Who Invented the Electric Washing Machine?

An Example of how Patents are Misused by Historians

By Lee Maxwell (Paper revised 19 February 2009)

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ABSTRACT

Only a small amount of the history of the development of washing machines has been documented and that is rife with inaccuracies in part because historians have misinterpreted patents in addition to having ignored other prior art.

This paper details how and why past authors have erred in citing Alva J. Fisher's 1910 patent to claim he had invented the electric motor powered washing machine. Important forms of prior art, other than patents, are presented to show when the Hurley Machine Company and the 1900 (Nineteen Hundred) Washer Company began large scale manufacturing of electric washing machines.

It is concluded that the inventor of the electric washer remains anonymous and that the "invention" came well before 1910. The example presented illustrates the pitfalls which may be encountered when using patents to establish inventorship. Hopefully future history of technology authors will take note and avoid repeat of yesterday's mistakes.

Introduction

The entire history of washing machines is one of the most ignored and most misrepresented segments of the history of technology. It is unfortunate that the supremely useful and ubiquitous "Machine of Monday" has not attracted more serious historical study. Almost all of the printed and internet history of washing machines is without much factual substance and appears to have been repeatedly handed down from incorrect or vague sources.

The purpose of this article is to illustrate, using as example the evolution of the electric washing machine how historians are misusing patents to establish historic fact. Too many researchers of history appear to have erroneously assumed the issuance of a patent to be the ultimate proof of inventorship and have also misconstrued patent information to establish dates of invention. Although we confine our discussion to the mistakes that have been made in reporting the history of the electric washing machine it is believed that these same kinds of mistakes have, and are being made when reporting on other inventions. Note: The phrase "electric washing machine," used in this paper, refers to a washing machine powered by an electric motor.[1]

Prior Reporting

"Who invented the electric washing machine?" Most libraries house materials that incorrectly reveal Alva J. Fisher as the one who invented the electric washer. The authors of these materials usually cite Fisher's US patent 966677, issued August 9, 1910, as proof of inventorship. (See Figure 1)[2] When students, at all levels, do searches of the internet to locate information about the history of washing machines they will find over 100 sites that also present faulty information.

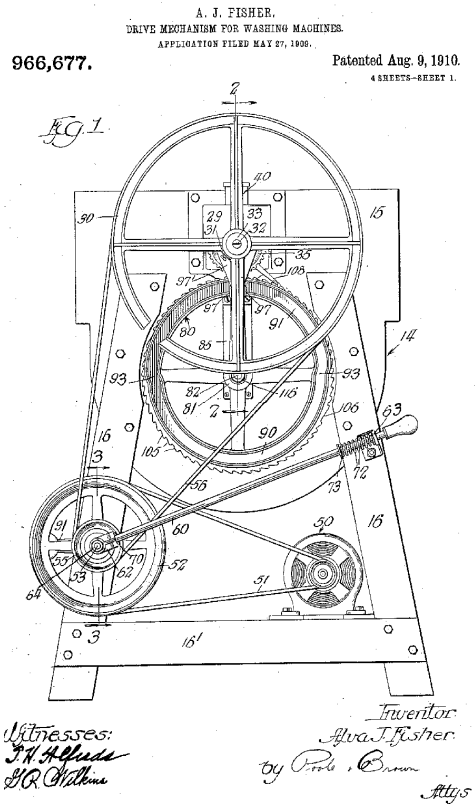

A. J. FISHER.
DRIVE MECHANISM FOR WASHING MACHINES.
APPLICATION FILED MAY 27, 1909.
966,677. Patented Aug. 9, 1910.
4 SHEETS—SHEET 1.
FIG. 1.
Witnesses:
Inventor:
Alva J. Fisher
Attys

Figure 1. Drawing from Fisher patent

In her book, Felder has a chapter titled, "1901 The Electric Washing Machine Is Invented."[3] There is no reference cited in the book to support her assertion that Fisher invented the electric washer in 1901. Perhaps the numerals 0 and 1 were inadvertently interchanged. Van Dulken includes the electric washing machine in his list of **100 inventions that shaped the world** and has a full page copy of Fisher's 1910 patent drawing, Figure 1, in addition to a written page describing the actions of the machine.[4] Haven, in his list of **the 100 greatest science inventions of all time** presents an almost unbelievable story about how Fisher invented the electric washing machine then sold the design to Westinghouse.[5] Although he does not cite Fisher's 1910 patent, Philbin credits him with the 1908 invention of the electric washing machine in his list of **the 100 greatest inventions of all time**.[6] The noted English inventor, author, and entrepreneur, Dyson acknowledges Fisher for having invented the electric washing machine in 1907.[7] Bunch, in his voluminous reference book, states that Alva John Fisher developed the first modern electric washing machine in 1916.[8]

Although the introduction of the electric washing machine was one of two major steps in the mechanization of domestic laundry, for some reason the often cited Giedion totally ignores the invention.[9] He seems to have had distaste with the entire development of the washing machine and refers to early machines as "grotesque contraptions." Strasser, without citing patents or other prior art, claims that the electric washer was introduced in 1914.[10] Stanley, in her compilation of women inventors, refers to over 50 washing machine patents.[11] Although her book does not contain discussion about the electric washing machine, she appears to have unequivocal faith in patents as proof of

inventorship. Weaver and Dale do not state that Fisher was the inventor of the electric washer however you might get that impression from their book as, A. J. Fisher is the only person mentioned in conjunction with electrical washing machines and a diagram of the washer, from his 1910 British patent (22114), serves as a full page background on the title page.[12] The same diagram is used within the text. Kane's (et.al.) huge, and popular, reference book of first facts alleges the 1910 Fisher patent to have been the first for an electric washing machine.[13]

Neither personal nor professional affront is intended by this author in citing historians who have made the mistake of incorrectly using patents to establish history. The writers mentioned have included within their books broader discussions of technology. By focusing on the big picture it is quite understandable details will be overlooked. The works of these writers of history are cited just to more starkly illustrate a point which will hopefully benefit future authors. It does seem curious that no book, academic writing, or journal article, written by a historian of technology, has been found that correctly relates the invention of the electric washing machine.

Patents 101

Researchers must be aware of more than just the title and diagrams of a patent, so before presenting a discussion about who invented the electric washing machine we give a layman's review of the essence of a patent. Myriad papers, books, and internet sites are devoted to patents and it is convenient to read what the professionals have to say. The elementary remarks made herein about patents are intended only to provide a brief introduction, or review, and in order not to further complicate matters we focus just on the US patent system. A more cosmopolitan approach must in general be taken when doing historic research and, with the internet, it is becoming increasingly more convenient to access patents, as well as other information, from across the planet.

A patent, or letters patent, is meant to provide a legal means whereby the owner of a patent may endeavor to enjoy the benefit of owning the invention described and which is alleged to be original and of the patentee's doing.

A patent application contains a general written description of the invention, a set of claims which precisely describe that which was invented and in many cases, drawings which illustrate the invention. The set of claims is of paramount importance and specifically identifies the invention. In order for an invention to be issued letters patent, the invention, a) must be of patentable subject matter, b) be novel, c) be non-obvious, and d) be useful. It is the task of the patent examiner to insure that these four requirements are satisfied before approving the issuance of a patent.

There are two dates printed on letters patent, the date of application and the date of issue. During the interim between these two dates the processes of, search (for prior art), examination, and prosecution take place during which time a patent examiner determines the patentability of the invention described in the application. If there are questions about patentability the iterative process, of patent prosecution, between the patent examiner and

the inventor is undertaken. In order to satisfy any objections made by the examiner it is possible that amendments to the original patent application may be made. Although it is not permitted, through amendments, to introduce new matters which were not in the original disclosure, all of the material of the letters patent may not be identical to that which was in the patent application.

In most countries except the United States, the “first to file” wins the prize. In the US, if more than one application, or patent which have been issued for less than a year, claims the same invention, the patent office may initiate an “interference practice. During an interference procedure the alleged inventors involved provide whatever evidence they can to justify their claim to be the first to invent. Likewise, others may introduce evidence (prior art) to disprove the claim.

Looking Only at the Diagrams

In this section it is illustrated how Alva J. Fisher has erroneously been credited with the invention of the electric washing machine. It is surmised that at least one previous researcher of history had found the 1910 Fisher patent and by observation of the first diagram therein, concluded that Fisher had invented the electric washing machine. Apparently searches, if any, for earlier patents involving electric washing machines were not successful. During 1910 the US, Austria and Britain (and perhaps more countries) had granted A. J. Fisher letters of patent, Table I, for his washer. The main body of the washer is shown to be the same in each of the three patents however the British and Austrian patents show an attached wringer which is not included in the US patent.

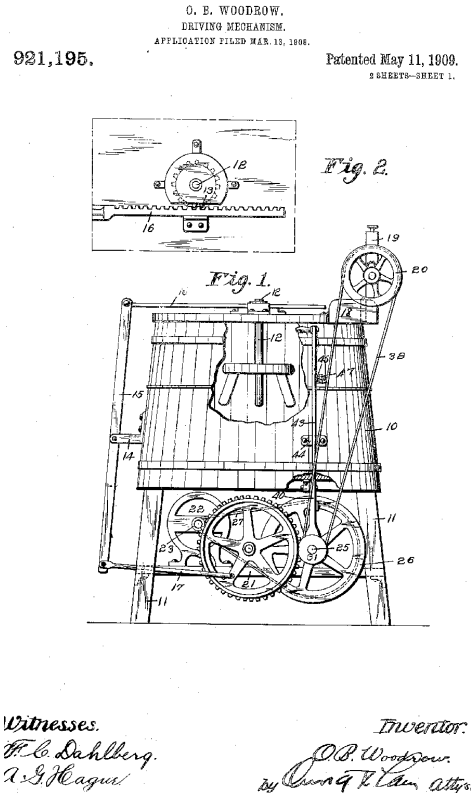
Patentee	**Pat. No.**	**Application Date**	**Patent Issue Date**
Winans, T. J.	841606*	12 Apr. 1906	15 Jan. 1907
Willsea, L. P.	870655	8 Jan. 1906	12 Nov. 1907
Woodrow, O. B.	921195	13 May 1908	11 May 1909
Lombard, N.	944736	4 Feb. 1909	28 Dec. 1909
Phillips, W. F.	950402	15 Jan. 1909	22 Feb. 1910
Fisher, Alva Josiah	45347**	30 Sept. 1909	15 Jul. 1910
Fisher, A. J.	966677	27 May 1909	9 Aug. 1910
Fisher, Alva Josiah	22114***	28 Sept. 1909	18 Aug. 1910
Voss, W. H.	1008502	7 Dec. 1908	14 Nov. 1911
Voss, W. H.	1013629	3 Dec. 1908	2 Jan. 1912
Sutter, J. H.	1092605	21 Nov. 1908	7 Apr. 1914

* No electric motor ** Austrian patent number *** British patent number

Table I. Electric washing machine patents applied for, or issued prior to Fisher’s.

Illustrated on the first drawing, Figure 1, of Fisher’s US patent is a washing machine with an electric motor. That an electric motor is shown, however, is of little consequence since each of the patents listed in Table I, except Winans’, have a figure showing a washing machine with an electric motor.

If we were to use the patent drawings as the only prior art then clearly we can conclude that Fisher was not the inventor of the electric washing machine. We need only show a diagram, Figure 2, from the Woodrow patent which was granted before Fisher had submitted applications for any of his three patents of Table I. Each of the patents listed in Table I, except for the Fisher patents has an application date earlier than 27 May 1909.


O. E. WOODROW.
DRIVING MECHANISM.
APPLICATION FILED MAR. 13, 1908.

921,195. Patented May 11, 1909.

2 SHEETS—SHEET 1.

Fig. 2.

Fig. 1.

Witnesses.
H. C. Dahlberg.
A. G. Hagner

Inventor:
O. B. Woodrow.
by Munn & Co. attys.

Figure 2. Woodrow patent drawing

Examine Patent Descriptions and Claims

Instead of just looking at the patent drawings, if we examine the descriptions and pay careful attention to the claims put forth in each of the patents we find that Fisher did not even claim to have invented the electric washer.

In Fisher's US patent the word "motor" is used three times in the description and only one time in a claim. In claim number 11 (of his 28 claims) the phrase "motor actuated drive" is written. The word "motor" can be used to mean any form of motive power but "electric motor" was most likely meant in this case. Although Fisher uses the word "motor" seven times within the description of his British patent, the word "motor" is not used a single time in any of the 7 claims. Fisher refers to a "motor" 5 times in the description section of his Austrian patent. He mentions a motor in 3 of the 14 claims of the Austrian patent however it was not done in the context of claiming invention of an electric washing machine. Neither in America, Austria, nor England did Fisher assert ownership of the invention of the electric washer. Surely it would have been so stated by his legal representatives, if he intended to claim the invention.

In the second paragraph of his description Woodrow states, "The object of my invention is to provide means of simple, durable and inexpensive construction, permanently connected to the frame of a washing machine, whereby all of the operating mechanism, including an electric motor, or other suitable power device, may be mounted beneath the body of -----." Each of the five claims in the Woodrow patent refers to a motor. He, more than any other patentee, listed in Table I, seems to have declared inventorship of the electric washing machine.

In retrospect, it is fairly evident that those authors who cite Fisher's 1910 patent as proof that he was the inventor of the electric washing machine did little investigation other than to look at the first drawing included in his patent. If those writers would have invoked the other patents, of Table I, as prior art, or if they had read the claims within Fisher's patent, surely there would have been some question as to who invented the electric washer.

First to File

Louis P. Willsea may have been the first to file, at the US Patent Office, an application which illustrates an electric washing machine. The title of Willsea's patent is "Centrifugal Machine" and it is explained in the beginning part of the description that the invention pertains to extractors as well as washers. A centrifugal washer is one in which the washing fluid is forced through the clothes by centrifugal action. The particular extractor-washer shown in Willsea's patent is one for use in a commercial laundry and likely would not be found in the home. Centrifugal type washers which employ the same principles as Willsea's machine have, however, been produced for domestic use. The word "motor" is not mentioned in either of the two claims of Willsea's patent and, like Fisher, he does not aver to have invented the electric washing machine.

Patentability of the Electric Washer

The "invention" of the electric washing machine would probably not have qualified for patentability. Creating an electric washing machine, sometime during the years 1890-1905, would have amounted to merely taking a hand operated washer, of which there were many (see oldewash.com and/or Maxwell's book[14]), and attaching an electric motor in such a way the washer is powered by the motor. One of the basic criteria for a patent to be issued is that the invention be "non-obvious." With the existence of many different hand-operated washing machines and the ready availability of fractional horse power electric motors (and the distribution networks making electric power accessible) it appears "obvious" that production of the electric washer would have been mandated by a multitude of overworked housewives.

A patent issued to G. C. Lester (US Pat. No. 718135) on January 13, 1903 (Application filed 8 Mar. 1902) illustrates a coffee roaster with an electric motor. The coffee roaster uses a rotating foraminous drum very similar to that used by many washing machines including the Thor machine designed by Fisher. The patent for Lester's coffee roaster is listed in class 68 by the US Patent Office. Class 68 is where patents for most washing machines are put. Lester's patent could surely have been used to show that putting an electric motor onto a washing machine, by the year 1905, was obvious.

It seems almost ironic that an obvious invention cannot be patented. Interestingly, on April 30, 2007, the US Supreme Court ruled on a case involving obviousness of an invention.[15] What is obvious today may either be more or less obvious next year depending on the logic of the lawyers and the courts.

Patent Applications Not Subject to Peer Evaluation

Patents, or applications for patent, are not necessarily good prior art for historians to use to support proof of inventorship. The entire procedure of approving a patent is not subject to overt peer evaluation. Patents are approved by government examiners who are undoubtedly highly educated but who may not necessarily have depth of experience in all matters about which they are asked to judge. For example, there are over 24,383 patents which have been issued in class 68, the class in which washers are put. In addition to the patents there exists a wealth of other individual pieces of prior art concerning washing machines. It is not too hard to realize why all pertinent prior art, including prior patents, may not be considered during the examination of a patent application.

Even after a patent is awarded, the claims may be judged illegitimate as a result of litigation or through reexamination by the patent office, and the patent voided. Prior art, which had not been considered by the patent examiner, could form the basis for voiding a patent.

The patent office, by using the word, “inventor” on the application materials and on the letters patent, strongly suggests, at least to the unwary, that letters patent are proof positive of invention. By discovering a fault in logic, a mathematical proof may be invalidated. The proof of invention offered by a patent may be invalidated by merely bringing to light, an overlooked item of prior art. Instead of using the word “inventor” on the patent application and on the letters patent, words such as “alleged inventor” and “patentee” would perhaps be more suitable.

Other Important Prior Art

Regardless of whether or not an invention has been patented, there are a number of other prior art forms which may be employed to determine date of invention. These other prior art include drawings, notes, pictures and oral presentations prepared by, or for, the inventor. There was a multitude of individual washing machine inventors and their original “engineering notes” were not usually archived. These unique materials are not commonly nor easily found.

At least in the case of washing machines, patent information is not good evidence to determine dates of production. More useful prior art usually comes in the form of manufacturer’s brochures, operating and maintenance manuals and advertisements found in newspapers, trade journals, magazines, etc. For example, if there were a full page advertisement in the March 1899 issue of Good Housekeeping picturing electric washing machines for sale, the ad would be an important piece of prior art. Two examples of washing machine advertising, and a picture from a magazine article, are used as prior art in the following section.

In addition to the material, described above, a washing machine itself can be prior art. Unfortunately it is usually not feasible to determine an exact date of manufacture on a machine because the production records of most companies have been discarded. As a

notable exception, there are production records for many of the wringer washers produced by Maytag.

Most washing machines were, and still are, manufactured and marketed prior to patents being issued for those machines. The Thor washing machine, designed by Fisher, is an example where the patent applications were not even filed until almost 3 years after production of the washer had begun. Often machines were built and sold having never been patented. If a patent date is etched, embossed or in some other manner put onto a washing machine you can only be sure that the particular machine was not built before that date. If a machine was patented but has no patent date posted on it, then the machine could have been manufactured either before or after the issuance of letters patent.

First Mass Marketed Electric Washers

The electric motor was put onto the washing machine for the purpose of providing power to the agitation system as well as to the wringer used for pressing the water out of the clothes. Although the machine of Figure 3 is not the first model of Thor electric washer produced by the Hurley Machine Company of Chicago it was designed by Fisher and his 1910 patent drawings accurately describe the mechanisms of the machine pictured.[16]

Figure 3. Thor Washing Machine. ca 1911

Figure 4. Postcard--Thor washer. ca 1908

The postcard, Figure 4, picturing an early Thor Electric Washer designed by Fisher, has a postmark of October (?), 1908. It is believed that the washing machine pictured on the postcard is the first electric model to have been

produced by the Hurley Company. Unfortunately it is not known when the postcard was printed.

On 15 January 1907, J. T. Winans was issued a patent for the washer shown in Figure 5. The only mention of motive power for Winans' washer is in the first part of the patent description where he states that the pulley 13, Figure 5, may be driven by a water motor. A water motor, or turbine, belted to the pulley 13, is connected to a faucet. When the water is turned on, the turbine rotates and provides power to the washer. This water power arrangement is pictured in early ads issued by the 1900 Company. The use of water turbines was not too popular and the company proceeded to manufacture an electrical powered version of Winans' design, Figure 6.

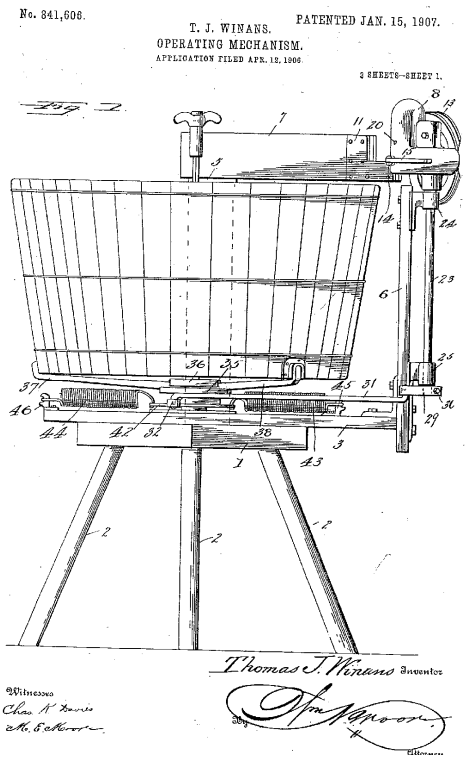


Figure 5. Winans patent drawing

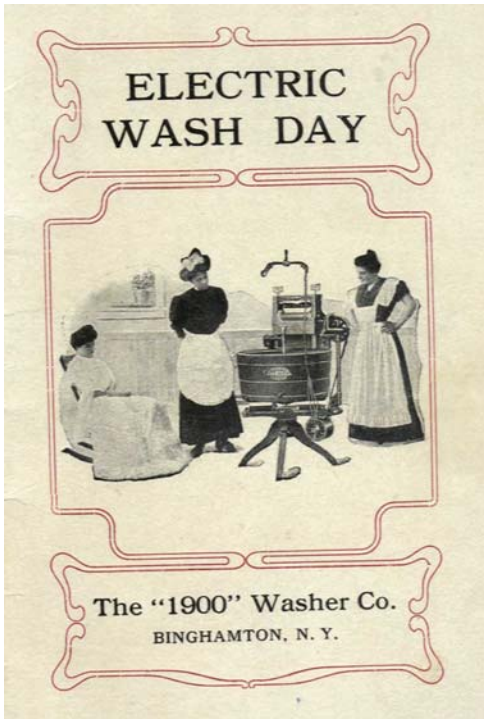
Figure 6. 1900 washer. ca 1907

Except for the electric motor the mechanisms of the actual machine are nearly identical to those shown on the patent diagram, Figure 5. The legs, along with added bracing, of the machine produced, are a different design from those shown in the patent diagram. Like Fisher's US patent, Winans' does not show a wringer mechanism.

It is of special interest to note how convenient it was to have put an electric motor onto the Winans washer. Shown in the patent drawing, of Figure 5, is a platform which supports the mechanical parts of the washer. The electric motor is mounted on the underside of this platform, Figure 6. The large pulley 13 is placed at an angle allowing clearance for the belting between it and the motor. One could almost suspect that the

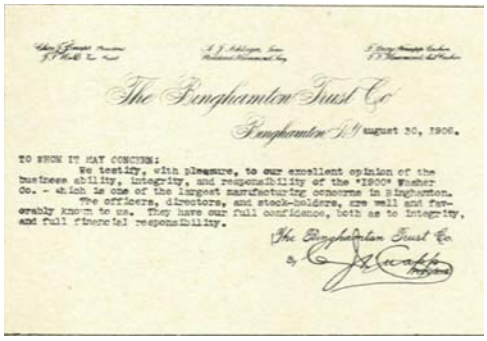
unique design features of Winans' machine were meant to accommodate an electric motor.

The 1900 Company issued a pamphlet, shown in part by Figure 7, picturing an electric powered version of Winans' machine. It is assumed that the date, August 30, 1906, on the letter from the Binghamton Trust Company which is reprinted on one page of the pamphlet, suggests that the pamphlet was issued later that year.




ELECTRICAL WASHING-MACHINE.

Figure 8. 1900 Washer. ca 1907


The Binghamton Trust Co
Binghamton N.Y. August 30, 1906.

TO WHOM IT MAY CONCERN:
We testify, with pleasure, to our excellent opinion of the business ability, integrity, and responsibility of the "1900" Washer Co. - which is one of the largest manufacturing concerns in Binghamton. The officers, directors, and stock-holders, are well and favorably known to us. They have our full confidence, both as to integrity, and full financial responsibility.
The Binghamton Trust Co.
By

Figure 7. 1900 Brochure. ca 1907

In the July-December 1907 issue of "Arena" the same model (see Figure 8) of 1900 electric washer was pictured in an article by B. O. Flower.[17] As contrasted from the pamphlet of Figure7, the issue date of the "prior art" of Figure 8 can be authenticated and proves the electric washer was being manufactured by at least December 1907.

Because of the evidence presented herein, it is believed that the 1900 Company was the first to mass produce and market the electric washing machine. This belief, could however, be proven wrong by revelation of earlier prior art for the Thor machine. No advertising or other information has been found to suggest another company, besides the two mentioned, could have been the first to produce electric washers in substantial quantities.

Who Did Invent the Electric Washing Machine?

The Thor electric washer was produced by the Hurley Machine Company ca. 1907. If Fisher's engineering notes were available they might show he had involved an electric motor on his machine as early as 1905. However, no such notes are known to exist. The Nineteen Hundred Company began production of an electric washing machine ca. 1906. If Winans' design notes were available they might also show that he was putting an electric motor on a washer by 1905 or before.

Discussed above, Woodrow may have claimed to be the inventor of the electric washer in his patent application dated 13 May 1908. (Although, it is not clear that his patent makes such a claim.) But by that time washing machines with electric motors were already in production and advertisements to sell them were issued by 1906-1907. An interference practice, if conducted, would surely have resulted in the denial of any claim that Woodrow would have made relative to the invention of the electric washing machine.

It is estimated that there were over 1000 companies producing washing machines during the early 1900s. Most of these companies were very small but almost all would have had the wherewithal to manufacture at least one electric washer. One-quarter horsepower electric motors (the size used most often for washing machines) and electrical distribution networks were beginning to be in use by the 1890s.

In his 1894 book, Sir David Salomons illustrated the electric butter churn of Figure 9 in addition to an electric mangle and other electric home appliances.[18] The churn of Figure 9 is a "close cousin" to a rotating drum washer and during the 1800s there were several patents for devices which could be used either as a butter churn or a washing machine. Surely in the same era that the electric butter churn came into being, so did the electric washing machine.

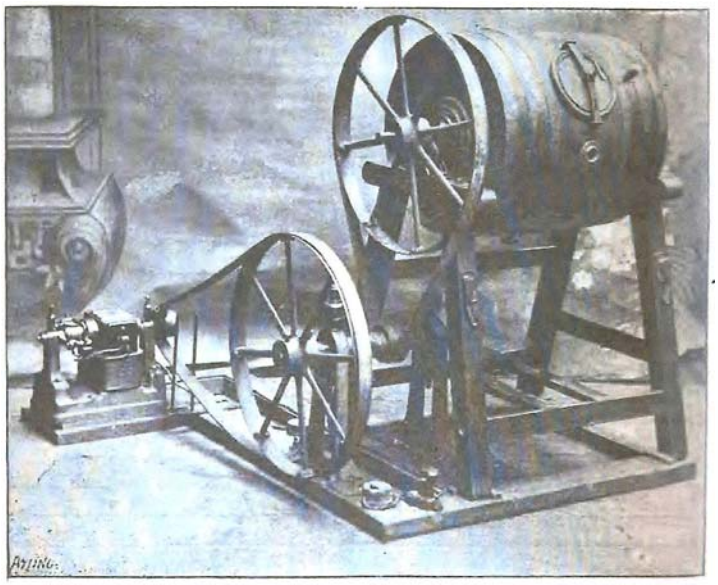


Figure 9. Electric Butter Churn. 1894

As Cowan relates, by 1900 small electric motors were sold with the intention that householders would connect them to hand cranked washing machines.[19] Her excellent writing relates the consequences of, and how, technology was integrated into the domestic environment, and she makes little or no use of patent information. Cowan, in another book states, "If there were no such thing as a patent, we would not know very much about inventors."[20] Well, we have myriad patents but we

must interpret patent information correctly or we still won't know much about inventors. Unless, and until, further evidence is presented the inventor of the electric washing machine certainly must be one of the unnamed householders mentioned in her book.

Summary: The Lessons Learned

The most compelling pieces of evidence, that A. J. Fisher should not be given credit for having invented the electric washing machine, are his US, Austrian and British patents of 1910. In none of the patent claims (28 for the US, 7 for the British and 14 for the Austrian) does Fisher allege to have invented the electric washer. There are at least five patents for washing machines, having diagrams showing electric motors, which were filed before any of the Fisher patents. More importantly, there is other prior art, which predates 1908, showing an electric washing machine not of Fisher's design.

With so many books, articles and internet sites showing Fisher to have invented the electric washing machine it is easy to see why the error gets propagated. It may be a very long time, if ever, before the record gets set straight. Instead of the specific Fisher debacle, the more important issue to be learnt is that researchers of history should use caution when using patents to establish inventorship.

Other aspects of patents, and the processes involved in approving or denying them are illustrated above. These procedures are discussed herein so that future authors will at least question the use patents in determining historic fact. Possible flaws inherent in the process of approving patents are presented and although, patents are imperfect it is not within our jurisdiction to suggest ways to make them more ideal sources of history. The imperfections are mentioned here just to caution researchers.

- We conclude herein that patent information should be used properly and with caution in the determination of historic data.

- Letters patent are government issued documents which deeds ownership of an alleged invention. Patents are meant to be used by the legal community.

- Letters patent are issued without the benefit of overt professional peer review.[21]

- Know that patents can, and have been, nullified. A patent is not the ultimate proof of inventorship.

- When using a patent to cite inventorship researchers must examine, in detail, the patent claims. The adage, "a picture is worth a 1000 words" is not true for patents.

- Inventorship is difficult to prove. It is much easier to disprove inventorship.

- Patents may be used to show that an invention existed at least as early as the patent filing date.

- When using a patent application to establish a date of invention, make sure that the invention in question is that which is evinced in the patent claims.

- Other forms of prior art are often more valuable than letters patent, when ascertaining inventorship.

- Specifically, by the example used in this writing, it cannot be concluded that Alva J. Fisher invented the electric washing machine and furthermore, whoever did, remains unknown.

- It is believed that the 1900 Company was the first to mass produce an electric washing machine. Future revelation of additional prior art may prove otherwise.

The Future

The history of the development of the washing machine and other pieces of domestic technology needs more attention from the History of Technology sector. We have gone from an industry of over 1000 companies manufacturing washing machines during the early 1900s to only a handful including, two US mega-corporations, today. There are a remarkable number of different schemes which have been used in doing the laundry. The equipment is fascinating and those folks interested in history should read of it. The development of the washing machine from the mid 1700s through the year 2000 would surely provide basis for several graduate dissertations. The reporting should be done while there is yet opportunity to collect the necessary material.

Notes

[1] There are other kinds of "electric washing machines." For example a US patent (512970) titled "Electric Washing Machine" was issued to J. P. Johanson on Jan. 16, 1894. Johanson's washing machine utilizes two electrodes, and a battery, to pass an electric current through the water containing the clothes. Methods of clothes washing using electric currents were demonstrated prior to 1894 and are, in fact, of contemporary interest.

[2] A complete set of drawings and descriptions for each of the US patents, cited herein, may be obtained by downloading them from the US Patent Office web site, uspto.gov. To view British and European patents go to the web site, ep.espacenet.com.

[3] Felder, *A Century of Women*, 13-16

[4] Van Dulken, *Inventing the 20th Century*, 26-27

[5] Haven, *100 Science Inventions of All Time*, 192-194 (Note, Westinghouse did supply electric motors for the washing machine designed by Fisher but there is no evidence that Westinghouse bought the design.)

[6] Philbin, The Hundred Greatest Inventions of All Time 256-258

[7] Dyson, *James Dyson's History of Great Inventions*, 137

[8] Bunch, *The History of Science and Technology*, 486

[9] Gideon, *Mechanization Takes Command*, 550-553, 560-571

[10] Strasser, *Never Done*, 117

[11] Stanley, *Mothers and Daughters of Invention*, 300-303

[12] Weaver and Dale, *Machines in the Home*, 36

[13] Kane, *Famous First Facts*, 287

[14] Maxwell, *Save Womens Lives-History of Washing Machines*

[15] See the US Supreme Court ruling No. 04-1350 on the internet at : supremecourtus.gov/opinions/06pdf/04-1350.pdf

[16] The first Thor electric washer incorporated a wringer with three rollers but no forward and reverse clutch to control the direction of rotation of the rollers. With 3 rollers you don't need to change rotation direction since the clothes can be fed through the wringer from either front or back of the wringer. The wringer mechanism is shown only in Fisher's British and Austrian patents.

[17] Flower, "The Coming Electrical Home for America's Millions" Arena, 593

[18] Salomons, Sir David, Electric Light Installations-Apparatus-A Practical Handbook, 304

[19] Cowan, *More Work for Mother*, 93

[20] Cowan, *A Social History of American Technology*, 120

[20] Public Law 96-517, enacted by the US Congress on Dec. 12, 1980, in essence made the review of patent application more "overt." Any person can submit prior art believed to have bearing on the patentability of any claim. Note, the law does not pertain to patents which were expired prior to Dec. 1980. Also note, the law does not demand overt 3rd party professional review.

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Books

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Acknowledgements

The patent drawings of Figures 1, 2, and 5 were copied from the US Patent Office internet site, uspto.gov

Figure 4 is a copy of a postcard issued by the Hurley Company

Figure 7 is a copy of a brochure issued by the 1900 Washer Company

Figure 8 is copied from The Arena Journal

Figure 9 is copied from David Salomons book

Figures 3 and 6 are photographs taken by the author

“The Moving Finger writes; and, having writ,
Moves on: nor all your Piety nor Wit
Shall lure it back to cancel half a Line,
Nor all your Tears wash out a Word of it.”

The Rubaiyat of Omar Khayyam

About the author

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After guiding the learning experience of aspiring electrical engineers for 30 years Dr. Maxwell retired in 1986. He has since that time amassed over 1060 antique washing machines and holds the Guinness World Record for his collection. In addition to collecting and restoring machines for his unique museum near Eaton, Colorado, he maintains an internet site (www.oldewash.com) and an extensive library both dedicated to the archiving and dissemination of information about the development of the washing machine.

He has authored two books including:

“The Theory of Graphs: A Basis for Network Theory” (with Myril Reed) Pergamon Press, NY, 1971

“Save Womens Lives—History of Washing Machines”, Oldewash Publisher, Eaton, CO 2003