business in Latin American countries, we jointly engaged Mr. Hale, and during that year and 1917, he made a long trip for us to all the countries of South America, developing a lot of new and satisfactory business, especially at Rio de Janeiro, Buenos Aires and Lima.

Mr. Hale made another trip for us about two years later, and then decided to remain at Rio as our representative, later transferring to Buenos Aires, where he continued as our agent for several years.

Following this, we made an agency arrangement for Argentina with the excellent firm of Newbery and Rodriguez, which was discontinued a few years later, on account of difficult competitive conditions there, but, I am happy to say, was renewed last year (1935) to the satisfaction of both parties.

Sangamo's representatio in the World War.

THE entrance of the United States into the World War brought to us, like all companies of any size, many problems, first, loss of many employes to the service, second, obtaining necessary materials, and third, employes to take the places of those who left. As to materials, we had relatively little trouble, for we were soon placed on the list of preferred industries by the War Industries Board, but it was very

difficult to obtain men, and thus became necessary to use women for many jobs formerly performed by men, and it was amazing how well they did such work.

As soon as war was declared in April, 1917, the first to go was our Sales Manager, Barela Southwick, then Captain of Company "C," and soon after Sumner Rogers, our Production Manager, who was a Captain in the Reserve Corps, left, soon followed by Goin Lanphier, our Purchasing Agent, Dana Johnson, Roy Butherus, Donald Funk (who had just come with us from Yale) and many others, so we eventually had a total of 162 in the service, of whom four lost their lives in action, a record of which Sangamo is very proud. Those left at home also had responsibilities in connection with the war, especially our President, Mr. Jacob Bunn, who served as Chairman of the Second District Draft Board, discharging this difficult responsibility with characteristic tact and fairness.

Death of Jacob Bard—December, 1918.—Fred Holtz comes with us soon thereafter.

JUST at the end of the war, late in November, 1918, our beloved and brilliant Chief Engineer, Jacob Bard, was taken down with the deadly "flu" then prevailing, and on December 13th passed away, his death following soon after that of George Torzillo, our valued and able sales manager from the fall of 1917.

Bard's loss was a real calamity for us, and I did not see how he could ever be replaced, but Fate intervened, in the rather remarkable way she sometimes does, and we got Fred Holtz, who came with us early in January, 1919. Mr. Bunn and I had met Fred in 1916, through our good friend, Mr. Henry Babson, of Chicago, when Fred was Associate Professor of Electrical Engineering at the University of Nebraska, to which he had recently returned after several years' valuable experience with the General Electric Company at Schenectady, and especially with Dr. Steinmetz.

We were then anxious to have him come with us, as assistant to Jake Bard, but before our discussion reached a conclusion, we were in the war, and Fred entered the service, ending in November, 1918, as Captain in the Signal Corps. So, knowing he would soon be out of the service, he wrote me the *very week* that Jacob Bard died, asking whether we would have an opening for him, so, the day after Jacob's death, I wired him to come to Springfield, which he did, and, after a very short talk with Mr. Bunn and me, decided to come with us. We secured his early release from the service, and he thus came with us to begin the organization and development of a full-fledged engineering department, which has been responsible, more than any other factor, for our success in the years since 1919.

RIGHT after this we received a letter from Mr. Charles Hunter, Managing Director of the Edison-Swan Electric Company, Ltd., of London, saying he had heard of our meters through a mutual friend, and as their arrangement for the sale of a

Our connection with Edison-Swan Electric Co. Ltd. of London—1919. My trip to England that summer.

well-known English meter had recently been terminated, they wanted an arrangement with us for the British Isles and Australia. Following our favorable reply, "Ediswan" sent over one of their directors, Mr. Edward Gimingham, who had been associated in "Ediswan" with Sir Joseph Swan and Mr. Edison, almost from its inception in the late '70s, to negotiate a contract with us, and he stayed in Springfield several weeks in February, 1919. Mr. Bunn then decided that I should go to England to further investigate this very important matter, before concluding an agreement with "Ediswan," so in April, shortly after Mr. Gimingham's return, I went over, remaining nearly four months to work out an arrangement, and to visit our agents in Barcelona, Paris, Milan, Brussels and The Hague. After much cabling and writing to Mr. Bunn, he finally approved a contract with "Ediswan," for an initial period of ten years, under which we gave them our exclusive agency for the British Isles and India, and non-exclusive for Australia, the latter being made possible only through the courtesy of Mr. Warburton, who kindly waived his exclusive agency for Australia (which he has again had since 1933) to enable us to make a deal with "Ediswan." Under this contract, "Ediswan" agreed to erect a building for us at the west side of their works at Ponders End, Middlesex, which was started that fall, and finished early in 1920, and to undertake an active sales campaign on Sangamo meters in Great Britain. As a first step in this, I visited most of their depots in England and

Scotland during June, 1919, being most courteously received by their depot managers and salesmen, and the high light of the trip was when I went with Mr. Hall, of their Glasgow depot (now, I am glad to say, with British Sangamo) and obtained a fine order from the Clyde Valley Electric Company, "Ediswan's" first Sangamo business. I am happy to say that Clyde Valley Company has continued ever since as one of the most important of our customers in the British Isles.

Also, during this trip to Scotland, while going from Glasgow to Edinburgh with Hall, I had a brainstorm which resulted in our K.V.A. meter, a new conception, I believe, in measuring and recording the energy, wattless energy, and varying power factor of a polyphase circuit.

Arrangement with M. Delamare.—We open our office in Paris—1920.

DURING my visit to Paris in May, I met M. Albert Delamare, for many years before representing Landis and Gyr in Paris, and made arrangements with him to represent us in France. Following this, Mme. Delamare and he visited Springfield the following winter, and when they returned to France, he started energetically and successfully to develop business for us there, but after a year or so, the increasing restrictions of the French government on importation of foreign meters made it practically impossible to continue selling in France, so in July, 1921, we had to discontinue our arrangement with M. Delamare, to our great regret.

Rogers' trip to the Orient —1919–20. Beginning of British Sangamo— 1920.

IN February, 1919, Sumner Rogers returned from the service, and, anticipating an arrangement with "Ediswan," we decided to send him to England to take charge of our venture there, but, in preparation, decided to have him make a trip to Japan, Australia, New Zealand, and the East Indies, to acquire a first hand knowledge of the market for meters in those countries, and to assist Mr. Ashida in determining further expansion of our activities in Japan. Rogers had a very interesting and successful trip of ten months, from May, 1919 to March, 1920, and late that fall, went to England. In the meantime, after considering the organization of a British company jointly with "Ediswan," we had decided to own it entirely, so, early in 1920, British Sangamo Company, Ltd., came into being, and soon afterward, in February, we sent Roy Butherus to Ponders End to get our testing equipment installed in the new building, and to start preliminary manufacturing, mostly with parts sent from Springfield. Roy had come with us, as a very young lad, in 1912, and after several years in the factory and testing room, went into the service, gaining valuable experience in the Signal Corps. After his return from France, he was again in the testing room, and, when we looked around for a capable young fellow to send to England, to take charge of assembling and testing, "Dutch" Hodde selected Roy, and we have had every reason, in the years since, to congratulate ourselves on this happy choice.

Later, Roy became Secretary, Chief Engineer and

Superintendent of British Sangamo, but, eventually, as the business grew, devoted himself entirely to the two first duties, and to him, our great success in England in using Bakelite, and the development of our prepayment mechanism, are due.

Actual production at the British plant was considerably delayed for various reasons, but finally got under way in April, 1921.

My trip to Barcelona— May, 1919— The LC amperehour meter.

DURING my visit to Barcelona, in May, 1919, I visited the Ebro Power Company, a subsidiary of the Canadian and General Finance Corporation, and found them interested in our A.C. meters, but also anxious to obtain a D.C. amperehour meter for house service, a purpose for which our mercury meter was not acceptable to them. They were therefore using a European make of commutator type amperehour meter, and, after examining this, I rashly said we could make a better one, at a competitive price, so Ebro gave us an initial order for 1000 of the proposed meter. On my return home, I put the problem up to Fred Holtz, and we soon designed a meter, called the "LC," and during the summer of 1920, shipped the first order, and more, to Barcelona. But this job was just grief from the start,—for the engineering department, for the factory, and, worst of all, for our customer, so, after expensive effort to get these meters right, and finding their cost prohibitive as compared with the price we could get for them, we gave up this venture, and wrote off a large loss to experience.

To be continued.

A new book, by **Martin Swetsky**, FNAWCC. **A GUIDE TO ELECTRICAL HOROLOGY** includes: chapters on history, electrical principles, repair hints & tips, plus repair reference info. This book may be purchased from Mitchell Swetsky, 10 Chelsea Way, Fairport, NY 19450. Price $42. Post Paid.

New publication: 60-page booklet with facsimiles of instructions and drawings re: **FAVAG** clocks with Hipp-toggle, period 1930-1960 (all in French). $25 including postage. Rare French book on CD-Rom, easily printable (in .tif format: "Horlogerie electrique-1ere partie-Horloges-meres et installation horaires" by **Ch. Poncet**, Cluses, 1905, 227 pages. 25 USD or 25 EUR. Order email, viredazepal @bluewin.ch, or address Michel Viredaz, Chemin du Raidillon 48, CH-1066 Epalinges, Switzerland.
Send money in banknotes, no checks please.

CD containing animations of 40 different electric clock systems (such as **ATO, Brillie, Bulle, Campiche, Eureka, Garnier, Gent Hipp, Lowne, Poole, Shortt, Synchronome, Tiffany, Wagner**) and 20 slave movements. Included are some biographies and portraits of inventors and a large reference list to relevant literature. Price $20, includes shipping. J. E. Bosschieter, contact me at BoscoClocks @Zonnet.nl

BARR cylindrical pendulum assembly. Brass bob 1 3/4" long, 1" diameter, overall length 6.5". $10.00
Sal Cabibbo 345 Summit Ave., Hackensack, NJ 07601. Phone/FAX (201) 489-8176

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

NAWCC National Convention Chapter #78 Meeting Report

Chapter #78 depends upon the Journal of the Electrical Society as its main method of exchanging information between those interested in electric clocks. However, we also try to hold informal meetings at various Regional Meetings and at the National Convert ion. This year at the National Convention in Charlotte, NC the meeting was very well attended with 34 members and interested collectors participating. Eight new members joined the Chapter which was an added benefit. Bill Ellison chaired the meeting and provided a brief demonstration of the use of an inductive pick-up (a telephone pick-up) attached to a beat amplifier in setting-up electric clocks. Inductive pick-ups respond to electrical noise and normally produce fairly distinctive sounds as the clock operates. These sounds can be very helpful in determining if a problem in a clock is mechanical or electrical. Brian Mumford then demonstrated one of his very sensitive inductive pick-ups and how the computer could be used to analyze how a particular clock is performing. Brian noted that this type of analysis is just beginning and we have a lot to learn abut this aspect of electrical clocks.

These informal Chapter #78 meetings feature open discussions and questions and answers from those in attendance. This meeting was typical and several sources of items useful to electrical clock collectors were mentioned. These sources will be summarized in the next issue of the Journal and, perhaps, we will be able to continue this type of listing as new sources are discovered by our members.

As a close to the meeting, Jeff Hamilton of Tallahassee, Florida was kind enough to demonstrate a copy of a CD entitled "From Bain to Shortt". This CD shows the operating principles of 41 electric clocks in an animated format. These animations are very detailed and even the shape of the various clock hands are accurate for each clock. The CD also contains photographs of electric clocks and electric clock makers. Finally, a bibliography covering electric clocks and clockmakers is provided. The CD was developed and produced by Mr. J. E. Bosschieter who can be contacted at www.BoscoClocks@zonnet.nl. Copies of the CD can be purchased from Jeff who can be contacted at www.clockmaker.com.

Bill Ellison

--- MART ---

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

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

Junker **EARLY BATTERY CLOCKS**, Movements, Parts, etc, send details.
Martin C. Feldman, 6 Stewart Pl., Spring Valley, NY 10977

D.E.H.O. slave; please send size, condition and price.
Kenneth Erlenbusch, 124 North Avena Ave., Lodi, CA 95240, e-mail kene_lodi@gotnet.net

Gents or **Synchronome** slave movements.
Jon Carpenter, 17436 S.R.I., Spencerville IN 46788 – email: JON6313@AOL.COM

REPAIR: ALL EARLY BATTERY CLOCKS Specializing in **BULLE** using orig. parts.
Martin C. Feldman, FNAWCC, 6 Stewart Pl., Spring Valley, NY 10977

HARD TO FIND PARTS AVAILABILITY:
BULLE suspension assemblies, fabric type, just like the originals. **TIFFANY** Single Contact suspension springs (0.004") The Horolovar Co., Box 264, St. Clair Shores, MI 48080 (313)882-9380

TIFFANY Double Contact Suspension Springs: Use a **Hamilton** Ladies Watch Mainspring, Specification: **HAMILTON** 6/0 #2521, 1.40 mm x 0.12 mm x 11¼". Available from:
Bill Schroeder @ $3.00 each + postage. 6033 N. Sheridan Rd., #31H, Chicago, IL 60660,
(773)275-2563. Also available from most Watch Parts Suppliers.

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

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

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

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

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

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

THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78

NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXIX #3, SEPTEMBER 2003

Fellow Horologists:

This issue of the Journal continues Catalog #32 of the Standard Electric Time Co., of Januaty, 1910, and also the story of "Sangamo, a History of Fifty Years" by R. C. Lanphier and B. P. Thomas. We are also starting a new series on Silent Electric Clocks, material provided by Harvey Schmidt.

During this past summer, there have been informal meetings of Chapter #78 held at several of the Regional meetings in additional to a slightly more formal meeting held at the National Convention. Chapter #78 carries out its main business via the Journal. However, it is interesting and enjoyable to meet with fellow electrical clock enthusiasts. Several interesting clocks were shown during a "Show and Tell" portion of the meetings and some very helpful repair tips were described. If you are planning to attend a Regional, please check the program to see if there is an Electrical Horology Society meeting planned. If not, how about hosting a meeting.

During the meeting at the National Convention held in Charlotte, NC this year, several attendees suggested that a listing of sources for electrical parts would be helpful. In response to this suggestion, a listing of sources that I have found useful is included in this issue of the Journal. This listing is not an official endorsement of the Chapter and it is by no means a complete listing. If you have other sources that you have used, please let me know and we will add these sources to a later issue.

The New England Chap. 8 has scheduled an all day symposium dedicated to Henry Warren, Warren Telechron, GE Clocks, and selected topics of interest in Electrical Horology. The event is to take place at the Warren Conference Center in Ashland, Mass. on Saturday, October 11th, 2003. For more information call Burt Kassap, V.P. Chap. 8 at (617) 332-0162 or e-mail milbur @earthlink.net.

Enjoy this issue of the Journal.

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

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

2

TELEGRAPHIC ADDRESS:
"SILECTOCKS, BARB, LONDON."

TELEPHONE. 2820 CITY.

ALL COMMUNICATIONS TO BE ADDRESSED TO THE COMPANY.

TRADE MARK: "SILECTOCK" SYSTEM.

CODE USED: A.B.C. 5TH EDITION.

THE SILENT ELECTRIC CLOCK COMPANY, LIMITED,

192, Goswell Road,
London, E.C.1.

CONTRACTORS TO H.M. POST OFFICE, H.M. HOME OFFICE, CROWN AGENTS FOR THE COLONIES, EGYPTIAN POSTAL ADMINISTRATION, &c.&c. ALSO TO MANY RAILWAYS, BOTH AT HOME AND ABROAD, INCLUDING THE EGYPTIAN STATE RAILWAYS, THE CENTRAL ARGENTINE RAILWAY, THE SOUTH AFRICAN RAILWAYS, &c. &c. &c.

GOLD MEDALS, LONDON, 1909. GHENT, 1913.

REF.

YOUR	
OUR	MB

31st. March. 19 19

C. J. Robertson Esq.,
Oakholme, Hampton-in-Arden.

Dear Sir,

We thank you for yours of the 29th. inst. with enclosure and duly enclose our receipt herewith.

Yours faithfully,

For THE SILENT ELECTRIC CLOCK Co LTD

M Boswell

SECRETARY

THE SILENT ELECTRIC CLOCK CO LTD
192, GOSWELL ROAD, E.C.

1209 31 MAR 1919 191

Received from C J Robertson Esq.
the sum of Twenty Pounds Ten
Shillings and Six Pence
for goods supplied.

For THE SILENT ELECTRIC CLOCK CO LTD
£20-10-6 M Boswell
SECRETARY

ONE PENNY

NOTES UPON THE INSTALLATION & MAINTENANCE OF "SILECTOCK" ELECTRIC CLOCKS.

INTRODUCTORY.

The general principle of an Electric Clock System is that ONE "Master" Clock controls a number of subordinate dials, all of which indicate the time kept by the Master Clock.

DIAGRAM. 1.

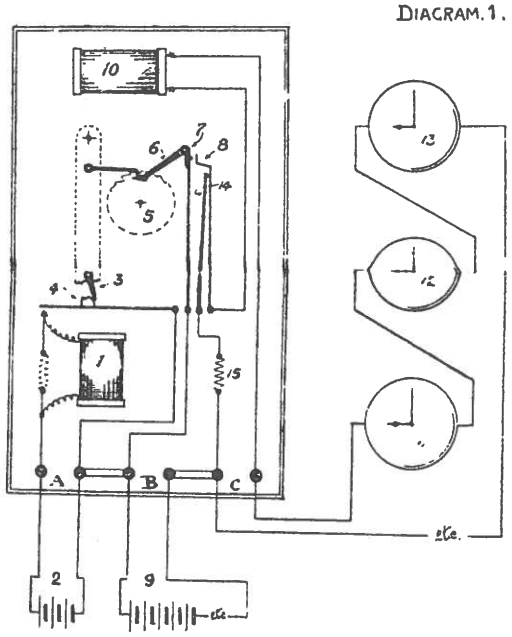


Diagram I. shows CONNECTIONS, &c., in MASTER CLOCK for working the clocks from Battery Supply.

The Pendulum of the Master Clock is kept swinging by occasional impulses from electro-magnet (1). The Battery of three cells (2) which actuates the pendulum is switched on to the magnet whenever the trailing nib (3) fails to swing clear beyond the block (4), and consequently depresses the contact spring.

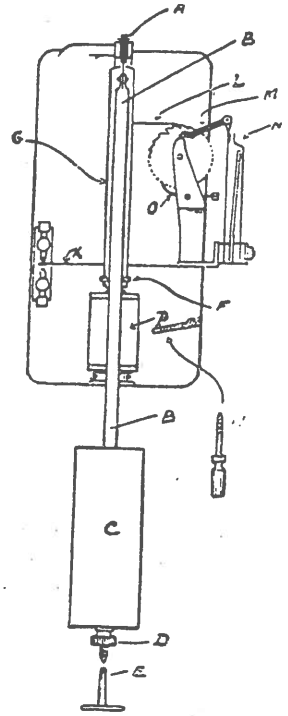
These contacts should only be made about once every 20 to 25 seconds in a Master Clock with short pendulum ("Half-seconds beating"), and about once every 60 or even 80 seconds in a Master Clock with long pendulum ("Full Seconds beating"); and the deterioration of this battery (which should normally be about 4 volts) can be detected by the gradually increasing frequency of the trailing nib's engagement with, and depressing the block. When this depressing occurs more frequently than once every 10 seconds, the battery is in need of renewal.

At each swing, the pendulum feeds forward a countwheel (5) which has one of its thirty tooth spaces (or two, in the case of the Long Pendulum clock—since the long pendulum takes exactly twice as long to swing across) *cut extra deep*, so that at each thirtieth second the driving click engages into link (6), and so actuates the main contacts (7) and (8), thus completing the circuit from the Main Battery (9) via dial (10) to all the distant dials (11), (12), (13), etc. To prevent sparking, the contact (8) is arrested by contact (14) at the instant prior to breaking of the main circuit, and contact (14) is connected through a non-inductive coil (15) to the return end of the line. This coil (15) as ordinarily fitted in a Master is suitable for an installation up to twenty-five clocks, when driven by battery supply. From 25 to 40 clocks an extra coil is inserted, and from 40 to 60 two extra coils. (N.B.—**See Diagram II. with reference to Installations actuated by Electric Light supply.**)

The duration of this main Contact at (7), (8) is about one-fifth of a second, and *is correctly adjusted* before leaving the Works. If it appears too brief or too long (see SECONDARY DIALS), it **can** be altered by bending the brass spring to the left to lengthen, or to the right to shorten, the duration of contact; but before attempting this, it is advisable to make sure that the Master Clock case has been fixed truly upright—a **very** important point.

FIXING OF THE MASTER CLOCK IN ITS POSITION.—A pendulum clock must be fixed securely upon a rigid and upright wall to ensure good timekeeping. It should not be fixed in a position where it may be subject to great extremes of temperature, or where much dust is likely to settle upon it.

The case can first be hung on one screw by the sunk plate at its back. Then place the pendulum in position, and when the pendulum hangs true to the indicator gauge at the bottom of the case, the other fixing screws may be driven in, and the case made secure to the wall. The Battery and Dials' Circuit wires can now be connected to the terminals in the case, and the whole installation set going by starting the pendulum swinging—far enough to let the trailing nib pass clear over the block (Diagram I., 3 and 4).



This illustration shows the parts of an ordinary Half-seconds Master Clock mechanism:—

A.—The " chops " where suspension spring rests.
B.—The pendulum rod.
C.—The bob.
D.—The rating nut.
E.—The gauge-piece at bottom of the case.
F.—Fork of pendulum crutch frame.
G.—Pendulum crutch frame (not used in Full Seconds Master mechanisms).
H.—Screw for securing crutch frame during travelling (not used in Full Seconds Master mechanisms).
K.—Spring carrying block into which trailing nib falls to actuate pendulum. In the Full Seconds mechanisms this is a double set of springs.
L.—Driving click.
M.—Link to contacts (see 6 in Diagram I.).
N.—Contact springs (see 7, 8, in Diagram I.).
O.—Backstop.
P.—Electro-magnet driving pendulum (see 1 in Diagram I.).

THE SECONDARY DIALS each have a mechanism comprising the gear wheels, the rotary armature, an electro-magnet, and a permanent magnet. The permanent magnet holds the armature in definite position (corresponding to a half-minute on the dial face), but at each thirtieth second the electro-magnet is energised and pulls the armature forward a distance corresponding to a quarter-minute on the dial face, and when the current impulse ceases, the permanent magnet pulls the armature (which is so formed that it cannot travel backwards) forward a similar quarter-minute step, where the armature is held by the permanent magnet until the next thirtieth second. Thus the movement of the hands in their clearly defined " two-step " motion gives a clear indication of the conditions under which the dial mechanism is working. The two steps should be clearly defined and apparently of equal strength, *because the permanent magnet pull has been carefully adjusted* with a fixed " keeper " (the position of which must *not* be shifted) at our Works, to ensure that the current necessary to actuate the dial mechanism is the **same** for every clock.

BATTERY AND WORKING CURRENT.—All our subordinate dial mechanisms are made to work at a normal working current of 250 milliamperes. If this amount is exceeded, say doubled, no harm will be done to the dial mechanisms (but see paragraph " CONNECTING UP THE DIALS "), and if it drops to perhaps 210 milliamperes the clocks will still respond; but, to obtain satisfactory working, the current should be maintained at a steady 250 milliamperes. For all ordinary household clocks our No. 1 mechanism is used, with a resistance of 5 ohms, so that at 250 milliamperes there must be a voltage of 1.25 volts per clock. To obtain this from ordinary dry cells or wet cells, an allowance of something like 3 cells to every two dials of the circuit should be made—thus allowing for the drop in the voltage of the cells. If dry cells are used, and there are many points in their favour—cleanliness, less variation of resistance, etc.—good ones, and in a medium size, are recommended. If wet cells are used, they must be substantial circular zinc pattern, and must be kept in good order. In any event, the battery should be kept in a cool place, out of harm's way, but not difficult of access. For larger clocks, such as 24-in. dials, Tower clocks, we make larger mechanisms, which work at the same 250 milliamperes, and can therefore be connected up with the smaller clocks, but which need a higher voltage; as, for example, our No. 4 mechanism, worm-driven, for Tower clocks, driving stout exposed hands in the open, and taking 4.5 volts.

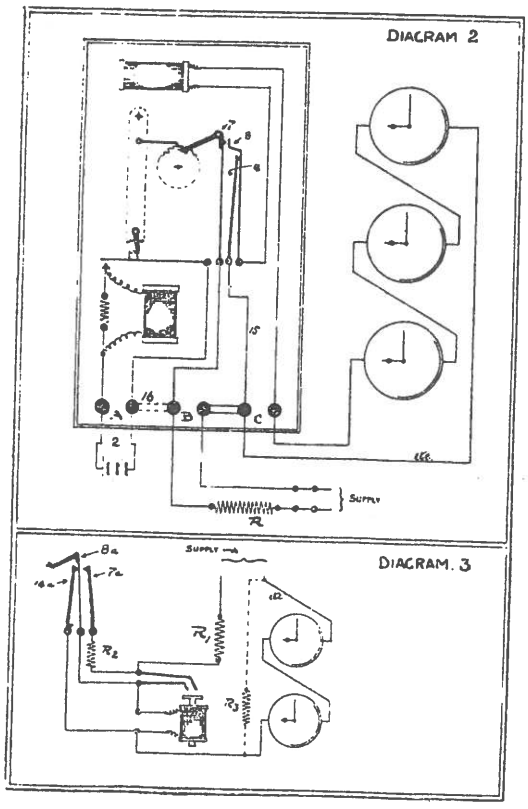
TABLE OF OUR STANDARD MECHANISMS.

No.	Resistance.	Working Current.	Volts.
1.—Ordinary Indoor Clocks	5 ohms	250 m.a.s.	1.25
2.—Larger Indoor Clocks, up to 24-in. diameter	6.5 ohms	250 m.a.s.	1.625
3.—Outside Clocks—glass over hands, up to 36-in. diameter	14 ohms	250 m.a.s.	3.5
4.—Outside Clocks—exposed hands. Worm-driven, up to 3ft. 6ins. diam.	18 ohms	250 m.a.s.	4.5
5.—Outside Clocks—exposed hands. Worm-driven, up to 5ft. 6ins. diam.	55 ohms	250 m.a.s.	13.75

For remarks upon use of Direct Current Electric Light supply, see Diagram II., and instructions thereon. If small Accumulator Cells be used, and kept in sound condition, the number required can be substantially reduced by arranging the wiring of the installation so that two separate circuits of dials are run from the pair of terminals (marked C on diagram) labelled " DIALS " in the Master Clock—but, of course, in this event, the dial on the Master (10) must be arranged to work in conjunction with this parallel arrangement. This is sometimes used when, say, 60 or 70 clocks are in one installation, such as a Railway Station or large Hotel (see Diagram IV.).

CONNECTING UP AND STARTING AN INSTALLATION.—It is extremely important to connect all dials so that the current enters by the left (IX o'clock) side, and if the clocks are connected up reverse way they will not respond to the proper working current. A simple way of ascertaining whether all the clocks of an installation are connected up properly is to set them going for a few minutes, and then stop the Master Clock, *having previously reduced the battery supply*, so that only about 210-220 milliamperes is given. The dials that are connected the wrong way will have failed to respond to this low current, and their wires can then be reversed. Then add cells to bring the battery to its proper strength, and set going again. *This is of special importance*, because a dial connected the wrong way will respond to an excessive current, such as may be given by a new battery, and in the course of a few days when the battery drops to its normal strength this wrongly-connected dial will fail to respond, and will get slow to the others, without any apparent reason.

Since the hands can be moved gently by pushing them round (as one can alter the hands of an ordinary mechanical clock), it is advisable to set the whole installation to indicate the same time, somewhere near true time, before setting the Master going. It is important to see that the link (6) is **below** the driving click, and the latter can be raised gently to allow the link (6) to fall into its proper position. All connections having been made—and each pair of terminals, shown A, B, and C on the diagram, are labelled distinctly " PENDULUM BATTERY," " DIALS' BATTERY " and " DIALS " respectively—the pendulum should be set swinging gently by hand, so that the trailing nib (3) passes clear over the block (4). To set the whole installation forward a few minutes, it is an easy matter to wait until the driving click has fallen into the deep notch on the countwheel (5), and simultaneously and gently lift the backstop underneath the countwheel. This results in the driving click remaining **in** the deep notch, consequently every swing of the pendulum sends out impulse throughout the circuit, putting the dials forward a half-minute at each second. In ten seconds one can in this way set the installation five minutes fast. It must be borne in mind that the dial on the Master Clock case is just an ordinary one in the series, and may require its connections reversed like any other, and that altering its hands from the face has no effect upon the remaining clocks. Any uniform alteration of the time of the whole installation can only be effected by sending additional impulses from the countwheel at the Master-Pendulum mechanism, or (if the whole lot of clocks are fast) by ceasing the sending of the impulses. This latter can be done either by gently stopping the pendulum from swinging—being specially careful not to do this when the driving click is engaging in the deep notch on the countwheel; or (*but it must be done carefully*) gently lifting the link (6) so that it is away from all possible engagement by the driving click. If this latter course is adopted, special care must obviously be taken so that the contacts at (7) and (8) are not closed, or else an impulse may be sent through the installation—and an impulse sent by a careless push of the finger may produce a disarrangement of the time of the dials, because it is more than likely it will have been too " splashy " a contact, instead of the firm, steady contact made by the driving click.



WIRING.—All the electrical connections throughout the installation should be carefully made. The wire used should be of good quality, No. 20 v.i.r., or 3/25 v.i.r., and should be run in tube or conduit, unless the installation is only a few clocks. If the wires have to pass through damp or exposed places, extra precautions should be taken to avoid current leakage.

REGULATING MASTER CLOCK. — This is done exactly as in any ordinary pendulum clock, turning the rating nut at the bottom of the bob to the right to go faster, or to the left to go slower. When, however, a close degree of accuracy is required, the best method is not to stop the pendulum, but to drop small weights on the top of the bob—the adding of such weights raising the centre of gravity of the bob, and causing the clock to gain slightly.

SPECIAL NOTES re UTILISING ELECTRIC LIGHT SUPPLY FOR ACTUATING THE DIALS' CIRCUIT.

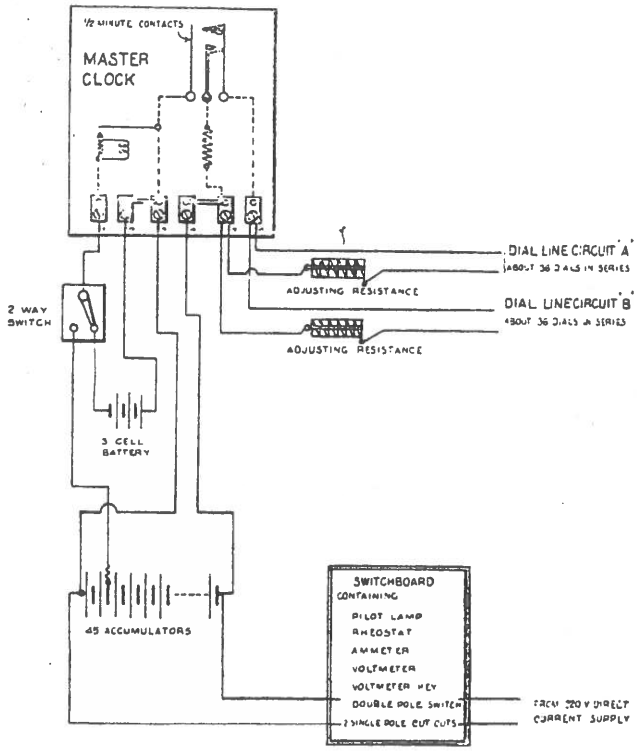
Diagram II. shows connections for working the dials from Direct Current Electric Lighting supply. This method provides sparkless action of the main contacts (7) and (8)—the whole of the line being short-circuited at contact (14) the instant prior to breaking the main circuit. It will be seen that at (15) a direct connection is made in place of the non-inductive coil used in a Battery System (see Diagram I.).

To ensure satisfactory working conditions, the arrangements as shown in Diagram II. should be limited as follows:—

Voltage of supply.	Maximum number of ordinary (No. 1 mechanism) Dials in a circuit.
200-250.	Forty-five.
100-110.	Thirty-six.
50.	Eighteen.
20.	Nine.

The Resistance (" R " on Diagram II.) must be non-inductive and of ample current carrying capacity. Its resistance (steady current value) is obtained by subtracting the total dials' resistance from 4×voltage of supply. A lamp resistance has many advantages, but if a carbon filament be used, it should be on the low side as to resistance, or if a metal filament, vice versa—on account of the relationship between hot and cold resistance.

Diagram III. is to show the general methods of using electric light supply for really large installations. The Master Clock contacts must be of special design, and a special relay switch is employed. The total dials' resistance plus that of R_1, should equal 4×voltage of supply. But R_1 should not be less than about 30 per cent. of the total dials' resistance. On a 240-volt circuit about 100 dials can be worked. For more than eighty, several circuits are connected in parallel and controlled by the same switch. In this case a dissimilarity in the respective ratios of R_1, and each dial circuit's resistance should be aimed at. Also if the dial's wiring be enclosed in metal conduit it is best to avoid making any appreciable lengths of run by single wire.



Resistance R_2 is to limit the current which passes through contacts 8a, 7a. Resistance R_3 is a permanent shunt. The value of R_2 should be such as to limit current to .3 ampere on a multiple circuit installation, or to about .15 on a single circuit one.

R_3 may be of any value between 4 and 6 times the joint resistance of all the dials' circuits, and is best determined by trial, because the requirements of the whole circuit would depend, not only upon the number and grouping of the dials, but also on the nature and extent of the wiring.

Diagram IV. illustrates an example of an installation in which (1) the dials are run in two parallel circuits, and (2) the source of supply is from accumulator cells. Adjusting resistances (in this case these were mounted together with milliamperemeter) were in each circuit to simplify equalising them. A special switchboard was arranged for charging the accumulator cells, and while the Master Pendulum was normally driven from three dry cells, a two-way switch was fitted so that it could be driven from the first pair of the accumulators while a new set of dry cells was being installed at any time.

GENERAL REMARKS.—The wiring for a large installation operated from a high voltage supply should be carried out in a substantial manner—not inferior to electric light wiring. All the wires where they attach to terminals should have the braiding cut back about an inch beyond the inner portion of the insulation (to reduce surface leakage).

All circuits should be efficiently protected with small fusible cut-outs. Those of the type used in telephone plant are preferable, or " heat coils " of suitable pattern may be advantageously used.

Where supply is from a " 3-wire system " the wire connecting from the " outer " should be the one leading to resistance (R., Diagram II.) and Master Clock contact, so that the return end of the dials' line becomes connected to the " neutral " wire of mains. This is important, for otherwise the dials' connections would be normally at a high potential relatively to " earth."

To be continued.

Continued from June, 2003 issue.

Fig. 454

STREET POST CLOCK, DOUBLE DIAL

This is a Secondary Clock, operated from a Master Clock, therefore unaffected by weather. Dials black, with gold numerals, or ground glass for illumination

30″ Dial

Standard Electric Tower Clock

The STANDARD tower clock is (1) compact, (2) strong, (3) not affected by snow or sleet, (4) has no weights (thus eliminating an ever-present source of danger in weight clocks), (5) is run secondary to the Master Clock, so that it shares its accuracy, (6) and is capable of successful installation in any tower.

Fig. 455 shows a tower clock mechanism mounted on a stand inside the tower. A small electric motor, completely enclosed, supplies the driving power. It is operated by primary closed circuit or storage batteries. The motor is started by the Master Clock, and after driving the hands forward exactly one minute is automatically stopped. Most ingenious locking devices are employed to ensure the positive and exact operation of these tower clocks.

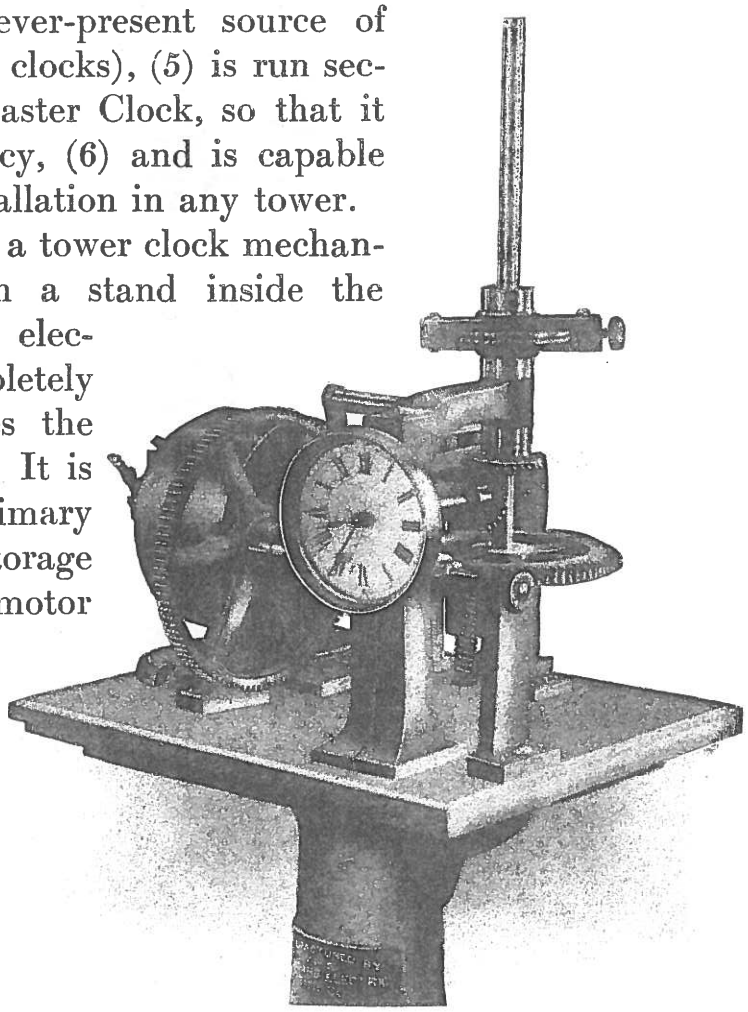


Fig. 455

Dimensions above Pedestal,—12¾″ x 16¾″ x 17¾″ high
Pedestal 35½″ high

The shaft shown projecting vertically terminates in a crown gear to drive horizontal shafts which run out to, and actuate, the clock dial mechanism on one or more sides of the tower.

Fig. 619

TYPICAL TOWER CLOCK INSTALLATION

When a STANDARD tower clock is required to strike, a separate motor operated from storage battery is used to actuate the striking mechanism. Thus an ample amount of energy is available for the work. Since the starting of the motor and consequent sounding of the bell is controlled by the Master Clock, its precision and regularity of action are assured. The control contacts are of cam type, described on page 9.

No two tower clock installations are exactly alike, hence full data should always be given covering the number and size of dial faces, whether desired for illumination or not, available space for mounting clock mechanism, whether or not striking mechanism is desired, together with drawings of tower if available; also voltage of charging current and whether A. C. or D. C.

Program Clocks

The function of the Program Clock is to control automatically the ringing of signals, or the operation of any other devices, according to predetermined schedules.

The Master Clock controls the Program Clock movement through the contact *F* (Fig. 574, page 7), which is made on the thirtieth second. This clock movement operates a drum with pins spaced around it so as to engage holes along the center of the Program Ribbon, Fig. 40. The Program Ribbon is of heavy bond paper printed on both edges with hour and minute divisions and run at a rate to complete a cycle in twelve hours. It is perforated near the edges, with a punch provided for that purpose, for the times the signals should be given.

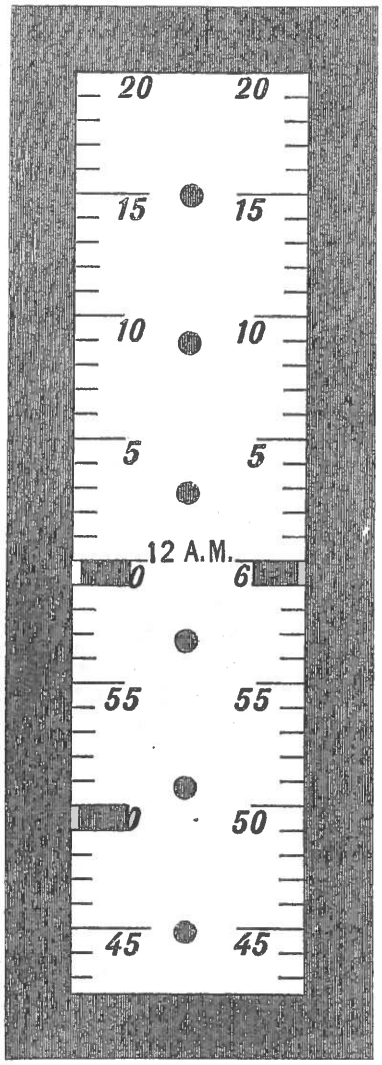


Fig. 40

Section of two-circuit Program Ribbon perforated near edges to ring one circuit at 11.50 and 12, and the other at 12 M.

Operation of signals is as follows: Consider one side of one circuit, wired through one of the four contact fingers shown resting on the Program Ribbons in Figs. 33 and 34. Directly under the contact finger, but ordinarily insulated therefrom by the ribbon, is the contact bar, which in turn is connected to the Master Clock Contact L–L^1, page 7.

Continued on page 55

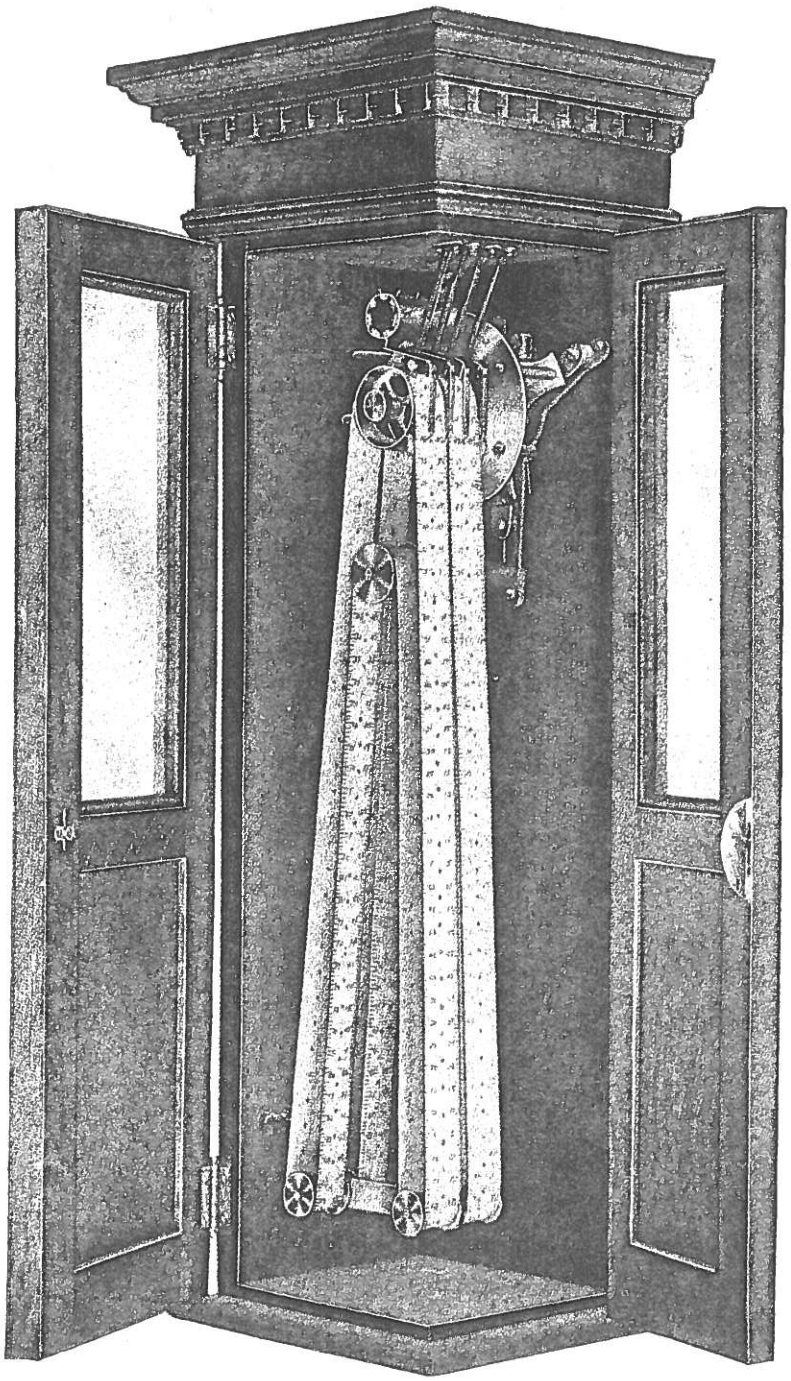


Fig. 34

PROGRAM CLOCK

Case open, showing working parts

List No. 208

This is a 4-circuit clock, the front view of which, with door closed, is illustrated by Fig. 33, page 56

List Numbers

With Program Relays	*Without Program Relays*		
199	**207**	2 circuits	12-hour ribbon
200	**203**	4 circuits	
201	**209**	6 circuits	

When more than a 6-circuit Program Clock is desired, combinations of the above 2, 4, and 6 circuit clocks can be arranged in suitable case.

Continued from page 53

For a definite number of seconds each minute, the circuit at L–L^1 is closed; and if the contact in the Program Clock is closed through a perforation in the ribbon, the bells or other apparatus will be actuated for a certain number of seconds during the *particular* minute for which the ribbon is punched. That is, there are two contacts in series: one is closed *every* minute for a definite number of seconds, and the other is closed *only* for *those* minutes in which the signals should sound. One controls the duration and the other the occurrence of signals.

Program Changer.— Above the drum driving the ribbon is a cylinder actuated every twelve hours, and so arranged that pins set into its circumference will lift any contact finger off of the ribbon for any period of twelve hours during the week, or for as many twelve-hour periods as desired.

The clock can thus be set to substitute automatically one program schedule for another, or cut out all programs for certain periods, which makes possible different schedules for different days of the week or for day and night. A Program Ribbon will control circuits from each edge, and the Program Clock can have one, two, or three ribbons; that is, be made for two, four, or six circuits.

The Program Clock may be mounted in a separate case, as in Figs. 33 and 34, or in a Master Clock case, as illustrated by Figs. 565 and 580, pages 57 and 58.

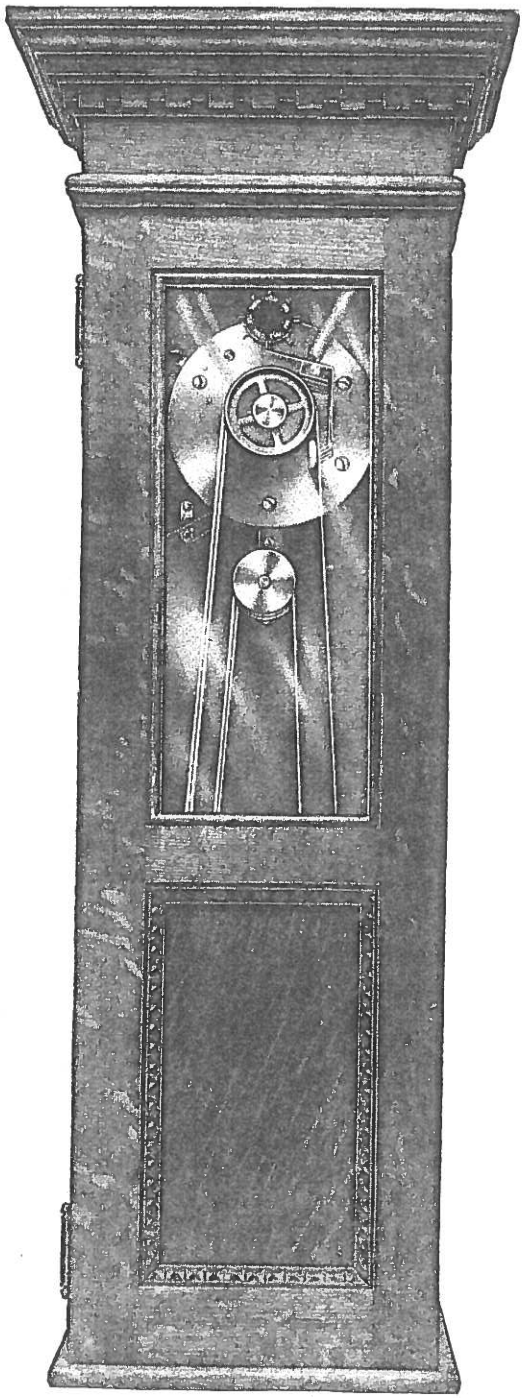


Fig. 33

PROGRAM CLOCK

Separate from Master Clock

No. of Circuits	Extreme Dimensions		
	Height	*Width*	*Depth*
2	31″	11″	$8\frac{1}{4}$″
4	31″	11″	$8\frac{1}{4}$″
6	31″	11″	$9\frac{1}{4}$″

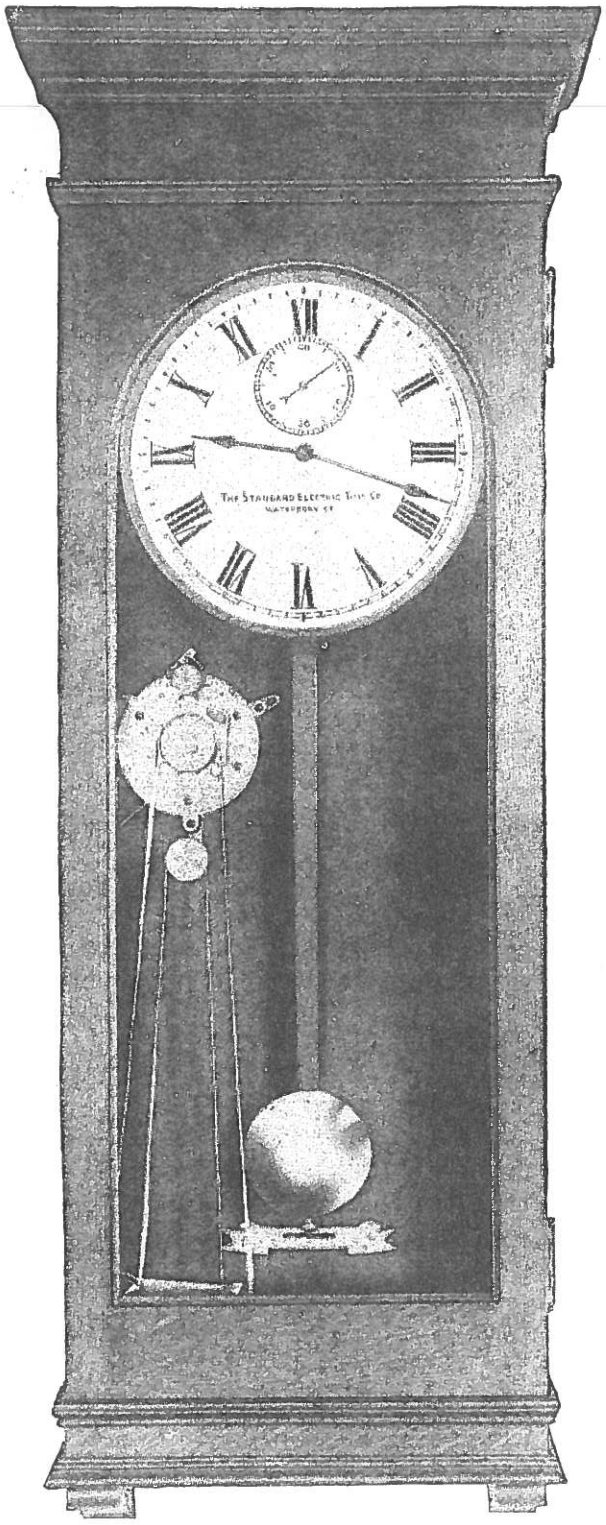


Fig. 565. List No. 66

MASTER CLOCK. 72 BEAT

With 2-Circuit Program Clock in Case

Metal Ball Pendulum

Extreme dimensions the same as shown for Fig. 481, page 21

57

To be continued.

Continued from June, 2003 issue.

Acquirement of ground and buildings from Illinois Watch Co.—January, 1920.

JANUARY, 1920, marked a great step in Sangamo history, when we bought from the Watch Company the land and buildings they had rented to us up to then. This transaction was financed by a bond issue to the Watch Company, and the early retirement of this obligation, within three years, was largely due to the excellent financial guidance of Mr. J. H. Holbrook. He had returned to Springfield, after several years with the National City Bank, of New York, in July 1920, to become Vice President of the Springfield Marine Bank, and, at the same time, a Director, and Treasurer of Sangamo, and continued in those capacities most successfully until his death in June, 1935.

No. 7 Building erected—1920.

DURING 1919, our business at Springfield increased so rapidly that we required more space, so had the Austin Company erect No. 7 building, which was occupied in 1920 by the assembling, testing, and shipping departments.

Our manufacturing venture with Ashida in Japan.—Dana Johnson takes charge there—1920.

AS a result of Rogers' long visit to Japan in 1919, and at the urgent request of Mr. Ashida, we decided to join with him in the manufacture of meters at Osaka, under an arrangement for sale of parts to him, plus certain royalties, while he planned to make bases, grids, covers, series coils and some other parts, and do the assembling and testing operations. It was evidently necessary to send a competent man from Springfield to take charge of this work, and again Hodde selected a man from his

department, Dana Johnson, who had also returned from the service in 1919. So Dana went to Osaka in the Fall of 1920, and as a first step, learned Japanese, so that he was soon able to assist Ashida in his sales work in Japan and Manchuria, as well as managing the manufacture of meters. He was very successful in his work, as evidenced by the rapid growth of our Japanese business for several years, but, following the great earthquake in 1923, there was such an enormous demand for meters in Japan that several European manufacturers rushed in and offered destructive prices, with the result that we decided, early in 1928, to withdraw Johnson from Japan, and he returned home in July, to take charge of our Lincoln meter business, as related further on. However, we continued our arrangement with the Ashida Company, which still manufactures Sangamo meters, some parts still being supplied by us and Canadian Sangamo, but most of the meter now being made in Osaka.

Development of the type N amperehour meter—1921.

EARLY in 1921 our Engineering Department developed the type "N" amperehour meter, doing away with the damping disk and separate damping magnets of the long-established D-5 amperehour meter and giving a much more rugged construction for the severe service to which battery meters are subjected. The "N" construction has been successfully used ever since, both at Springfield and at British Sangamo.

Mr. Bunn and I visit our British factory and the Continent—Spring of 1921.

EARLY in 1921, Rogers had some serious problems, both as to manufacturing, and our contract with "Ediswan," so, in February, Mr. Bunn and I went over, and determined on considerable additions to our then very meager facilities at Ponders End, and also adjusted certain features of our contract with Mr. Ford, Chairman of "Ediswan." We also visited M. Delamare in Paris, and our agent in Milan, our business in Italy then being quite important, though later brought to an end by the low-price competition of Italian and German meter manufacturers.

Production of moving picture, "Story of an Electric Meter"—1921.

THAT spring we engaged the Rothacker Film Company of Chicago, to produce a three-reel moving picture of our product and manufacturing operations, entitled, "The Story of an Electric Meter," one of the earliest of the industrial pictures produced in co-operation with the U.S. Department of Commerce, and the Bureau of Mines. The film was very successful, and having been first heartily approved by Mr. Hoover, then Secretary of the Department of Commerce, it was first released at the N.E.L.A. Convention at Atlantic City, in May, 1921, where it attracted such favorable comment that it was soon in great demand in this country and abroad, so that eventually some twenty copies were in circulation. During the eight or nine years that it continued to be shown, we estimated that over a million persons saw our "movie," so it was a good advertising investment for us.

Our first effort with demand attachments. Minerallac Electric Co. Chester I. Hall —1914–1915.

AS far back as 1914, we had been interested in the production of a demand attachment, having made an arrangement at that time with the Minerallac Electric Company of Chicago to manufacture their attachment, which was one of the first, if not the first, on the U. S. market, having been manufactured by them for several years. Their Chief Engineer, Mr. Chester I. Hall, therefore came to Springfield, where he spent much time for the next year or so with Jake Bard, improving the attachment, and supervising our manufacture of it. Unfortunately, just as we were well launched on this enterprise, the Minerallac Company was taken over by General Electric, and the production of these demand attachments was transferred to Fort Wayne, Mr. Hall also going with G. E., where he later developed many important devices in the demand metering field, especially the "Graphometer" and "Printometer." Through the courtesy and fairness of Mr. Fred Hunting, then head of the G. E. Fort Wayne works, and my good friend of many years, all of our material in process, tools and other items, for the production of Minerallac attachments, were taken over at a price that let us out without any loss on the undertaking, but we were thus left without any demand device. So, during the next two years, Jake Bard gave such time as he could to the problem of developing demand devices of our own, and built several very interesting models of graphic demand meters. However, with his death, no further work was done until late in 1919, at which time Fred

Holtz and Jim Martin began the development of an attachment, and especially of a small synchronous motor for the timing element, which resulted in the famous Holtz patent application on our type "A" induction-reaction motor in 1921, and the production of the first type "H" demand attachment, embodying this motor, in the summer of 1923. The patent on this motor was finally granted ten years later, after a long interference declared by the patent office, and while other small synchronous motors, operating on different principles, such as our types "F" and "G," have been developed in later years, none, to us, has been so interesting as the type "A," still used, with very slight mechanical changes from the original, in our demand attachments and combination time-switch meters.

Development of the S-2 meter for export trade —1923.

IN 1923, recognizing the need for a smaller and less expensive A.C. meter than the type "H," for export trade, we designed the "S-2," which was thereupon produced at our Canadian and English factories, being superseded a few years later by the "S-3," similar in design, but improved in structure and performance. Manufacture of this meter was discontinued at British Sangamo early in 1928, but still continues as a very important part of our Canadian company's business, through whose engineering department also came the development of the "S-3" polyphase, and combination of the "S-3" with Lincoln demand elements, in the years between 1925 and 1930.

Second visit to British factory— January, 1924.

IN January 1924 Mr. Rogers cabled us of serious difficulties at British Sangamo in connection with a large order from Australia, which had come just at a time when the very existence of our British company was threatened through a combination of circumstances, so Mr. Bunn told me to go to England at once, and I arrived at Ponders End early in February. Within a short time we had worked out a program, and by the time I returned, early in May, British Sangamo was out of the woods, and on the successful upward course it has maintained since, principally due to the good business judgment and firmness shown by Rogers in this crisis, and the engineering ability of Roy Butherus.

Our relations with North Metropolitan Electric Supply Co.—George F. Shotter.

IT was also about this time that our British company began to enjoy the splendid business relations with the North Metropolitan Electric Supply Company, of Middlesex County, that have continued ever since, and thus to the personal relations with their Chief Meter Engineer, George F. Shotter, one of the leading authorities on meters in Great Britain, whose wise and unselfish advice and suggestions have contributed so much to the success of British Sangamo.

My friendship with Dr. Guido Semenza, of Milan.

DURING this trip I visited several of our agents on the Continent, but the outstanding event of the trip was my first meeting with the famous Italian scientist and engineer, Dr. Guido Semenza, of Milan, to whom I had a letter of introduction from his life

long friend, Mr. John W. Lieb, Vice President and General Manager of the New York Edison Company. Dr. Semenza was then, and until his untimely death in 1931, the Chairman of the International Electro-Technical Commission, head of the C. G. S. Meter and Instrument Company of Monza, near Milan, and one of the three greatest electrical engineers in Italy. He was a simple, kindly man, and I shall never forget the courtesies of himself and his family to us on this, and a subsequent trip to Italy in 1927. In the meantime, he honored us with a visit to Springfield in 1926, and expressed much pleasure in seeing our factory and laboratory.

Our venture in the electric clock business, beginning 1926. —Hamilton-Sangamo Co.— 1929.—Sale of business to General Time Instruments Corporation— 1931.

AND now I come to the most important venture in which Sangamo ever engaged, outside of the meter business—electric clocks. In the winter of 1923–24 Fred Holtz was in Europe investigating new developments and assisting our British factory, and, hearing a lot about several new types of electric clocks then being offered in England and on the Continent, he thought of using our little type "A" motor to wind the spring of a clock, not a new conception, fundamentally, but his idea was new in respect to several important features. On his return, he discussed his scheme with Mr. Bunn and me, and it sounded so good that Mr. Bunn asked him to build some models for which the Watch Company supplied movements. During the latter part of 1924 we built some forty clocks, which gave such good results over a period of several months that we decided

to engage in the manufacture of these clocks, and, after tooling up the following year, produced the first clocks in the spring of 1926, shortly before Mr. Bunn's death. Regular production of a handsome line of clocks, with several styles of cases made by Erskine-Danforth, was started that summer, and in October we announced these clocks to the trade.

At this time, synchronous clocks had not been generally accepted, as they were later, so our new line was favorably received by jewellers throughout the country, and we then started a very ambitious and expensive campaign of advertising of our clocks, both in trade and popular magazines. Early in 1928, the Hamilton Watch Company had purchased the Illinois Watch Company, and began operating the Springfield plant. Through our association with them, especially in the purchase of 11-jewel escapements for our clock movements, the suggestion was made in September, 1928, by Mr. Charles F. Miller, President of Hamilton, that we join forces in the electric clock business, resulting in organization, on June 1, 1929, of the Hamilton-Sangamo Corporation, equally owned by the two companies. The plan was for Sangamo to continue manufacture of the clocks, with Hamilton supplying the escapements and the sales experience.

Under this impetus, the new company started with bright prospects, but already the greatly increased vogue of synchronous clocks, at far lower prices than those at which we could sell our electrically wound clocks, was giving us difficult competi-

tion, and when the crash in all business started in October, '29, the problems of Hamilton-Sangamo became still more difficult. To meet the synchronous clock competition we therefore developed our type "E" non self-starting synchronous motor during the spring of 1930, and in August put on the market a new line of clocks embodying these motors, which were favorably received. However, we soon realized that we needed a self-starting synchronous clock, so later that year produced the first type "F" self-starting motor, principally due to the engineering ability of one of our principal research engineers, Fritz Kurz. We were about to offer a line of self-starting clocks embodying this motor, when, in December, 1930, the General Time Instruments Corporation of New York, owning the Western Clock Company ("Big Ben") and the Seth Thomas Clock Company expressed an interest in using the type "F" motor in their electric clocks. As we could not sell motors to any other concern than Hamilton-Sangamo, the upshot of the matter was that Mr. Ralph Matthiessen, President of G. T. I. Corporation, offered to buy the Hamilton-Sangamo Corporation, and thus obtain the exclusive rights to the use of all our motors, A.C. and D.C., for clock purposes, as well as the established business of the Hamilton-Sangamo Corporation. The business was therefore sold to G. T. I. Corporation in April, 1931, and Hamilton and Sangamo retired from the clock business, with considerable loss, but with much valuable experience.

Research Laboratory built—1924.

SHORTLY after Mr. Holtz and I returned from Europe, in the spring of 1924, we realized the inadequacy of our engineering and research facilities, so, with some hesitation, presented to Mr. Bunn our plans for a really complete and well-equipped laboratory. To our great satisfaction he immediately said he agreed with us, and to go ahead, so our present laboratory was built that summer, and occupied that Fall; it has paid for itself many times over since then.

Our venture in the radio parts business. Pressley circuit—1924.—Experiments with receiving sets—1925–27

IN the spring of 1924 our New York manager at that time, T. B. Rhodes, met a former army engineer named Pressley, who had recently invented a new radio "hook-up," involving the use of the superheterodyne circuit. At that time radio sets were being largely built by amateurs from sets of parts, tuning coils, transformers, condensers, chokes, etc., so Pressley planned to offer a set of transformers and fixed condensers to enable amateurs to employ his circuit. As he was well vouched for, and as his circuit was very good, we made a royalty arrangement with him, and in September 1924, put the "Pressley kit" on the market. It met with instant favor, but our success was short lived, for in December the Radio Corporation of America notified us that the Pressley circuit infringed some of their most important patents, so, on advice of our counsel, we discontinued manufacture of the Pressley parts in January, 1925.

However, in developing these parts we had made a very satisfactory fixed condenser molded in Bakelite, the first, I believe of this type, so we immediately followed the Pressley kit with our type "A" condenser, which, later, was supplemented by the cheaper "Illini" type, and both were successful.

During the great boom in production of radio sets in 1928–29, our sale of these condensers to manufacturers of receiving sets was very large, but with the crash this business dropped off sharply. However, the type "A" condenser still continues to be favored for use in important radio devices, and several other types are also now made by Sangamo.

Soon after the introduction of these condensers, in 1925, we learned of a very fine receiving set which had been developed by a group in the East, including some of our business friends, and for which license rights were being granted to a small group of well-known manufacturers. We decided to take a license, and then undertook development of a fine set, which we proposed to sell at about $600. We built nine sets, after much preliminary experimental work, at a cost of some $25,000.00, which were put in service early in 1927, and gave splendid results, but by this time, with the clock venture requiring large expenditure, we realized that we could not go on with radio sets except at great expense and at the risk of jeopardizing our meter business, so in 1928 the radio set project was dropped.

Mr. Jacob Bunn's death —May 10, 1926.

IN September, 1925, I had to go to California on business with Jerry Monahan and Lorrin Nott, so Mr. Bunn, Mr. Henry Merriam and Mr. Arthur Mackie decided to go along, as they said, to "check up" on me. We had a very interesting and enjoyable trip, until we reached the Grand Canyon, on our return, where Mr. Bunn became ill, but we thought it was only a cold. However, on our arrival home the middle of October, he was still sick, and then began the long illness, culminating with the greatest blow that has ever fallen on Sangamo, when Jacob Bunn passed away on May tenth, 1926.

For nearly thirty years I had been so closely associated with him, and had received from him all those years such unfailing interest, sympathy and understanding of our problems, that his going meant to Sangamo and to me a great void which could never be filled. Since his death, all of us associated with him have tried to carry on as we felt he would have wished us to, so whatever Sangamo is today is a monument to its founder and guiding spirit for so many years, Jacob Bunn.

Our exhibition Sesqui-Centennial Exposition Philadelphia —1926.

IN 1926, we had our second exhibit at a great exposition, the Sesqui-Centennial at Philadelphia, where, again our products, meters and electric clocks, received highest awards, but this exposition was not so well attended as had been anticipated, and our participation in it was not of great sales value.

Sangamo becomes a public company. Listed on Chicago Stock Exchange—June, 1927.

SHORTLY after Mr. Bunn's death, we were approached by Paul H. Davis & Company of Chicago, and Kissel, Kinnicutt and Company of New York, with regard to making Sangamo a public company, and listing our stock on the Chicago Stock Exchange, so in June, 1927, several of the larger owners of Sangamo sold a considerable part of their holdings, and the company was recapitalized with 125,000 shares of common stock, with par value of $16.00 per share, and 10,000 shares of 7% Preferred stock, with par value of $100.00 per share. A large block of both stocks was then offered to the public, in July, 1927, and was quickly taken up. Following this, Mr. H. I. Markham, partner in Paul Davis & Company, and Mr. Walter Robbins, then a partner in Kissel, Kinnicutt and Company became directors of Sangamo, our Board being increased to nine members, and both of them have continued to render most valuable service to us since that time.

Purchase of land for British-Sangamo plant near Enfield—Summer of 1927. First building erected—1928. Termination Ediswan sales arrangement—1933.

BY the end of 1926, British Sangamo had outgrown the building at the "Ediswan" works, at Ponders End, so in the summer of 1927, while I was in England, Mr. Rogers and I found a well located piece of land on the Cambridge Arterial Road, just outside of Enfield, one of the important manufacturing suburbs, twelve miles north of London.

During 1928 we erected the first building of the present British Sangamo plant, which was occupied in the summer, and, as the new plant was only three miles from the old factory at Ponders End, we were

able to retain nearly all of our employes at the old plant. By this time, Mr. Rogers had decided to confine his meter production entirely to our type "H," so manufacture of the type "S-2" in England was discontinued in the fall of 1928.

From 1926, we had had several discussions with "Ediswan" in regard to modifications of our sales agreement with them, and, failing to reach a satisfactory understanding when the original contract with them expired in 1929, we thereafter continued with them on a temporary arrangement, until we found, early in 1933, that British Sangamo could not develop as it should without control of sales being in its own hands. So, on July 1, 1933, "Ediswan" ceased to represent British Sangamo, and Mr. Eric Dymond, who had been our sales engineer for several years, became Sales Manager of the company, and rapidly organized an efficient sales organization, as evidenced by the fact that the business of our British Company has almost doubled in the three years since we took over our sales. Since 1928 there have only been two years when British Sangamo did not erect additional buildings, the largest additions, in space and equipment, having been made in 1935 and this year, so the plant is now one of the largest and best equipped for meter and time switch manufacturing in the British Isles.

Purchase tract north side Converse Avenue. Erection No. 1 Warehouse—February, 1928.

IN February, 1928, we purchased the six acre tract across Converse Avenue from our main building, and that spring erected our No. 1 Warehouse, as our

space for raw materials and finished stock had become entirely inadequate, and again this spring (1936) we built, adjacent to this, the No. 2 warehouse.

Improvements in construction type "H" meter —From 1914 to 1933.

GOING back in history of the type "H" meter, our principal product for the past quarter century, it is a matter of great pride to Sangamo that this meter has been essentially the same in principle and construction for a quarter of a century, the original design having been so well adapted to detail improvements and modifications, as the metering art progressed, that we have found it unnecessary to bring out an entirely new type of A.C. meter in all these years.

In 1914 the original "H" was slightly modified in the electromagnetic structure, and then brought out as the "H-2," then, some fourteen years later, compensation for temperature and overload were incorporated, and the designation (in the United States and Canada) changed to HC, this having been announced in January, 1928.

Finally, when the four U. S. meter manufacturers, in 1933, agreed on standardization of external features of all meters, further detail changes were made, resulting in the present HFA and HFS meters, but they can be recognized at a glance as "grown-up" brothers of the old "H" meter of 1911.

Beginning electric time switch business —1930.— Arrangement with Venner.

IF our electric clock venture was, otherwise, a losing venture, it brought one good result, our decision to go into the time switch business. We began

to consider this in the Fall of 1928, and shortly thereafter, Mr. Charles DeLong, formerly expert designer and model-maker for the Watch Company, showed us the model of an astronomical dial for time switches, some features of which were later incorporated in our present successful design. With this added interest, we hastened the development of a switch embodying our electrically wound clocks, both A.C. and D.C., with 11-jewel escapement made by the Watch Company, which, with almost no changes, still continues as the finest switch in our line, and unsurpassed by any other switch made in this country or abroad. We announced these switches in April, 1930, and in a year from that date, our time switch sales reached the modest volume of about $17,000.00.

Soon thereafter we realized the need of a less expensive line of switches for alternating current, and, as a first step in this direction, we made an arrangement, in January, 1930, with Venner of England, the leading manufacturer of time switches in that country, under which we obtained exclusive rights to their patents, designs, and sales experience for the United States and Canada. However, as our work on the new line of synchronous motor and electrically wound switches progressed, we found it necessary to depart, in many principal respects, from the Venner designs, and the VS and VW, as brought out in the Fall of 1932, therefore embodied many new features, developed in our Engineering department, the most important being the use of a quick

To be continued.

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

Sangamo and **Hamilton Sangamo** movements, motors, platforms, and other parts. Send SASE for list. **"Electrical Timekeeping"**, by F. Hope-Jones. 2nd Ed, 1949 Dust jacket a little ragged, contents are fine $35.
Harvey Schmidt, 75-80 179th Street, Flushing, NY 11366 or wwlathlot @AOL.com.

New publication: 60-page booklet with facsimiles of instructions and drawings re: **FAVAG** clocks with Hipp-toggle, period 1930-1960 (all in French). $25 including postage. Rare French book on CD-Rom, easily printable (in .tif format: "Horlogerie electrique-1ere partie-Horloges-meres et installation horaires" by **Ch. Poncet**, Cluses, 1905, 227 pages. 25 USD or 25 EUR. Order email, viredazepal @bluewin.ch, or address Michel Viredaz, Chemin du Raidillon 48, CH-1066 Epalinges, Switzerland.
Send money in banknotes, no checks please.

CD containing animations of 40 different electric clock systems (such as **ATO, Brillie, Bulle, Campiche, Eureka, Garnier, Gent Hipp, Lowne, Poole, Shortt, Synchronome, Tiffany, Wagner**) and 20 slave movements. Included are some biographies and portraits of inventors and a large reference list to relevant literature. Price $20, includes shipping. J. E. Bosschieter, contact me at BoscoClocks @Zonnet.nl

BARR cylindrical pendulum assembly. Brass bob 1 3/4" long, 1" diameter, overall length 6.5". $10.00
Sal Cabibbo 345 Summit Ave., Hackensack, NJ 07601. Phone/FAX (201) 489-8176

50 - **1908 SELF-WINDING CLOCK CO. CATALOGUES** reprinted in 1979 by Dr. Bengt E. Honning. New old stock. $35.00 ea. Including shipping. Roy Crowe, 9257Appleby St., Downey, CA, 90240, (562) 861-8788, email dcrowe 2259@AOL.com

---

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

SOURCES OF USEFUL ITEMS FOR ELECTRICAL CLOCK COLLECTORS by Bill Ellison

All Electronics Corporation: New and surplus electronics. Lots of interesting items. I particularly have liked the switching power supplies for powering electrical clocks. Order on 1-800-826-5432 or contact them on the Web at www.allelectronics.com.

Digi-Key and Mouser Electronics for new electrical components. I like the Keystone aluminum battery holders with the solder tabs. Both companies offer these battery holders.

Digi-Key 1-800-DIGI-KEY or www.digikey.com

Mouser electronics 1-800-346-6873 or www.mouser.com

Novus Inc. makes a product intended to clean and shine plastic. This product is marked as "Number 1" and it is sold in marine shops for polishing plastic windshields. Number 1 makes Poole clocks shine like new and I have had success cleaning up the "gold" finish used on Jefferson Mystery clocks.

--- MART ---

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

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

Junker **EARLY BATTERY CLOCKS**, Movements, Parts, etc, send details.
Martin C. Feldman, 6 Stewart Pl., Spring Valley, NY 10977

D.E.H.O. slave; please send size, condition and price.
Kenneth Erlenbusch, 124 North Avena Ave., Lodi, CA 95240, email kene lodi@gotnet.net

Gents or **Synchronome** slave movements.
Jon Carpenter, 17436 S.R.I., Spencerville IN 46788 – email: Jon 6313@AOL.com

Rotating contact for a **SELF WINDING** 60 beat rotary clock movement. Roy Crowe, 9257Appleby St., Downey, CA, 90240, (562) 861-8788, email dcrowe 2259@AOL.com

REPAIR: ALL EARLY BATTERY CLOCKS Specializing in **BULLE** using orig. parts.
Martin C. Feldman, FNAWCC, 6 Stewart Pl., Spring Valley, NY 10977

HARD TO FIND PARTS AVAILABILITY:
BULLE suspension assemblies, fabric type, just like the originals. **TIFFANY** Single Contact suspension springs (0.004") The Horolovar Co., Box 264, St. Clair Shores, MI 48080 (313)882-9380

TIFFANY Double Contact Suspension Springs: Use a **Hamilton** Ladies Watch Mainspring, Specification: **HAMILTON** 6/0 #2521, 1.40 mm x 0.12 mm x 11¼". Available from:
Bill Schroeder @ $3.00 each + postage. 6033 N. Sheridan Rd., #31H, Chicago, IL 60660,
(773)275-2563. Also available from most Watch Parts Suppliers.

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

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

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

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

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

THE JOURNAL OF THE ELECTRICAL HOROLOGY SOCIETY

CHAPTER #78
NATIONAL ASSOCIATION OF WATCH & CLOCK COLLECTORS

VOLUME XXIX #4, DECEMBER 2003

Fellow Horologists:

This issue of the Journal continues Catalog #32 of the Standard Electric Company dated January 1910. Also, the story of Sangamo by R.L. Lanchier and B.T. Thomas continues as does the series on the Silent Electric Clocks.

The symposium dedicated to Henry Warren that was sponsored by the NAWCC, New England Chapter #8 was excellent. The symposium was held at Henry Warren's home in Ashland, Massachusetts. Warren's home is now a conference center with motel accommodations on the grounds. It was possible to see the "Red Barn" from the conference room where we met. The Warren Mystery Clocks were produced in the Red Barn and what became the Telechron synchronous motor was conceived in this same location. For a brief review of the symposium see Page 23.

We have received an e-mail from Mr. Michel Viredaz informing us that the "Musée international d'horlogerie, La Chaux de Fonds" will organize a special exhibition about electric clocks from May to September, 2005,. We will keep you informed as we learn more about the exhibit and, if you are planning a visit to Europe in 2005 you may wish to schedule time for the exhibit.

On another matter, hopefully the information on sources of useful items for electric clock collectors included in the September JEHS was helpful. However, we have not received any additional sources from Chapter #78 members. Please let us know your secret sources. We will not tell anyone (except our members).

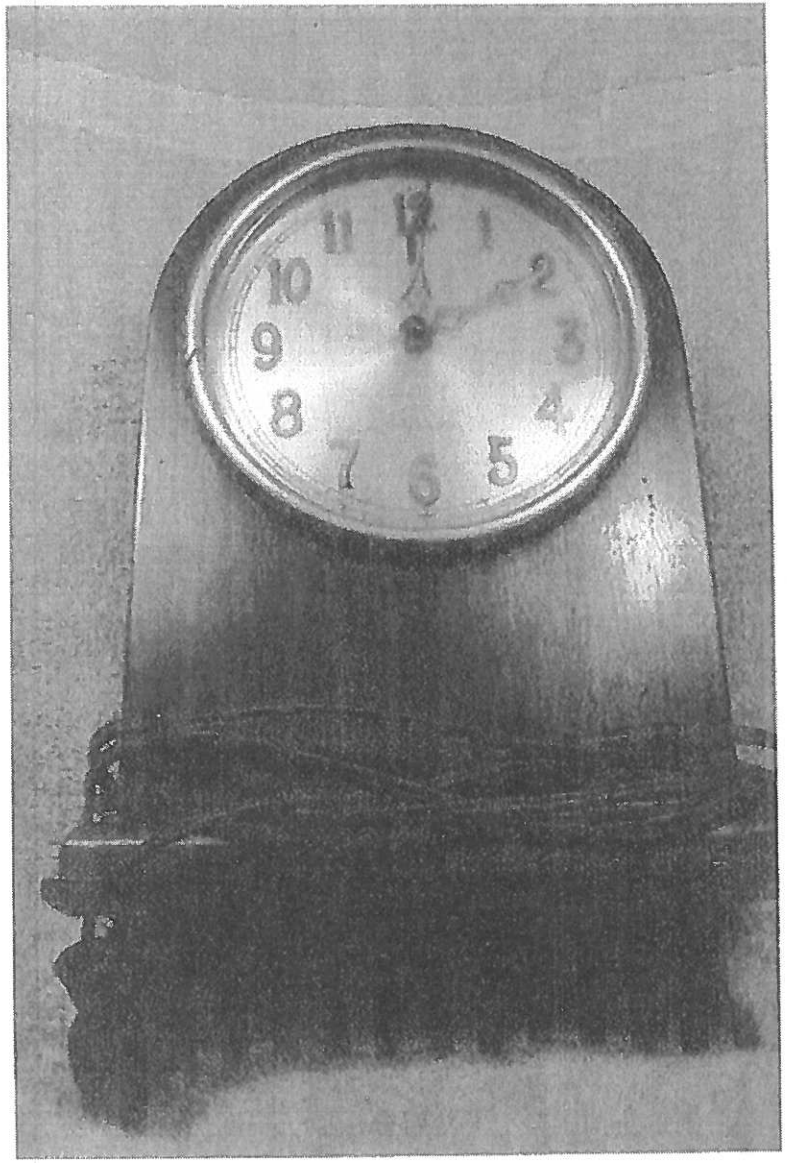
Speaking of Chapter #78 membership, it is time for our yearly dues payment. Dues remain $10.00, the same amount as has been the case for the last 30 years. A real bargain. Please pay promptly as it makes our Secretary-Treasurer's job much easier.

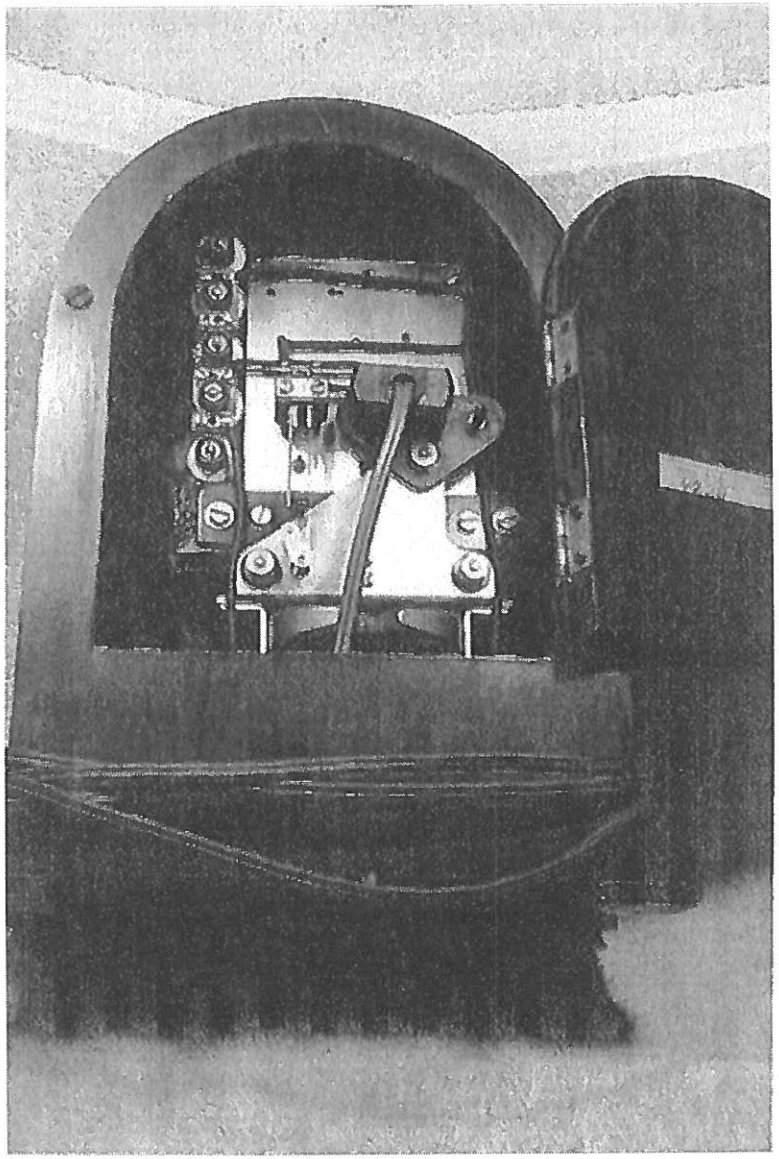
Finally, the March issue of the Journal is when the Mart secion of the Journal is "cleaned-up." Please let our editors know if you wish to continue your ads in the Mart.

Enjoy this issue of the Journal and have a happy holiday season and New Year.

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

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





On the dial is written "Landis & Gyr", on the outside of the back door "Herschede Hall Clock Co., Cincinnati, Ohio, USA. Panama Pacific International Exposition 1915 Grand Prize", on inside label "For direct current only #4229". Does anybody have any more information?

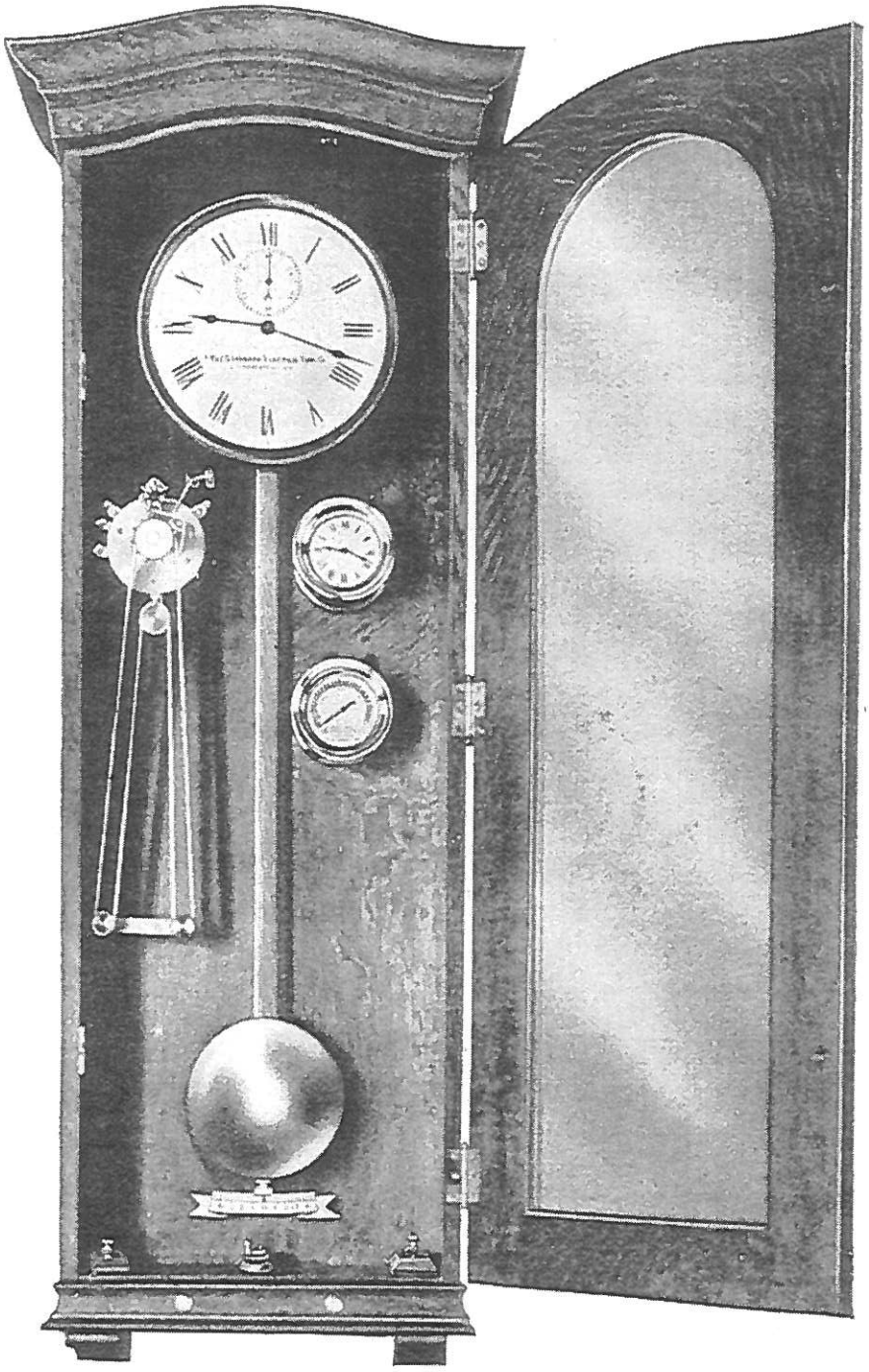


Fig. 580. List No. 32

MASTER CLOCK. 60 BEAT

With 2-Circuit Program Clock, Pilot Dial, and Battery Gauge in Case

Switches for system shown in base of case. Two push-buttons for ringing signals at other than scheduled times shown at front of base. Metal Ball Pendulum

Extreme dimensions are the same as shown for Fig. 634, page 12

Program Bells, Gongs, and Signal Lamps

These signaling bells are wired in parallel, and as many Program circuits used as there are different schedules to be rung. An automatic whistle valve, or any other device, can also be actuated by the bell circuit that has the same schedule.

Any number of bells or gongs may be controlled on one schedule or Program circuit with use of suitable relays. Prices of bells and gongs will be furnished upon request.

After an elaborate system of bells or gongs has been installed it may sometimes be desirable to change certain bells on one circuit to another Program. When such transposition is probable a connector board is used to which each bell or signaling device is wired, so that it is possible to switch any bell to any Program at will.

Signal or indicator lamps or other visual signals may be actuated by the Program Clock, since it can close a circuit to a relay which in turn will close the lamp signal circuit.

In engineering and industrial work the Program Clock has many important uses, while in schools it is invaluable.

REGULAR SIZES AND TYPES OF BELLS AND GONGS

Sizes in Inches	*Resistance in ohms*	*Type*
2½	35 or 60	Oak Box
2½	35 or 60	Dome
2½	35 or 60	Tea
3	35 or 60	Oak Box
4	35	Oak Box
6	15 or 35	Oak Box
8	15 or 35	Oak Box
6	15	Weather-proof
8	15	Weather-proof
10	15	Weather-proof
12	15	Weather-proof
14	15	Weather-proof

Electric Time Stamps

Time Stamps of the clock-containing type have been used with a measure of success, limited always by the inconveniences of winding and repairing them. The derangement of the clocks in this type is an inevitable result of the pounding to which they are subjected, since at each impression the works sustain a shock.

Evidently the way to make a reliable stamp is to remove the timing mechanism from the rough service inherent in stamping. This has been done by operating any number of stamps electrically from a Master Clock, so that the accuracy of the Time Stamp is equal to that of the Master Clock.

Precision therefore depends upon the service of the Master Clock, so that it is false economy to use other than a high-grade STANDARD regulator. Any of the self-winding clocks shown on pages 12, 15, 16, 19, 21, and 23 can be built to control Time Stamps as well as other Secondary equipment, when so ordered.

The Time Stamps automatically set themselves to the proper day, hour, minute, and meridian. They do not have to be wound, and only the months have to be set by hand. Different forms are shown on pages 61 and 62.

Time Stamps may be wound for almost any voltage, but are usually for 110 volts or from 15 to 30 volts. Relays must always be used for operating 110-volt stamps, and when more than two low voltage stamps are used a relay should also be employed; that is, the Master Clock should not be required to close directly a circuit to more than two low voltage stamps.

The relay for operating stamps may be placed either inside or outside the Master Clock case.

Time Stamps are always wired in parallel.

In ordering Time Stamps always specify operating D. C. voltage.

Electric Time Stamps

HOTEL ASTOR
AUG 27 1-45 PM 1908
NEW YORK

Fig. 473

FACSIMILE OF RECORD

In addition to the date, name, and address, any wording suitable to the business, such as *Received, Sent, Paid,* etc., can be used by simply turning a knob so that the word desired will be in place for printing.

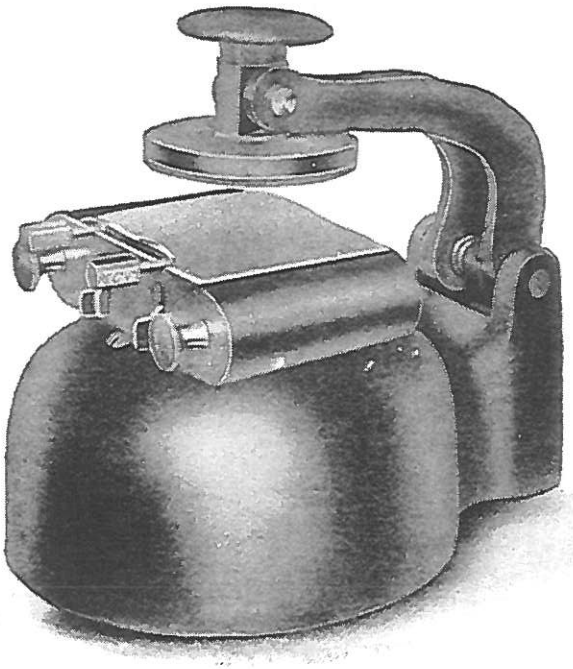


Fig. 472

Electric Time Stamps

Fig 475

Equipped with gauge for *In* and *Out* record cards, for time-keeping.

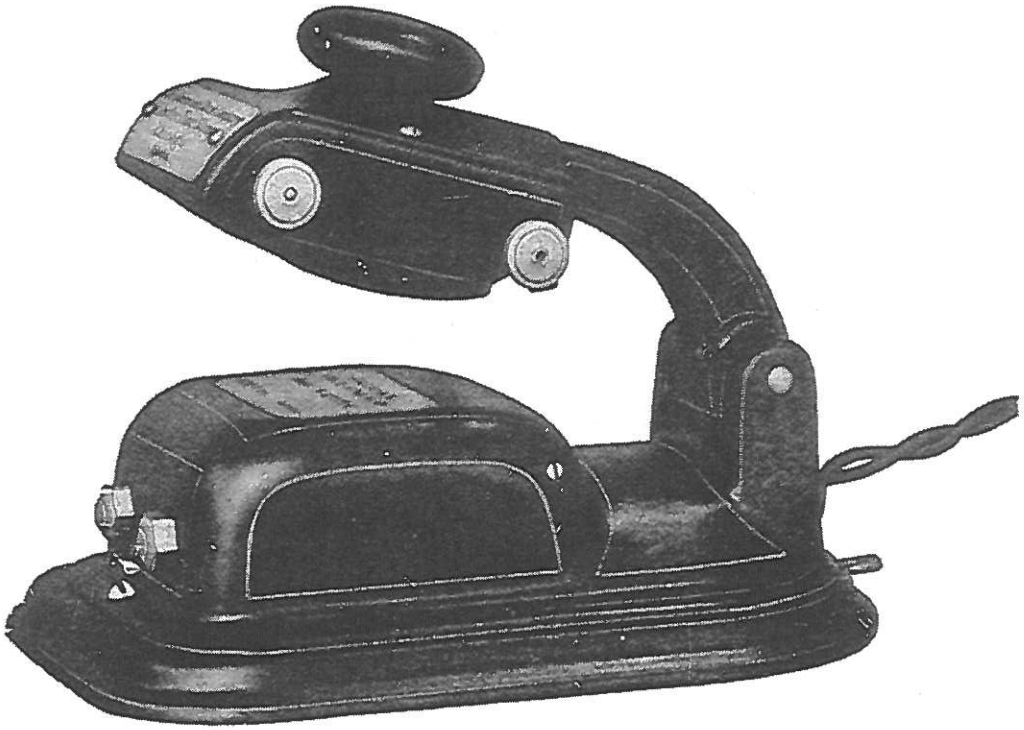


Fig. 486

Synchronizing Time Registers

ELECTRIC ESCAPEMENTS

Time Registers are now quite generally employed; and in large plants particularly, when several registers are used, it is almost impossible to keep the clocks together or correct, causing endless confusion and disputes. This all-important agreement and accuracy of clocks may be accomplished, however, by controlling all Time Register Clocks from a STANDARD Master Clock. A simple electric escapement attachment in each Time Register brings it into synchronism each minute with the Master Clock and other registers, thus eliminating all questions as to correctness, and saving the trouble and care in setting and regulating the clocks in Time Registers every day.

Registers of any make can be controlled by the STANDARD Time System. It 's the scientific and practical method of operating all time-keeping devices. Electric escapements are wound for series operation unless otherwise ordered.

Auxiliary Equipment

INDICATORS AND GAUGES

The Indicator or Pilot Dial is a small Secondary Clock mounted in a metal case and usually located inside Master Clock case. Its function is to show the time that is being indicated by the clocks on the particular circuit into which it is wired, so as to facilitate setting that circuit of clocks from set keys in base of Master Clock case.

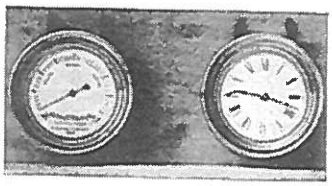


Fig. 617
Battery Gauge — Indicator or Pilot Dial

The Indicator may, however, be used as a regular Secondary Clock to indicate time at a distance from the Master Clock.

The Battery Gauge is mounted, ordinarily, in the Master Clock case, and so wired that it can easily be switched across any battery circuit to indicate if its strength is between the correct limits for the operation of the Secondary equipment.

Indicators and Battery Gauges are furnished, front or back-connected, for series operation as listed below.

	Front Connected	*Back Connected*
INDICATOR	**List No. 382**	**List No. 43**
BATTERY GAUGE	**" 383**	**" 44**

NUMERALS

Roman numerals are regular for all sizes of Stock Secondary Clocks. A great number of special forms of ornamental numerals have been made, some of which are shown on the dials, pages 43–49.

RELAYS

When the current and voltage for operating Secondary equipment become too heavy for the contacts in the Master Clock relays are employed.

The STANDARD type of relay will close a circuit of almost any current capacity used for Secondary Clocks. It is operated from the Master Clock by a current of about $\frac{1}{10}$ ampere.

Secondary Clock Movements

WITHOUT HANDS, DIALS, OR CASES

Secondary Clock movements in their brass movement cases, only, are required sometimes; and to facilitate ordering, the following table is inserted.

Face boards are those to the back of which the clock movement is fastened. When glass dials are employed the dial itself serves as a face board and should be $\frac{5}{16}$″ to $\frac{3}{8}$″ thick. For all wood face boards the standard thickness is $\frac{5}{16}$″ for No. 1 movements and $\frac{3}{8}$″ for No. 2 movements. For marble dials (which also act as the face board) the standard thickness is 1″.

SECONDARY CLOCK MOVEMENTS

Enclosed in Brass Movement Case. For Series Operation Unless Otherwise Specified

No. 1 Movement	No. 2 Movement		No. 3 Movement		
$\frac{5}{16}$″ Face Board	*$\frac{3}{8}$″ Face Board*	*1″ Face Board*	*$\frac{3}{8}$″ Face Board*	*1″ Face Board*	*Size Dial*
384					up to 12″
385					13″ to 14″
	386	390			15″ to 24″
	387	391			25″ to 30″
			388	392	31″ to 36″
			389	393	37″ to 48″
*$\frac{9}{16}$″	*1$\frac{1}{8}$″		*1$\frac{3}{4}$″		

*Space to be allowed between dial and glass for different movements.

HANDS AND DIALS

If hands and dials are required as well as the movements, order the regular style corresponding to the size of dial as shown on pages 66, 67, and 70. Mat dials are regular in the 8″, 10″, and 12″ sizes, and flat dials in 14″, 18″, and 24″ sizes.

To be continued.

Continued from September, 2003 issue.

break, short gap system, with silver button contacts, which has since proved so successful. Shortly before that time we started the manufacture of our astronomical dial, first applied on our original mercury tube switches, and then on the VS and VW. The other great factor in the success of these switches has been the Type "F" synchronous motor, already referred to.

Organization of Sangamo Fifteen Year Club—1927.

IN December, 1927 our "Fifteen Year Club," composed of employes with the three Sangamo companies for fifteen years or more, was organized, and since then has had many enjoyable meetings, with a dinner each December, when new members are taken in and given the much prized membership button, and a picnic for members and their families each summer. Sangamo takes pride in now having over 330 members of the Club at Springfield and 27 more at the Canadian and English plants.

Industrial survey and recommendations of Bigelow Kent, Willard & Co.—1929.

IN 1928, with our largely increased business at Springfield, we felt the need of outside advice on problems of production, handling of material, and costs, so, in September, engaged the well-known firm of industrial engineers, Bigelow, Kent, Willard and Company of Boston to make a preliminary survey of our plant and methods. This was completed and submitted to us in November, and indicated that many improvements, with consequent large savings, besides elimination of production jams in the shop, could be effected at a reasonable cost. So we engaged this firm to undertake the necessary

work, to which Mr. Kent gave frequent and able supervision from the beginning of the job, in February 1929, until its completion a year later, but the resident engineer for B. K. W. & Company, Mr. Tarr, deserves the great credit for what was accomplished. During his year with us he planned and installed the conveyor production lines in the Assembling and Testing Department, the conveyor line from No. 11 Department, changed location of many machines to eliminate lost motion, established a new and effective system of production control, and introduced important changes in our cost system.

As a result of this work, we saved the entire cost, including new equipment and machinery installed by Mr. Tarr, and all fees paid to B. K. W. & Company, in less than two years, not to speak of large economies in space utilization.

The Lincoln thermal demand meter and our association with it, beginning 1915.

THE story of Lincoln thermal demand meters, and our relation to them, is an interesting chapter in Sangamo history.

In 1915, our friends Col. E. A. Deeds, and Mr. Kettering, told me that their friend, Mr. Paul M. Lincoln, whom Col. Deeds had known during the early days of the Niagara Falls Power Company, when Mr. Lincoln was in charge of Westinghouse work there, had told them of an idea he had for a demand meter entirely different in principle from any other then used.

Owing to the fact that the meter engineers of Westinghouse, of which Mr. Lincoln was chief power

engineer, did not seem interested in his invention, he decided to have it developed elsewhere, so, at the suggestion of Col. Deeds, I met Mr. Lincoln in Dayton, and soon agreed to interest ourselves in his device. We finished the first model in September of that year, at which time Mr. Lincoln left the Westinghouse Company in order to devote his time to the commercial development of his meter, and the next month presented his first A. I. E. E. paper on thermal demand meters at an Institute meeting in New York, and exhibited the model we had made.

Following this, we were making plans to go ahead promptly under a verbal understanding we had with Mr. Lincoln, when I received a message from Mr. E. M. Herr, President of Westinghouse, asking me to meet him in Chicago, to discuss the Lincoln matter. He then explained to me that he was very anxious to have Mr. Lincoln return to Westinghouse, and had promised him that if he did they would build his meters. However, Mr. Lincoln, with a very high sense of honor, though not obligated to Sangamo by contract, refused to break his understanding with us, unless with our full consent and approval. Of course I told Mr. Herr that we did not want to stand in the way of what was best for Mr. Lincoln, and would consider our understanding with him cancelled, so, immediately thereafter Mr. Lincoln returned to Westinghouse, and in due course, they put his demand meters on the market, but made little effort to push them, at least, so Mr. Lincoln felt.

The United States having then entered the war,

little was done with Lincoln meters for a few years, but, in 1920, Mr. Lincoln having finally severed his connection with Westinghouse, and being unable at that time, under his contract with them on his thermal meter, to build them himself in the U. S., went to Canada, and organized the Lincoln Meter Co. Ltd., at Toronto.

He was fortunate in associating with him in this enterprise Mr. Stanley L. B. Lines, formerly with the well-known English meter firm, Chamberlain & Hookham. While Mr. Lincoln did not go to Toronto to live, he spent much time in Canada, and through the energetic and successful work of him and Mr. Lines, the Lincoln thermal meter, within a few years, became the standard demand device in Canada, and so continues to this time.

After a few years, about 1924, the Lincoln Company found a need for a combined energy and demand meter, and, as a result of Sangamo's early association with Mr. Lincoln, naturally turned to our Canadian Company to obtain the necessary watthour meter elements. The new instruments were thus announced and sold as Lincoln-Sangamo meters, and being eventually developed in many combinations, both singlephase and polyphase, found ready and wide acceptance in Canada and many foreign countries.

As a result of the close and friendly connection between the two companies, and, following several large orders for Lincoln demand meters from the Detroit Edison Company, Mr. Lincoln desired

again to undertake manufacture of his meters in this country, first, to sell them to Detroit without duty, and, secondly, to develop other business in the U.S., where up to this time, the block-interval type of demand meters had been used almost exclusively.

Organization of Lincoln Meter Company, Inc. in the United States, July 1928.

SO, in July, 1928, the Lincoln Meter Co., Inc., was organized with Mr. Lincoln, as President, holding a controlling interest, and Sangamo a minority, and a contract was made with Sangamo to manufacture Lincoln meters for sale in the United States. Rights for Canada and all foreign countries were retained by the parent Lincoln Company of Toronto.

Under the able sales direction of Dana Johnson, who had recently returned from managing our Japanese venture, the business of the U. S. Lincoln Company rapidly grew, with consequent value to it and to Sangamo.

Sangamo Company Limited acquires Lincoln Meter Co. Ltd. Toronto—1930.

THEN in 1930, it seemed desirable, for many reasons, to consolidate the Lincoln and Sangamo activities in Canada, so, in September of that year, the Lincoln Company, Ltd., became a division of Sangamo Company, Ltd., Mr. Lincoln and Mr. Lines becoming directors, and Mr. Lines also Vice President in charge of Lincoln meter sales, to which duty he gave fully of his ability and enthusiasm. His work was, unhappily, terminated by his sudden death the following spring, in April, 1931, a severe blow to our Canadian Company. The Lincoln plant,

on Stafford Street, Toronto, was taken over with the business of the Lincoln Company, and continued to be used for production of Lincoln meters to some extent, until this year, but is now exclusively devoted to production of Wagner motors for Canada, as referred to later.

In the fall of 1934, Mr. Lincoln, who had been for a number of years, as now, Director of the Department of Electrical Engineering at Cornell University, expressed a desire to dispose of his interest in the U. S. Lincoln Company, and in December, Sangamo acquired this on a mutually satisfactory basis, since which time the Lincoln Meter Company, Inc., although still retaining its identity, has been operated as a division of Sangamo.

The big 3-element meter order from New York Edison—Summer of 1931.

IN June, 1931, when our business at Springfield was beginning to suffer from the depression, we received an unexpected, and very helpful order from the New York Edison Company for 10,000 three-element HC polyphase meters with demand attachments, and some 8,000 clock movements for General Electric, to be used in D.C. demand meters for the Edison Company. These large orders kept us working at top speed until October, and contributed greatly to putting us in sound condition to meet the heavy losses of the next three years.

Changes in organization of British Sangamo—1932.

DURING 1931, Mr. Rogers told us that with the greatly increased business of British Sangamo, he felt it necessary to make some major changes in

his executive setup, so, in October Mr. Funk, our Vice President (and now General Manager), went to England to confer with Mr. Rogers and Mr. Butherus on this matter. As a result of their discussion, it was agreed that Mr. Butherus needed all his time for his heavy duties as Chief Engineer, and should therefore relinquish direction of manufacturing operations. This meant the selection of another man as Works Manager, so, at the suggestion of Scott Lynn, and as approved by Mr. Rogers and Mr. Funk, we sent R. C. Lanphier, Jr. to England in January, 1932, to undertake this responsibility, in which position he has since continued.

Proposed merger—Weston, Bristol and Sangamo—1929.

FOR many years, as far back as 1915, it had been suggested to us that a merger of Sangamo with certain other companies, and especially the Weston and Bristol instrument companies, might be advantageous, but the matter never reached active consideration until the latter part of 1929, when our friends Kissel, Kinnicutt and Company of New York approached these three companies, and, subsequently, two others in allied lines, in reference to a merger. While we were not especially eager for it, we agreed to submit data, as did Weston and Bristol, and in May, 1930, it seemed that a combination of these companies might be made, but the sudden death of Dr. Wm. H. Bristol, in June, put an end to the negotiations.

Our relation with Mr. Alfred Collyer beginning 1909

OUR acquaintance with Mr. Alfred Collyer began in 1909, through Mr. Walter Robbins, then Vice President of the Wagner Electric Manufacturing Company of St. Louis, whose products Mr. Collyer had been selling in Canada for some time. From then on, Mr. Collyer's principal lines were Wagner Motors and Transformers, and Sangamo meters, as I have mentioned.

Soon after the war, competition of Canadian made transformers decreased Mr. Collyer's business in Wagner transformers, all of which were imported from St. Louis, and later, as small A.C. motors were produced in Canada and offered at lower prices, his motor business, too, was adversely affected, so, during the latter part of 1931 Mr. Collyer decided, with Mr. Lynn and me, that the best interests of himself, his sales organization, the Wagner motor business, and Sangamo would be served by absorbing his organization into Sangamo Company Limited, Mr. Collyer continuing as Director and Vice President of Canadian Sangamo, and operating the Montreal offices. This change was made on January 1, 1932, and at the same time, our Canadian Company entered into an arrangement with the Wagner Company of St. Louis, under which it acquired exclusive rights for Canada to the Wagner motor business, with right to operate this business under the Wagner Company's name.

Soon thereafter, part of the old Lincoln plant on Stafford Street, Toronto, was equipped for production of the smaller sizes of Wagner singlephase mo-

tors, and part of the motor work was done at the main plant on George Street, but, with increasing motor business, an addition was built at Stafford Street this spring, and all motor manufacturing is now done there.

We go into sign flasher business—1932.

IN February, 1932, Mr. E. J. Schulenburg came to see us with reference to interesting ourselves in the manufacture of sign flashers, in which business he had been engaged for several years. As this seemed to fit in quite well with our time switch business, we made an arrangement with Mr. Schulenburg, under which we started the manufacture of flashers in a very modest way, but through his energy and knowledge of this business, it soon increased to a point where a separate department was required for the production of flashers.

In the few years since, our Flasher Department has supplied a number of intricate flashers for some of the best known and largest signs in the United States and Canada, especially in New York, Chicago, Toronto, Montreal and Cleveland. This business, started only a few years ago, has thus now become an important feature of Sangamo.

Herbert Nehls comes with us as Export Sales Manager—May, 1932.

IN May, 1932, Mr. Herbert Nehls, who had been a number of years, Sales Manager for North and South America for the well known meter manufacturing firm of Landis & Gyr of Switzerland, came with us as Export Sales Director. Soon thereafter he made a long trip to Cuba, South America and Mexico, followed by further trips to Cuba, Central America and Mexico, and then again in 1935 made a long trip to Europe and South America. Mr. Nehls' efforts so far have been principally beneficial to our Canadian Company, whose S-3 meter has been very popular in the export field, especially in Latin American countries, but his activities now extend in other directions, and he has proved most helpful to the three Sangamo companies.

Effects of the depression.—Large loss in 1932.

NINETEEN-THIRTY-TWO is a year that we look back on as a nightmare, for, with the growing force of the depression, our sales that year dropped below one million dollars, and, as a result, our net loss for the year was $268,790.00, a very severe blow to a company of our size. Furthermore, we were distressed through the necessity of laying off so many of our good employes, including many who had been with us for years, and at one time we had less than 500 people at Springfield, most of whom, outside of the offices, were working half time or less.

With 1933 some improvement began and in 1934 we again got slightly on the good side of the ledger.

Our exhibit Century of Progress, Chicago—1933.

WHEN the Century of Progress at Chicago was planned, we were somewhat dubious about exhibiting, after our experience at Philadelphia in 1926, but eventually we took a well located space in the Electricity Building and had the most attractive exhibit of the three expositions where we have

shown. One principal feature of this exhibit was a very large type HC meter, all details being faithful reproductions of the standard meter, and this large meter, arranged to operate on various loads, attracted much attention there, and similar meters, of which we made several, have been used for demonstration purposes by several of our large customers. We also had three large dioramas showing Faraday, Ferraris and Edison, which at the close of the exposition in 1933 were presented to the Julius Rosenwald museum at Jackson Park, Chicago. We derived much satisfaction from having exhibited at this exposition at Chicago, but as it was of little commercial value to us, we did not exhibit the second year.

The standardized "A" and "S" meter program—1933.

AS a result of requests from the Meter Committees of the Edison Association of Illuminating Companies, and of the Edison Electric Institute, the four U. S. meter manufacturers, General Electric, Westinghouse, Duncan and Sangamo, agreed early in 1933 jointly to undertake a program of standardization as to external features of meters, including arrangements of mounting, sealing, etc., and as a result the so-called "A B C" program was started early in 1933. At the same time the socket or plug-in type meter, originally offered by the Westinghouse Company some years before, was made a part of the general program, in other words, two fundamental types of external construction were offered, the "A" or service type meter with improved terminal facilities, and the "S" or socket type meter. This joint program has since been followed in the United States with splendid co-operation between the manufacturers, and with excellent advice and assistance from the two Meter Committees. Through this standardized program the efficiency of metering in the United States has been greatly increased during the past two years.

NRA Code for the electrical industry—July, 1933.

IN July, 1933, the electrical industry adopted a code under the NRA which was in effect for all electrical manufacturers until the NRA was declared invalid in June, 1935. We did not find the code onerous except for some inconvenience in reducing our normal hours of work to 40 per week, although in principle we had previously believed, and now believe more than ever, that 40 hours should not be exceeded for normal operations of a manufacturing business such as ours. With the withdrawal of the code regulations in June, 1935, we therefore continued with these hours for normal operation and there has been no bad effect up to this time, in the way of unfair competition or other practices which were forbidden under the NRA Code.

British Sangamo produced three-coin prepayment meters—Fall of 1933.—

IN the fall of 1933 our British Company made a very important step in prepayment meters through the introduction of their three-coin meter, the first of this type offered in England, and shortly thereafter introduced a fixed charge collector as a feature of prepayment meters, which has also proved highly

British-Sangamo becomes public company—October, 1935.

successful. In this connection it is interesting to note that until very recently our British Company was the only meter manufacturer in England offering a full line of meters, both standard singlephase and prepayment, with Bakelite bases and covers, and our success in this respect is principally due to the ingenuity and ability of Mr. Butherus in handling Bakelite for such purposes.

During the early part of 1935 while I was in England, we gave consideration to the matter of changing British Sangamo into a public company and putting some of its stock on the market. After careful consideration of this problem, we decided in August to increase the capitalization to 300,000 shares of common stock, with a par value of 10 shillings each, and to list the stock on the London Stock Exchange, which was done in October. At the same time a large block of the stock was offered to the public at 21 shillings per share, which was quickly taken up by stockholders in England and Scotland. With this change, however, control of British Sangamo remains with the parent company at Springfield.

Service Warrant plan for employes adopted—December, 1935.

DURING the latter part of 1935 we heard of a plan of extra compensation to employes which had been adopted several years before by the Package Machinery Company of Springfield, Mass., and on investigation of their plan, our directors voted in December 1935 to adopt a similar plan, of what we term "service warrants" for all of our employes at

the Springfield plant. Under this plan, after a year's service, an employe receives a warrant entitling him to receive in cash the same amount as paid to stockholders on two shares of common stock. With each year of service an additional warrant is issued, so that an employe with ten years service, for example, now receives under this plan an amount in cash equal to the cash dividend paid on 20 shares of our common stock. This plan was announced the first of this year and was very well received by our employes.

Death of Scott Lynn, President of Sangamo Company, Limited—January 1, 1936.

ON January 1st of this year, our company suffered the most severe blow since the death of Mr. Bunn, when Scott Lynn, President of our Canadian Company, died suddenly that evening. The Canadian Company was so entirely his creation and its present position reflects so much his untiring and splendid efforts to build it up, that it will ever remain as a great monument to Scott. Fortunately, and looking forward as he did in every matter, Scott had developed a fine organization, so that Mr. George W. Lawrence, Vice President, assumed the duties of President of the Canadian Company in March of this year, Mr. W. S. Ewens became Vice President in charge of sales, and Mr. D. C. Patton, who for many years has been Secretary and Treasurer of the Canadian Company, continued in that capacity. At the same time, the Board of Directors of the Company was strengthened by the addition of Mr. George B. Foster, of Montreal.

Death of Otis White—May, 1936.

MR. OTIS WHITE, our Senior Vice President for many years, and to whom much of the success of Sangamo is due, passed away in May, 1936, after a long and distressing illness. On account of this he had not been actively engaged in his duties with us for several years, but nevertheless his going brought a great sense of loss to those of us who had been associated with him and especially to the writer, after nearly 40 years of the closest and most satisfactory relations with Otis. The present high quality of Sangamo products and the excellence of many of our designs are fundamentally due to Otis White, and as the years go by, Sangamo will never forget what he did for it from the earliest days of the company.

Adoption of vacation pay plan for non-salaried employes—July, 1936.

IN June of this year we made a further step in appreciation of the services of our non-salaried employes by adopting a plan of vacation payments, made effective this summer. Under this plan any non-salaried employe with us over three years and less than five, receives three days' vacation with pay, those with us over five and up to ten, one week's vacation, and those with us over ten years, two weeks' vacation with pay. In announcing this plan, which met with highest appreciation from our employes, we stated that should it be necessary at any time on account of business depression to withdraw the plan, such action would apply to salaried as well as non-salaried employes.

Retirement of our preferred stock—July 1936.

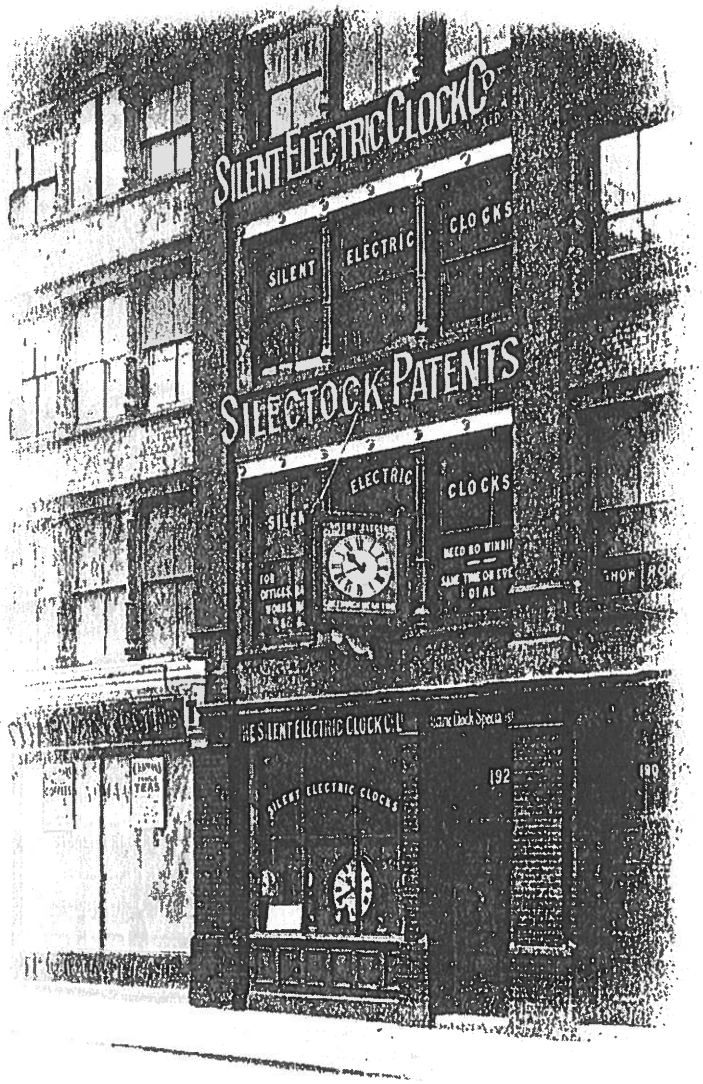
FOR some time the directors of Sangamo have been anxious to retire our preferred stock, of which some 7,000 shares were still outstanding at the beginning of 1936. Therefore this spring we decided to offer 2½ shares of common stock in exchange for each share of preferred outstanding, which offer was accepted by a large majority of our preferred stockholders and the stock of those who did not accept the exchange, was purchased on July 1st of this year at the call price of $110.00 per share. As a result of this action the capital stock of this company now consists of only 139,000 shares of common stock, all preferred stock having been retired and cancelled, and the company has no funded debt.

Thus, with the company in strong financial position, with business at the highest point in our history, with splendid relations between our employes and the company, with a commanding position in the fields in which we sell, we can look forward with strong faith and hope to the next forty years of Sangamo, which I hope and believe will be as eventful, interesting and successful as the first forty.

To be continued.

Continued from September, 2003 issue.

VIEW OF
HEAD OFFICE
AND
FACTORY,



192,
GOSWELL ROAD,
LONDON,
E.C. 1.

PREFACE.

THE last edition of our Catalogue was published in 1912, and in 1914 we were about to bring out a new edition, when the great European War broke out. During the continuance of this gigantic struggle the Silent Electric Clock Company, realising that as far as possible manufactures should be confined to articles directly assisting our country in the conflict, carried on on a reduced scale, and we are proud to say that every man of military age in the service of the Company joined H.M. Forces. Nevertheless, even with a minimum staff, we exported clocks, during the war, to South Africa, India, Argentine, Siam, etc., etc., and carried out contracts for the Admiralty and Post Office.

Now that the war is over, we have come back to ordinary routine and manufacture, and accordingly take this opportunity of bringing out a catalogue which otherwise would have appeared in September, 1914.

Our Clocks are manufactured throughout by ourselves. We do *not* import ready-made parts and merely assemble them, but we know the quality of the workmanship that we put into every detail of our work, and can give the fullest guarantee as to the excellence of the standard of manufacture.

We have made a speciality of really high-class clock cases and dials, and have a large number of original and historically accurate designs for different periods, suitable for country houses, etc.

For the Factory, the Schoolroom and the Office, we make a substantial but quite simple pattern of clock, and we extend a hearty invitation to all who are interested in Electric Clocks to pay a visit to our workshops and inspect the details of our manufactures.

SEPTEMBER, 1919.

INDEX.

To be continued.

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

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

Sangamo and **Hamilton Sangamo** movements, motors, platforms, and other parts. Send SASE for list.
"Electrical Timekeeping", by F. Hope-Jones. 2nd Ed, 1949 Dust jacket a little ragged, contents are fine $35.
Harvey Schmidt, 75-80 179th Street, Flushing, NY 11366 or wwlathlot @AOL.com.

New publication: 60-page booklet with facsimiles of instructions and drawings re: **FAVAG** clocks with Hipp-toggle, period 1930-1960 (all in French). $25 including postage. Rare French book on CD-Rom, easily printable (in .tif format: "Horlogerie electrique-1ere partie-Horloges-meres et installation horaires" by **Ch. Poncet**, Cluses, 1905, 227 pages. 25 USD or 25 EUR. Order email, viredazepal @bluewin.ch, or address Michel Viredaz, Chemin du Raidillon 48, CH-1066 Epalinges, Switzerland.
Send money in banknotes, no checks please.

CD containing animations of 40 different electric clock systems (such as **ATO, Brillie, Bulle, Campiche, Eureka, Garnier, Gent Hipp, Lowne, Poole, Shortt, Synchronome, Tiffany, Wagner**) and 20 slave movements. Included are some biographies and portraits of inventors and a large reference list to relevant literature. Price $20, includes shipping. J. E. Bosschieter, contact me at BoscoClocks @Zonnet.nl

BARR cylindrical pendulum assembly. Brass bob 1 3/4" long, 1" diameter, overall length 6.5". $10.00
Sal Cabibbo 345 Summit Ave., Hackensack, NJ 07601. Phone/FAX (201) 489-8176

50 - **1908 SELF-WINDING CLOCK CO. CATALOGUES** reprinted in 1979 by Dr. Bengt E. Honning. New old stock. $35.00 ea. Including shipping. Roy Crowe, 9257Appleby St., Downey, CA, 90240, (562) 861-8788, email dcrowe2259@ AOL.com

"A Guide to Electrical Horology" by Martin Swetsky, FNAWCC. Includes Chapters on History, Electrical Principles, Repair Methods, Tips, plus Repair References. Price $42.00 Post Paid. Mitchell Swetsky, 10 Chelsea Way, Fairport, NY 11450. E-mail MSwetsky@ Rochester.rr.com.

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

Review of Symposium dedicated to Henry Warren. By Bill Ellison.

The talks were excellent and there is no way that I could summarize all that was presented. However, there are two points that stuck in my mind after the symposium. The first point was that even during the depression the Telechron Clock Company ran two shifts in order to meet the demand for synchronous electric clocks. This level of demand illustrates how quickly the synchronous clock was accepted and soon came to dominate the clock business in the U.S. The second point concerned the efforts of Henry Warren and how he convinced electric power plant operators that it was to their benefit if they controlled the frequency of the electric power that they distributed. It was noted that Warren's success in frequency control made possible the nationwide electric grid for power distribution. The grid made the massive Electrical Blackout that struck the North East in August of 2003 possible. It was also noted that current power plant operators controlled frequency very closely but they did not attempt to control the "clock time" in each of their power plants. This lack of control of time has become one of the major problems in determining exactly the sequence of the problems that led to the largest Blackout in U.S. history.

--- MART ---

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

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

Junker **EARLY BATTERY CLOCKS**, Movements, Parts, etc, send details.
Martin C. Feldman, 6 Stewart Pl., Spring Valley, NY 10977

D.E.H.O. slave; please send size, condition and price.
Kenneth Erlenbusch, 124 North Avena Ave., Lodi, CA 95240, email kene lodi@gotnet.net

Gents or **Synchronome** slave movements.
Jon Carpenter, 17436 S.R.I., Spencerville IN 46788 – email: Jon 6313@AOL.com

Rotating contact for a **SELF WINDING** 60 beat rotary clock movement. Roy Crowe, 9257Appleby St., Downey, CA, 90240, (562) 861-8788, email dcrowe2259@ AOL.com

Secondary (Slave) clock or movement for a **MAGNETA** (Swiss) Master Clock. Movement or parts for an **AMERICAN** Clock Co. or **AUTOMATIC** Electric Clock Co. clock. Henry Weiland, 8946 W. Grantosa Dr., Milwaukee, WI. (414) 463-4681, e-mail hweiland@ execpc.com.

REPAIR: ALL EARLY BATTERY CLOCKS Specializing in **BULLE** using orig. parts.
Martin C. Feldman, FNAWCC, 6 Stewart Pl., Spring Valley, NY 10977

HARD TO FIND PARTS AVAILABILITY:

BULLE suspension assemblies, fabric type, just like the originals. **TIFFANY** Single Contact suspension springs (0.004") The Horolovar Co., Box 264, St. Clair Shores, MI 48080 (313)882-9380

TIFFANY Double Contact Suspension Springs: Use a **Hamilton** Ladies Watch Mainspring, Specification: **HAMILTON** 6/0 #2521, 1.40 mm x 0.12 mm x 11¼". Available from:
Bill Schroeder @ $3.00 each + postage. 6033 N. Sheridan Rd., #31H, Chicago, IL 60660,
(773)275-2563. Also available from most Watch Parts Suppliers.

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

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

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

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