History, Specifications, and Restoration of Stromberg Self-Winding Clocks

Scotty Dean (AZ) and Kenneth Reindel (TX)

For this article, I combined my love of history and my experience working in a clock shop in Tucson, AZ, to expand upon my usual informative customer write-up about the who, what, where, and why of a company. The clock that inspired this journey is a Stromberg Model 45 master clock that required extensive repair and replacement of all of the electrical components. Happily, an Internet search found Ken Reindel of Ken's Clock Clinic in Cedar Park, TX, who conducted the necessary electrical repairs. He includes details here about the movement and the electronics.

Figure 1. Alfred Stromberg.

Our joint article covers the biography of Alfred Stromberg (Figure 1), the history and developments of the Stromberg (and Carlson) companies, and some of the technical details of Stromberg Self-Winding Clocks. We hope our readers will find our research results as interesting as we did.

Scotty Dean

Alfred Stromberg from Sweden to Chicago

Alfred Stromberg was born on March 9, 1861, in Stockholm, Sweden. In 1876 he began working in the electrical field for Eller & Company. In 1879-1880 he became involved with the installation of the telephone exchange in Stockholm, and in later years he was involved with telephone exchange installations throughout the Scandinavian Peninsula and in Denmark. He emigrated to the United States from Sweden at the age of 23 (the 1900 census shows his immigration recorded in 1885). There is uncertainty whether he began his work in America for Bell Telephone in Pennsylvania, and then relocated to Chicago, or he commenced his work for Bell in Chicago. Whichever is the case, he did work for Bell Telephone in Chicago, where he met Androv Carlson. Alfred worked at Bell in the instrument and construction departments until 1890, when he went to work for the Chicago Electric Protective Co.'s Burglar Alarm System division. While Alfred worked in the alarm division he obtained the first of seven patents for electrical or telephone system designs. Alfred and Androv each invested $500 and formed the Stromberg-Carlson Telephone Mfg. Co. in 1894 to manufacture magneto telephones, switchboards, and central exchanges—largely for sales to independent telephone companies and suppliers. The Bell patents had expired, and Stromberg and Carlson thought that they could produce a better telephone.

In the 1900 U.S. Census, Alfred is shown in the West Town division of Cook County, within the city of Chicago, with his wife Ella and four children on West Superior Street. By the 1920 Census, Ella appears as a widow living in the 25th Ward of Chicago.

Relocation to New York

Stromberg-Carlson was originally located in Chicago; Carlson managed manufacturing and Stromberg was responsible for marketing. By 1901 the company had a workforce of 1,200 men, with per annum sales of one million dollars. By 1901-1902 Bell Telephone was acquiring independent telephone companies and suppliers, and a takeover effort was launched; Stromberg-Carlson managed to fend off Bell Telephone's efforts, and the company reincorporated as a New York state corporation in 1902, where state law offered better protection from takeover efforts.

In 1904 Stromberg-Carlson was purchased by Home Telephone Company, a relatively large service provider based in Rochester, NY (perhaps this purchase was in the long-range plan all along?). The new owners quickly relocated all Stromberg-Carlson operations to New York. Home Telephone purchased the company to ensure a continued equipment supply. The name Stromberg-Carlson may also be found on radios, televisions, public address systems, theater amplifiers, and even guitar amplifiers(!). In 1905 Stromberg and Carlson both sold their interests in the business, and both returned to the Chicago area.

More Businesses in Chicago

Alfred Stromberg was electrically minded and conceived of three new businesses: Stromberg Motor Devices, Stromberg Carburetor, and Stromberg Electric Manufacturing. Under his direction then, the first electric time stamp was developed by Charles Madison Crook in 1907, and in that same year the Stromberg Electric Company of Chicago began to manufacture and distribute this new automatic and accurate business machine. This remote-controlled stamp

was patented as the Model 1 Time Stamp and manufacture began at 23 S. Jefferson Street in Chicago. The firm grew and by 1908 was incorporated and moved to larger headquarters. It is interesting to note that the biography published in 1908 mentions only that Stromberg was the president of the Goldberg Motor Car Devices Mfg. Co. at 1253 Michigan Ave. and that his old partner Androv Carlson was still associated with him.

Tracking Time for Industry

The recording of the time of receipt of correspondence quickly became a minor application of this new device. Even in this early growth period of American industry, labor costs were closely related to production costs. It became increasingly necessary to find an accurate method for recording employees' work time and to have all times—the mail room, the factory floor, and administrative offices—matching throughout the company. Using the basic principles of the electric time stamp, Stromberg Electric Company developed the first electrically operated In and Out Recorder. Soon afterward, the company developed a Job Time Recorder, a Program Instrument, and Secondary Wall Clock, all operated by electric impulses from a single Master Clock. As with the Standard Electric Time Co. of Waterbury and the Self Winding Clock Co. of New York, Stromberg purchased movements, mounts, and pendulums from Seth Thomas.

The Stromberg Electric Company Chicago headquarters were by now located at 606 South Michigan Avenue, but by 1929 the company was reincorporated in Delaware and had sales offices in 24 U.S. cities and a subsidiary in Canada.

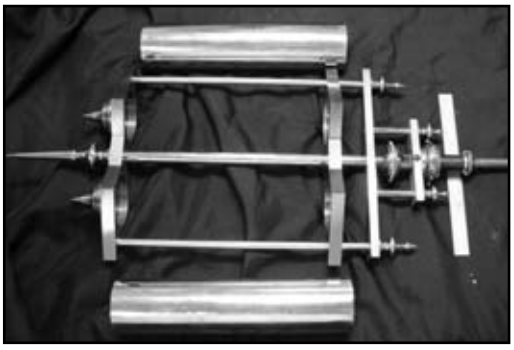
General Time Corporation (a November 1930 combination of the Seth Thomas Clock Company and the Western Clock Company) purchased all shares in the Stromberg Company in December 1935. Stromberg products were manufactured in a modern production facility at Thomaston, CT, shared by Seth Thomas Clocks. The Stromberg division was sold by General Time 30 years later, bounced around among a few owners, and by 1989 became a division of the New Haven Manufacturing Corporation.

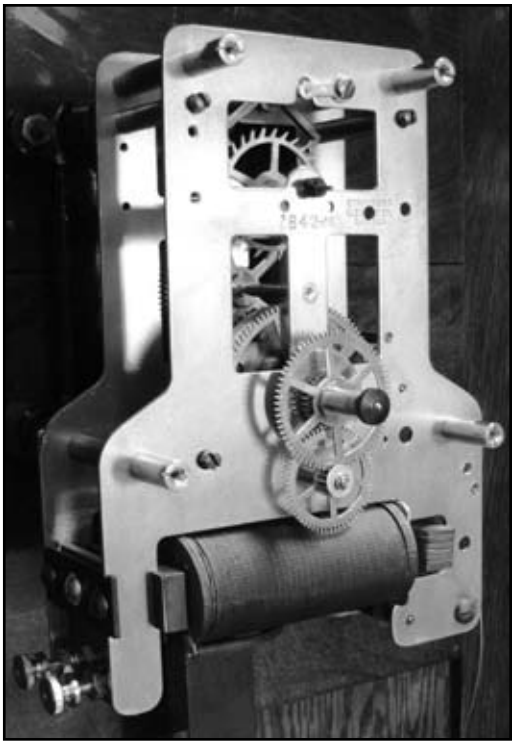
The Repaired Stromberg 45 Master Clock

Figures 2A-2C illustrate a Stromberg 45 Master Clock, which was retrieved from the administration basement of one of the large mining companies near Safford, AZ. The clock case, dial, and mercury pendulum were all in near pristine condition; unfortunately, the same could not be said for the works, or more specifically the electrical components of the works.

The Stromberg Master Clocks (self-winding electrical) were available in a few models and sizes. The full-sized Wall Case Master Clock Model came with a 14" dial, in a case 59" tall, 21-5/8" wide, and 7-15/16" deep. The standard case finish was golden oak or mahogany, although other sources list a third choice in mission oak. Solid mahogany or walnut was available for an additional cost, and custom cases as architectural special orders were also available upon request. This same case was used for two models of clocks: the Model 40, which used a wooden rod and a brass disc pendulum bob, and the Model 45, which used a metal rod and a mercury compensating pendulum. Both the Model 40

Figures 2A-2C.





and Model 45 used a 60-beat Graham deadbeat movement. A wall clock of approximately half the height (30 1/2" tall by 21-5/8" wide by 7-3/16" deep) with a 120-beat movement was available as the Model 30. The Model 30 was guaranteed to within 50 seconds a week, the Model 40 was guaranteed within 20 seconds a month, and the Model 45, due to the compensating pendulum, was guaranteed to within 10 seconds a month. It appears that Joseph M. Gensheimer's assertion in the June 2001 BULLETIN article that the Model 30 was guaranteed to within 30 seconds per month is incorrect, at least based on the company materials that the NAWCC Library has compiled.

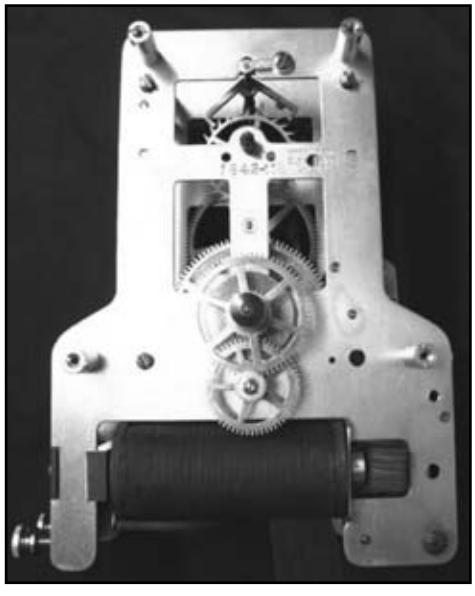
Imagine the height of the factory or office walls if a five-foot tallcase was intended to be used as a wall clock! They also made clocks intended as floor models. The most commonly advertised model was the Model 206, which used a Graham deadbeat 60-beat movement, had either a brass bob or mercury compensating pendulum available, and came in a case 76" high by 25 1/4" wide by 15 1/4" deep.

Ken Reindel Discusses the Model 45 Stromberg Movement

My experience with Stromberg Electric 60- and 120-beat movements has led me to believe that there are, unfortunately, rather few of these clocks remaining in circulation. It is quite difficult to gauge numbers. I see in my contact with scores of self-winding clock customers that perhaps one Stromberg will cross my bench in over 15 Self Winding Clock Co. movements within the same period of time.

Why are so few early Strombergs "apparently" remaining? First, it is unlikely that nearly as many Stromberg masters were originally produced in comparison to their Self Winding Clock Co. or Standard Electric Time Co. cousins. Self Winding Clock Co.'s relationship with Western Union and Naval Observatory Laboratories resulted in a nationwide time synchronization system. This obviously spurred sales of Self Winding Clock Co. systems to incredible levels. While Stromberg had master/slave arrangements for coordinating time across a local industrial setting similar to Standard Electric, IBM, and others, they didn't have the features of their competitors; therefore, it is likely that they served a narrower niche related to tracking labor hours. This niche was exploited later, and even today many time clocks bear the name Stromberg-Carlson long after their competitors closed their doors.

Figure 3. Stromberg Model 45. (Winding switch is missing.)



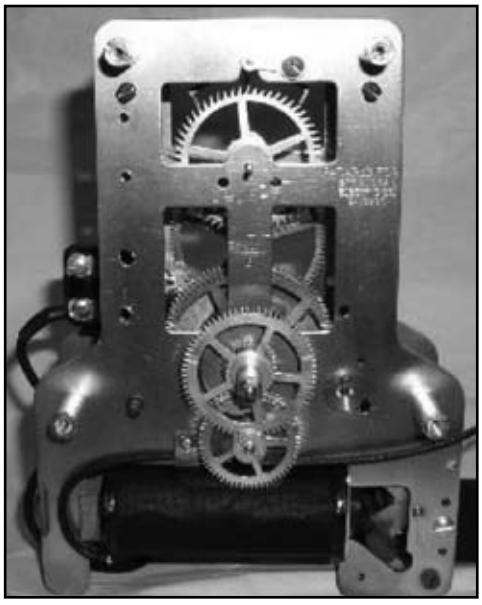
Second, unlike the Self Winding Clock Co., the cases used to house these wonderful Strombergs were not as varied, appointed, or elegant. This is not to say that they are unattractive. They are incredibly well built, but perhaps a bit more utilitarian than the SWCC and SET models.

Third, most Stromberg clocks run on unusual voltages by today's standards. Historically, it has been much easier to find No. 6 Dry Cells (or dry cell replica products such as those we manufacture), or for that matter a set of D cells and a holder to run many Self Winding Clock Co. models. But what does one do to power a Stromberg clock requiring 10 volts, 20 volts, or 24 volts DC? Common power sources are not as readily available at your local electrical or electronics supply shop. It isn't always obvious what's needed for the Strombergs. We've seen a few that had been previously plugged directly into 120-volt AC wall receptacles. Aside from the fact that AC current will not operate the clock, 120 volts can destroy the electrical components. We will discuss properly providing power.

Stromberg Principle of Operation

The Model 45 (Figure 3) operates on a minute impulse wind principle. In other words, every minute, a cam lifts a switch that connects the large coils to a DC power supply. These electromagnetic coils pull a lever that connects to a ratchet. The ratchet forces a ratchet wheel to advance, winding a relatively weak mainspring (mounted on the center wheel) sufficiently to run the clock for another minute. Should the power source disappear temporarily, the clock would continue to run for at least 40 minutes because the mainspring is long enough to provide a "reserve." The ratchet is cleverly clutched in such a manner to avoid jerking the escapement forward at full wind.

A close cousin to the Model 45 is the Model 31 (Figures 4A and 4B, see next page). This movement operates on a principle very similar to the Self Winding Clock Co. vibrating motor Style F movement. There is an hourly cam arrangement, an hourly contactor with platinum tipped contacts, a vibrating motor with a set of platinum contacts (shown left), and a clutched arrangement for translating the vibrating motion into winding motion for the mainspring. The rest of the movement is remarkably similar to the Model 45. Both movements use an innovative damping resistor wound noninductively onto the coils themselves! This eliminates the need to carry a separate damping resistor and the wiring between them, which if you



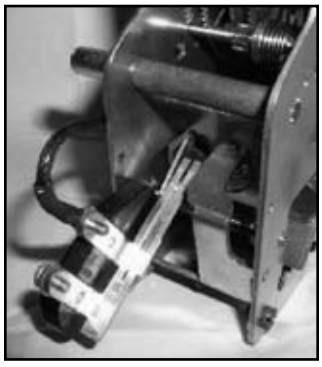


Figure 4A, left. Stromberg Model 31. **Figure 4B, above.** Closeup of Model 31 motor contacts.

Figure 5, right.

are familiar with the Self Winding Clock Co. movements, is often tangled, broken, or missing altogether.

A recent 120-beat specimen of the Model 31, which we had in the shop for restoration, wound once per hour, optimally using 16 volts with a 6-second wind time (originally meant for 20 volts but clearly overdriven at this voltage). At 16 volts it would draw about 55 mA during its wind interval. It was very efficient and reliable! The mainspring was exactly the same as its Model 45 cousin.

Providing Power. Although it is not the intention to provide a thorough background on powering early electrics here, it is interesting to examine some of the marvels found in powering clocks (Figure 5). These devices are large, heavy, inefficient, and in all cases unsafe by today's regulatory standards. They are often nonfunctional when found. We usually power clocks from a properly selected 6-watt Energy Star wall adapter (if all electrical components are present). For 24-volt clocks, for example, a small, inexpensive line power unit can be mail order purchased from DigiKey (part number T987-P5P-ND). We also manufacture products that provide any voltage one might need. Ours can be run from line or battery power.

There is a great deal of misconception about the power requirements for winding. Several popular DC-powered master clocks and supply power requirements (in watts) for successful winding of the movement are shown in Table 1. It is important to properly identify the voltage required by the clock. If the clock is not properly marked, this can become a challenge—the subject for another article.

Note in Table 1 that the Stromberg Model 45 is among the most power-hungry self-winding movements. The most power-efficient master in this list is the Self Winding Clock Co. 3-volt model, designed to run on early batteries with limited capacity.

The significance of the power requirement brings us to the specifics surrounding the restoration of the Tucson, AZ, Model 45 Stromberg (Figure 6). As received, this movement was missing every electrical component and anything mechanical associated with the fastening of these electrical components. The most challenging was the coils. We were prepared to manufacture new coils for the clock when I stumbled upon a scrap Stromberg slave movement that uses the exact coils. The coil winding resistance gave way to operation at 24 volts.

Table 1. Comparison between DC-powered Self Winding Master Clock Movements. Data represents clocks encountered and may not represent all clocks produced. Supply Power Requirement represents the minimum power required to ensure successful winding of movement alone (no accessories, tape drives, bells, slaves, etc.).

Clock	Winding Voltage	Mainspring	Wind Style	Supply Power Requirement
Stromberg 45	10, 20, 24 volts	.008" x .250" x 4'	Minute Impulse	3 watts
Stromberg 31	20 volts (runs well on 16 volts)	.008" x .250" x 4'	Vibrating motor	1 watt
Standard Electric Masters and self powered slaves	4.5, 12, 20, 24 volts	Helical spring	Minute impulse	1.2 watts
Self Winding Clock Co. Style F	3, 24 volts	.008" x .220" x 6'	Vibrating Motor	0.6 watts (1.2 watts for 24V)
ITR/IBM Masters	6, 24, 110 volts (DC)	.008" x .250" x 11'	Minute Impulse	4 watts

New mounting screws, left and right coil mounting plates, yoke iron and shim, and terminal board were fabricated. Combined with original Stromberg coils from the scrap Stromberg slave clock, all missing electrical components of the motor were replaced. Numerous nonoriginal and nonfunctional soldered on straps, wires, magnets, and springs were removed.

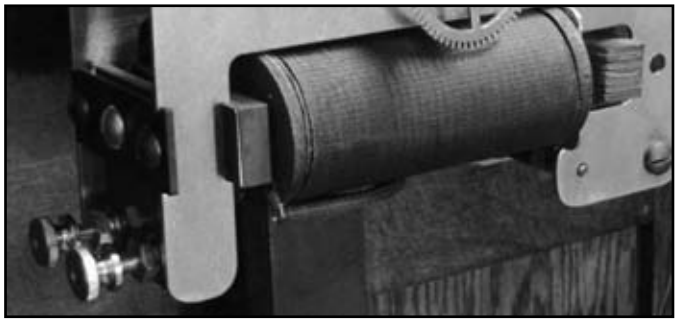


Figure 6.

Magnetic gap spacers were fabricated for the electromagnets, turned from solid brass stock, and installed. These spacers are very important. Without them, the armature will "stick" to the coil yokes, completing a magnetic loop, and will not release. The movement will be unable to wind and will stop.

Turning to the mechanical aspects of the movement, the Graham deadbeat verge/escape wheel assembly was polished and adjusted to proper lock and drop. The escape wheel was greatly worn (common with these clocks), which necessitated slightly closing in the verge pallets to accommodate it. Finally, the movement was cleaned, pivots were polished, and flush ("invisible") bushings were installed. The prewind on the mainspring was originally 3.5 turns, and that's what it was when we were finished with it. We like to give these movements the best treatment possible because of their rarity and uniqueness. We restore them like original in every way possible.

The winding system adjustments are numerous. They are also more delicate than one might at first perceive from looking at a rather robust, heavily built movement. Proper return spring adjustment is very important to reliable operation, as is the "gap" between the coil and the laminated armature.

What about the missing winding switch?

One component that could not be replaced (well, it could, but at great expense and difficulty) is the winding switch. An actual switch is shown in Figure 7 (actually from a complete Stromberg we encountered). The Arizona clock's switch was missing, but ultimately this was not a problem. We manufacture a product called the Model 1900W Clock Winder No. 6 Kit meant to power 24-volt master clocks (other voltages are available as well). It looks like a pair of No. 6 vintage dry cells. But inside is a timer and special power supply that sends out a brief 24-volt pulse once per minute, directly to the coils, to wind the clock. Internal alkaline D batteries power the whole thing (Figure 8).

The advantage of this product to the Arizona clock, in addition to making it unnecessary to find a new switch, is that the clock can now be run from these No. 6 "batteries" placed in the top of the clock out of view. This eliminates the enigma of power cords running to an early 1900s clock and gives freedom to place the clock away from an outlet. Battery life approaches one year at which time the D cells are exchanged for fresh ones, and another year of pleasant ticking is experienced.

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About the Authors

Scotty Dean works as a hospital director of statistical analysis in Tucson, AZ. He got into clock repair for relaxation and as a hobby after taking a course at the local community college. A decade later, he now teaches the community college course, as well as works part-time for a clock repair shop in Tucson to help justify purchasing more clocks and clock tools. In addition, Scotty is active in Chapter 113, serving as a director. In his "spare" time, he plays bass drum for the local competition bagpipe band, "The Seven Pipers," and thus is himself a giant metronome. He doesn't use a Microset to set clocks in beat but rather his bass-drumming ear.

Ken Reindel works as the Director of Analog Measurement Technology for National Instruments in Austin, TX. He has been restoring antique clocks since the age of 12 (tinkering since 6). His company is Ken's Clock Clinic, which can be found at www.kensclock-clinic.com. Ken strives to support Chapter 15 as well as HBACC (Ken's Korner) with presentations and articles on a variety of horology-related topics including electrical fundamentals for horologists and full restoration of self-winding clocks.

Figure 7.

Figure 8.