

The Edison “Electric Automatic Stop”

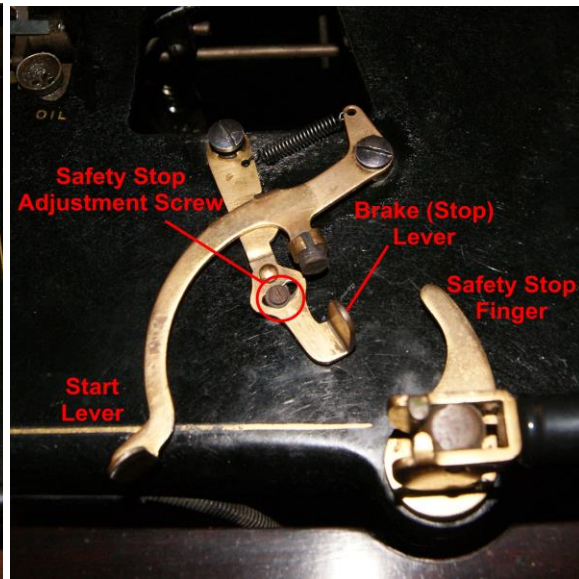
After I acquired my Edison Chippendale Diamond Disc Phonograph, I felt compelled to learn as much about the C-250 (and C-19) as I could. I quickly realized that subtle changes had occurred to certain features throughout the many years they were produced, minor – yet notable – variations. This realization instilled a sense of wonder in me. Although I found answers to *some* of the questions I had, those answers frequently created more complex questions: when was *mine* produced, how was the Chippendale developed, how did it compare to other “phonographs” of the period? I *needed* to know!

As I slowly began to understand my beloved Chippendale, I became increasingly more curious about a device I had seen with some frequency: “The Duncan Stop.” I wrote this article to share some interesting facts that I’ve discovered along my journey, and I hope you find the information interesting and valuable.

Many Edison Diamond Disc Phonograph enthusiasts recognize the term “Duncan Stop,” or “Duncan Brake,” as the name applied to the automatic stop found on a significant number of C-250 Diamond Disc Phonographs. It appeared in numbers plentiful enough that we still encounter it today. It has been reported this device was first installed on the very expensive Edison “*Art Models*”, and after April 1917, the C-250 and more expensive models [1].

In the summer of 1915, Thomas A. Edison, Inc. was experimenting with an electric mechanism to automatically stop the turntable at the end of a Diamond Disc record [2]. Already in place was a simple mechanical arrangement designed to automatically stop the turntable when the reproducer reached the end of a record. It appears that this “Safety Stop,” as it was called, was developed early on for the Type A mechanism and has been observed on A-250’s and other early models.

The safety stop was developed “*to prevent the tracking of a portion of the record which might result in injury to the stylus or other parts of the phonograph* [3].” It consisted of a “finger” mounted under the operating handle on the horn pivot shaft that acted on the brake lever. When the reproducer reached the end of a record, the finger pushed on the brake lever and actuated it to stop the turntable. Early versions of this system don’t appear to have been easily adjusted and, at some point, an adjustable brake lever appears. It was pre-adjusted at the factory and if it went out of adjustment it could be re-calibrated by a set screw under the turntable. A start lever, coupled with the brake lever, was also standard on current models of Edison’s Disc Phonograph. (See pictures below, shown on a C-250 in START mode)



The start lever was not retained with Edison's Electric Automatic Stop; instead, the start and brake levers were incorporated into a single, accessible, dual purpose lever. It should be noted that Edison literature used the term "brake" and "stop" somewhat arbitrarily. (See pictures below, shown on a C-250 in START mode)



A typical No. 6 dry-cell battery (not shown) placed in the horn compartment and retained by a metal bracket was employed for the current. One post of the battery was connected to a wire lead from the solenoid, and the other post to a wire lead that ran up through a conduit (tube) on the horn neck to the rear of a modified reproducer. (See below)



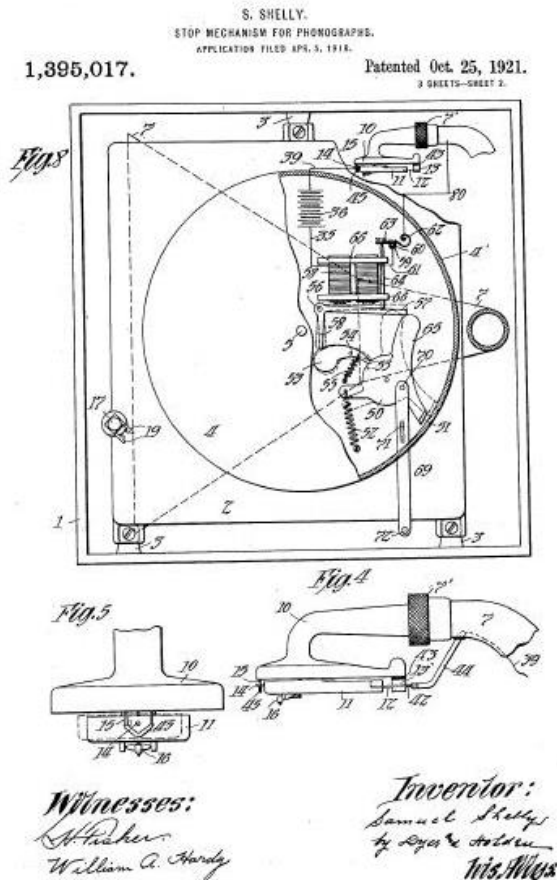
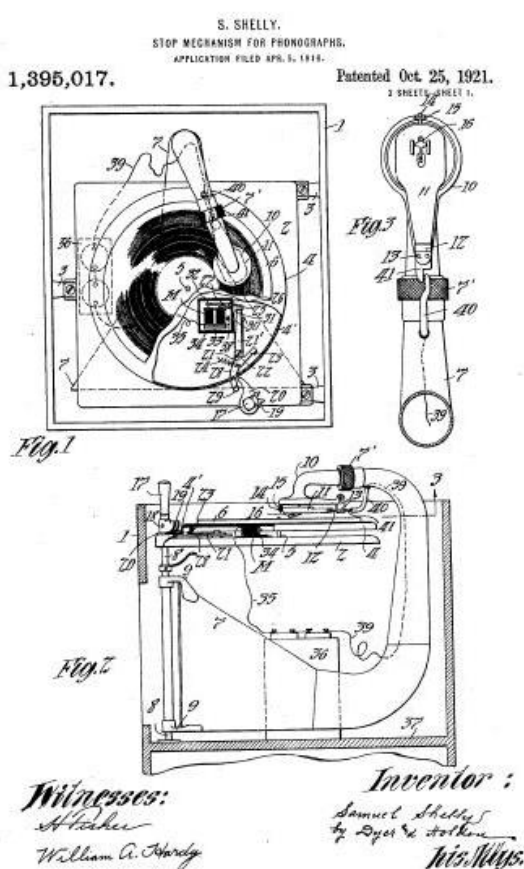
While Raymond Duncan is widely credited for the electrical device used to automatically stop the Edison Disc Phonograph, the story doesn't appear to have actually, started with him. Two competing inventors were actually contracted by TAE, Inc. for the rights to their devices.

In a contract dated March 9, 1916, a man named Samuel Shelly sold his invention, "STOP MECHANISM FOR PHONOGRAPHS" (Patent No. 1,395,017 filed April 5, 1916 granted October 25, 1921) to TAE Inc. for the sum of \$540.00 [4]. The Patent document contains 8 illustrations used to represent *two different* mechanisms. (See images below)

Figures 1, 2, 4 and 5 *conclusively* illustrate the Electric Automatic Stop I've observed on the C-250; an electro-mechanical device that actuates a brake lever, through means of a dry-cell battery wired to a slightly modified reproducer and a solenoid.

Shelly stated in his Letters of Patent, "*My invention relates to phonographs and more specially to improved stop mechanisms for phonographs; and while particularly designed for application to phonographs of the type in which a reproducer having a floating weight is employed and which is adapted to play records of the hill and dale type, many of the features of my invention is also applicable to other types of phonographs or talking machines* [5]."

Despite mentioning "talking machines", Shelly clearly indicated a device primarily intended for the Edison Disc Phonograph.



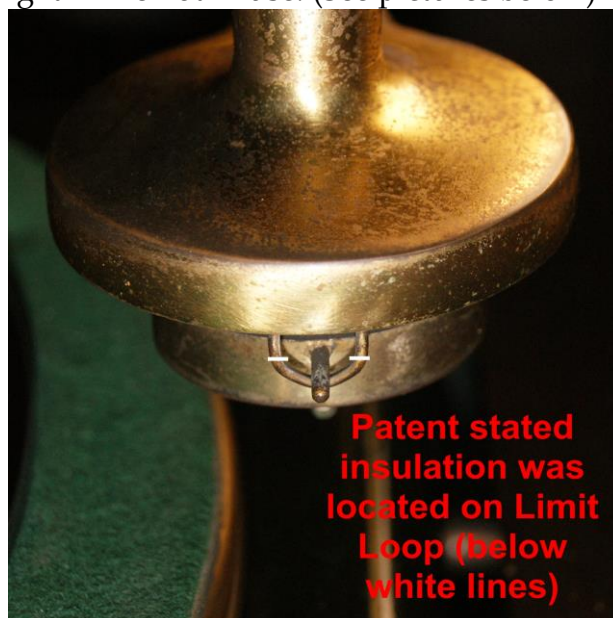
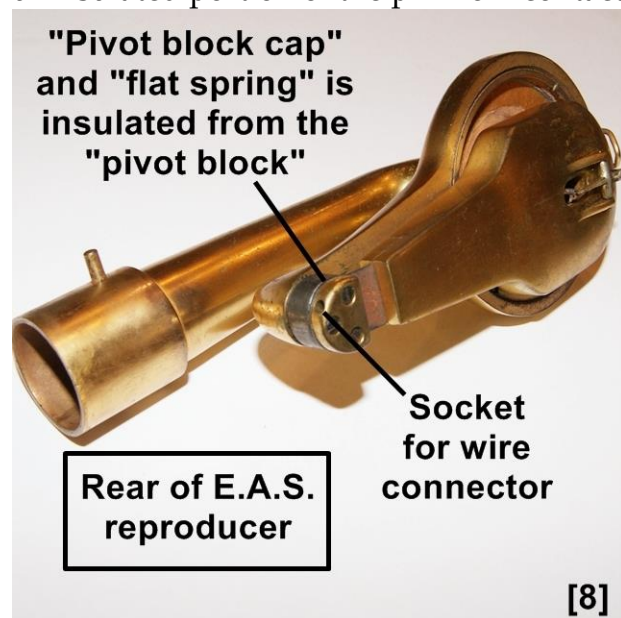
In regard to the reproducer, he claimed; when the stylus left the final groove of a record, a sudden lateral movement of the floating weight was caused and propelled it toward the center of a record. When this occurred, the limit pin of the reproducer would contact the limit loop. He used this action like a modern switch to close an electrical circuit and activate a solenoid. The electrified solenoid created a magnetic field that actuated the brake lever, and caused it to engage with the turntable.

Shelly's device was located on the motor plate, under the turntable, with one end of the brake lever protruding forward of the turntable. It replaced the typical start and stop levers using their original mounting locations. To start the Phonograph, the lever was moved to its right, which released the brake and energized the electrical circuit. When the reproducer reached the end of a record, it activated the solenoid, creating a magnetic field, and actuated the brake lever. The original Safety Stop finger was retained in case of an electrical failure or malfunction to stop the turntable and prevent damage to the stylus.

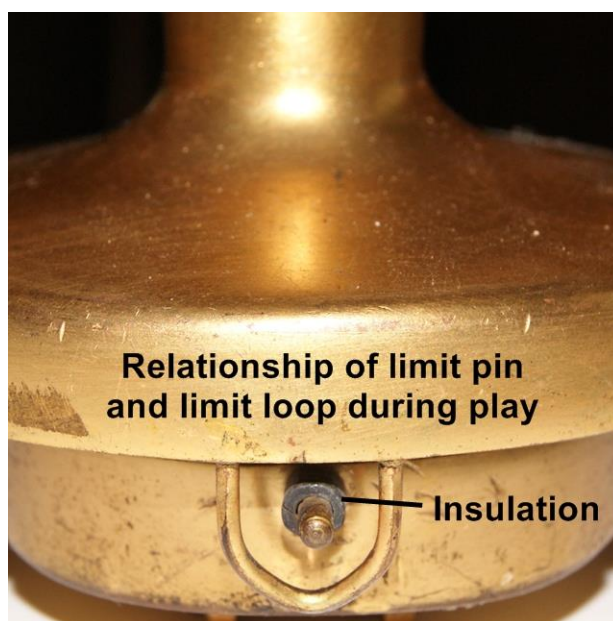
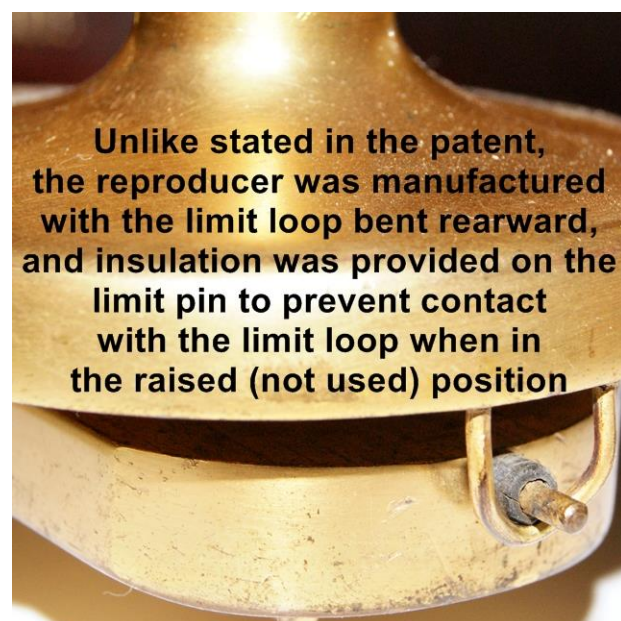
Figures 3, and 8 characterized a much different, modified, construction that used a more complicated mechanical arrangement of levers and pivots. (Figures 6 and 7 are of another modified reproducer, and are not included by me in this article.) This mechanism was located on the motor plate under the *rear* of the turntable, with an exposed lever protruding from under the right rear of the turntable. To start the Phonograph, the exposed lever was pulled by the user. It disengaged the mechanical brake and started the turntable. Simultaneously, a "flat spring" (switch) mounted to the

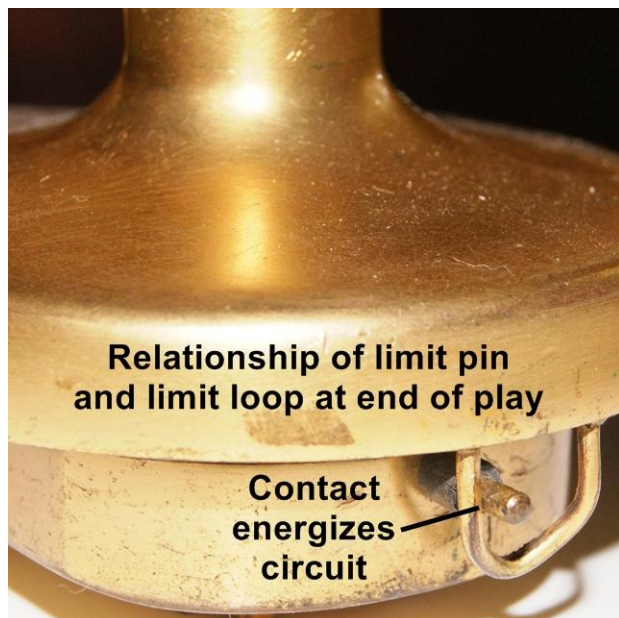
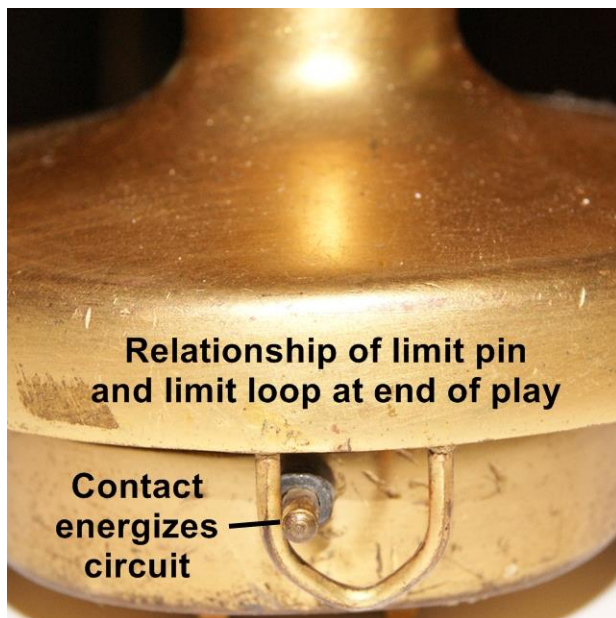
motor plate near the solenoid was released and activated an electrical circuit. When the reproducer reached the end of a record, it activated the solenoid and created a magnetic field. The magnetic field actuated a plunger that simultaneously engaged the mechanical brake, and disengaged the flat spring (switch) used to deactivate the circuit.

Both of Shelly's mechanisms used a slightly modified reproducer that activated, or deactivated, an electrical circuit. When not in use, it did not conduct electricity because *"The lower V-shaped portion of the [limit loop] is provided with suitable insulation [6]."* The reproducer I've seen used on C-250's (Type AA No. 5 Diamond Disc Reproducer [7]) is shown illustrated in Figures 4 and 5 of the Patent. Despite the Patent statement that the limit loop was provided with insulation, two notable changes were implemented at some point: the limit PIN received insulation – instead of the loop – and the lower "V" portion of the limit loop was bent rearward to prevent the uninsulated portion of the pin from contacting it while not in use. (See pictures below)



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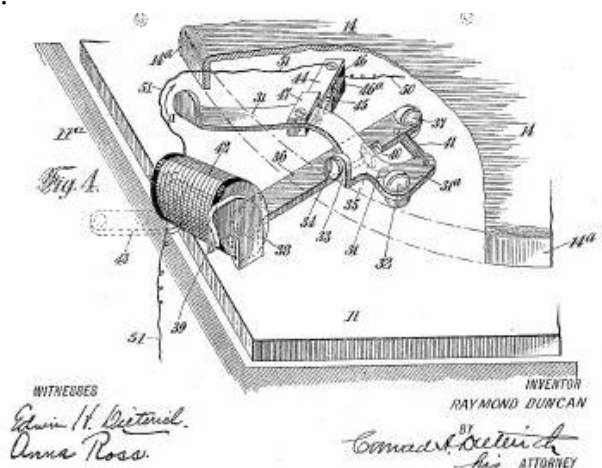
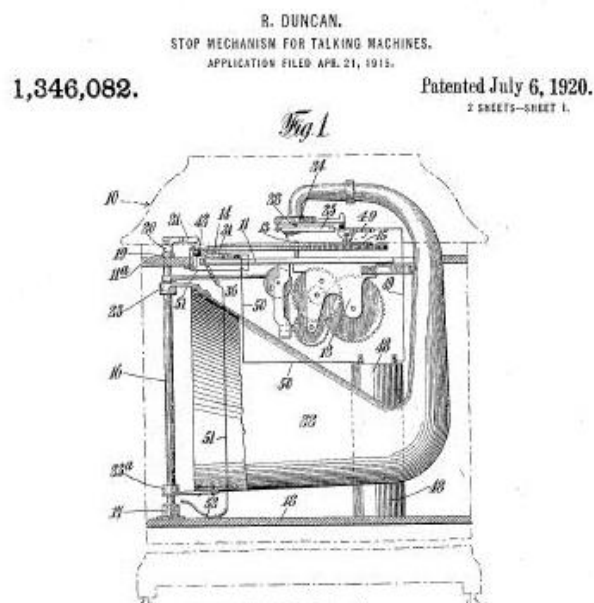




Raymond Duncan

Just 41 days later, on April 19, Raymond Duncan also entered into a contract with TAE, Inc. for the use of his invention [9], “STOP MECHANISM FOR TALKING-MACHINES” (Patent No. 1,346,082, filed April 21, 1915 granted July 6, 1920) in which it was agreed, after January 1, 1917, Duncan would receive a royalty of \$0.25 for every Phonograph sold by TAE, Inc. that included his electric stop mechanism [10].

Similarly conceived as Shelly’s device, Duncan’s was also an electro-mechanical device that actuated a brake lever, through means of a dry-cell battery wired to a slightly modified reproducer and a solenoid. Duncan claimed that at the end of a record, the limit pin of the reproducer contacted the limit loop, completing an electrical circuit. In fact, the words he used to describe this action were nearly identical to Shelly’s [11]. However, after reading Duncan’s Patent Application and carefully studying his illustrations, I realized there were some compelling *physical* differences between Duncan’s device and both of Shelly’s devices.



Duncan did not specifically state his device was designed for the Edison Disc Phonograph; instead, he indicated the device “*related to improvements in talking machines.*” In Figure 1 of Duncan’s illustrations (above), the device shown certainly resembled an Edison Diamond Disc mechanism. However, Figure 3 indicated the tonearm moved in a transverse motion laterally across the turntable during playback. This motion is contrary to an arc, a fundamental principal of the Edison Diamond Disc Phonograph design. Another obvious difference was that Duncan’s construction was much simpler than either of Shelly’s devices – but more difficult to attach to the Edison Disc Phonograph – suggesting that Duncan did not intimately understand the function of the Edison Disc Phonograph geared drive mechanism.

Two levers of his own unique design, shown in figure 4 of his patent (above), were mounted on the motor plate on either side of a solenoid. These apparently *did not* use existing holes after the Edison levers were removed. Duncan clumsily mounted the solenoid to the underside of the wooden turntable trim with a bent metal bracket that placed it over the *top* of the motor plate forward of the turntable. The brake lever on the left of the solenoid was prominently exposed, and was used by the operator, to start the turntable by releasing the brake. To the right of the solenoid was a second prominent lever. When this lever was moved by the solenoid, or manually by the user, it actuated the brake lever to stop the turntable [12].

Duncan used a pair of contacts that were mounted to the motor plate in an undisclosed manner to activate, or deactivate, the circuit. The left lever, when moved into the start position, engaged the contacts. The Edison Safety Stop mechanism does not appear in Duncan’s illustrations, nor is it mentioned in the text, but it’s likely his device could have been produced to function with it. Because the solenoid, switch contacts, and operating levers were separate components, precisely mounting Duncan’s device to an Edison Disc Phonograph would have been a nightmare. However, the basic *concepts* of the modified reproducer, solenoid and wiring are essentially the same as Shelly’s version. The behavior of the Diamond Disc Reproducer floating weight, its movement, and the resultant forces – causing the limit pin to contact the limit loop – is a *fundamental principle* that both Shelly *and* Duncan used for their inventions to function.

As a result of the earlier contract with Shelly (and the decision by the Commissioner of Patents awarding priority to Shelly) it appears that Duncan was not immediately paid his royalty (or paid at all) for Edison’s use of the Electric Automatic Stop [13]. TAE, Inc. must have realized supporting Shelly’s patent – and buying the rights to it for a single payment – would cost less in the long run than the royalty contract with Duncan.

On January 12, 1920, several years after TAE Inc. began using an electric automatic brake on the C-250, Duncan successfully had his day in the Court of Appeals of the District of Columbia. Through an Interference Proceeding, he sought a reversal of the Commissioner of Patents award to Shelly for “priority of invention.” In Duncan’s testimony, he stated that he conceived his invention in May 1914 and had achieved a working model of his device in June 1914. He filed an application for Letters of Patent April 21, 1915.

Shelly asserted to the Court he had conceived the idea of an automatic stop for phonographs in April of 1914, and achieved a working model by May 17, 1914. He also stated he had a written description of the invention by June 15, 1914. Nearly two years later, on April 5, 1916, Shelly filed his application for Letters of Patent. The Court even stated in its report that Shelly had produced and experimented with an automatic stop for a phonograph that was operative in May 1914. However, a working model of this device was never preserved by Shelly. When asked why, he explained *"I did not intend to use these parts over again because they were too bulky and clumsy. These parts were simply used to show that my theory or experiment was right [14]."*

Further, it was noted in the Court documents that during the same time period that Shelly was experimenting with his device, Duncan *"came into the field with commendable promptness [and] reduced his invention to practice [15]."* In fact, Duncan's device was already being tested in TAE, Inc.'s experimental laboratory during the summer of 1915, and this activity led to negotiations culminating in the contract with Duncan of April 19, 1916.

Shelly claimed that he had prepared an application to patent his invention in May of 1915. But, he told the Court, he never filed it because he didn't have the necessary funds to pay the \$30 attorney fee. Duncan's attorney countered this claim by asserting that Shelly was *"employed most of the period in question, during which he bought a motorcycle and was paying for [it] in installments [16]"* proving his claim of poverty was bogus. Shelly did nothing with his device from June 1914, until he decided to make a second mechanism, and submitted it to TAE, Inc. around February 18th 1916. He assigned his patent rights to them 19 days later. The Court was convinced that the purchase of Shelly's Patent by TAE, Inc. *"inspired the completion of the [Duncan] royalty contract...for the express purpose of defeating and suppressing it [17]."*

On March 1, 1920, the Court reversed the earlier decision of the Commissioner of Patents awarding "priority of invention" to Shelly. Receiving priority of invention would allow Duncan to finally capitalize on his invention, or so it seemed. In the end the favorable decision came about a year and a half *after* the Electric Automatic Stop was abandoned by TAE, Inc.

However, the fact remains: the invention patented by Samuel Shelly *was* the Electric Automatic Stop used on the C-250.

Francis W. Pratt
December 20, 2014

References

- [1] George L. Frow, *The Edison Diamond Disc Phonographs and the Diamond Discs*, Los Angeles, CA: Mulholland Press, 2001, pg. 190
- [2] *Duncan v. Shelly*, reports of cases adjudged in the Court of Appeals of the District of Columbia, Vol. 49, pg. 245 (49 App. D.C. 1920)
- [3] Samuel Shelly, "Stop Mechanism For Phonographs" US Patent 1,395,017, application filed April 5, 1916; lines 32-36
- [4] *Duncan v. Shelly*, reports of cases adjudged in the Court of Appeals of the District of Columbia, Vol. 49, pg. 245 (49 App. D.C. 1920)
- [5] Samuel Shelly, "Stop Mechanism For Phonographs" US Patent 1,395,017, application filed April 5, 1916; lines 10-16
- [6] *ibid.*, lines 50-52
- [7] *Instructions For Setting Up And Operating Edison Diamond Disc Phonographs, Types C-250-B275-B375 and B450* TAE, Inc., form 1691-20M218
- [8] Photo courtesy George F. Paul
- [9] *Duncan v. Shelly*, reports of cases adjudged in the Court of Appeals of the District of Columbia, Vol. 49, pg. 244 (49 App. D.C. 1920)
- [10] George L. Frow, *The Edison Diamond Disc Phonographs and the Diamond Discs*, Los Angeles, CA: Mulholland Press, 2001, pg. 191
- [11] R. Duncan, "Stop Mechanism For Talking Machines" US Patent 1,346,082, application filed April 21, 1915; lines 105-119
- [12] *ibid.*, lines 18-24, "constructed and arranged [so] that the same [device] may be operated ordinarily as an automatic device when a record has been completely played, or which may be operated manually to stop the driving mechanism when the reproducer is at any point upon the record. "
- [13] Because of the ensuing Interference Proceeding *Duncan v. Shelly*, we must assume this to be true.
- [14] *Duncan v. Shelly*, reports of cases adjudged in the Court of Appeals of the District of Columbia, Vol. 49, pg. 244 (49 App. D.C. 1920)
- [15] *ibid.*
- [16] *ibid.*, pg. 246
- [17] *ibid.*, pg. 245