

History of Incandescent Electric Lamps in the USA

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Introduction

This document:

1. recites a terse history of incandescent lamp technology, including patent numbers
2. discusses the [consolidation](#) amongst manufacturers of electric lamps in the USA, as the number of manufacturers decreases from dozens in the early 1900s, to seven in 1936, and to three in the 1950s.
3. collects citations to the major [patent](#) infringement cases in the USA involving electric lamps,
4. [links](#) to other websites,
5. and cites the U.S. [statute](#) that prohibits manufacture of some traditional incandescent lamps.

Terse History

The conventional history is that Thomas Edison invented the incandescent electric lamp in the year 1879. The truth is that other inventors created electric incandescent lamps during the 1860s and 1870s, but those lamps had both a short lifetime and a dim light, because of a poor vacuum inside the bulb and unsatisfactory filament material.

- In 1878, Joseph Swan in England developed an incandescent lamp with a carbonized cotton thread as a filament, but Swan's filament had a relatively low resistance, which dissipated more power than Edison's later bamboo filament. British Patent 4933 (issued 2 Jan 1880); U.S. Patent 234,345 (issued 9 Nov 1880).
- In 1879, Thomas Edison invented an improved carbon-filament lamp that is described in U.S. Patent Nr. 223,898 (issued 27 Jan 1880).
- In 1880, Edison developed an incandescent lamp with a filament made from carbonized bamboo. U.S. Patent 251,540 (granted 27 Dec 1881). Edison was the first in the USA to manufacture a commercially successful incandescent electric lamp.

In 1881, Swan developed a nitrocellulose filament that had a high resistance.

- In 1889, four of the Edison companies (Edison Lamp Company, Edison Machine Works, Bergmann & Company, and Edison Electric Light Company) merged to form Edison General Electric.
- In 1892, Edison General Electric merged with Thomson-Houston Electric Company to form the General Electric Corporation. This merger made GE the leader in electric lamps in the USA.
- In the 1880s and 1890s incandescent lamps used carbon filaments and had both low light output and short life. While tungsten, with its low vapor pressure at high temperatures, was an obvious choice for a filament, there were technical problems in manufacturing small-diameter filaments of tungsten. In 1904, Alexander Just & Franz Hanaman — then assistants to Professor Vortmann of the Technische Hochschule in Vienna — invented a tungsten-filament lamp. U.S. Patent No. 1,018,502 (issued 27 Feb 1912). General Electric purchased the rights to this U.S. Patent for US\$ 400,000 before the Patent was issued. The rights to a Hungarian patent were sold to Tungsram, and the rights to a German patent were sold to Osram, making the two inventors very wealthy.
- In 1912, Dr. William D. Coolidge at General Electric Research Laboratories in Schenectady, NY invented drawn tungsten filaments for electric lamps. U.S. Patent 1,082,933 (issued 30 Dec 1913).
- In 1913, Dr. Irving Langmuir at General Electric Research Laboratories invented gas-filled (either dry nitrogen or argon) lamp bulbs, U.S. Patent 1,180,159 (issued 18 April 1916). The gas filling slowed the evaporation of the filament, increasing the lifetime of the lamp and reducing blackening on the inside of the glass bulb.
- In 1913, Dr. Irving Langmuir also invented coiled filaments, which had greater luminous efficiency than plain wire filaments, because of less heat loss to convection in gas-filled bulbs. Claim 13 of Langmuir's U.S. Patent 1,180,159 (issued 18 April 1916) mentions "a closely coiled tungsten filament".
- In 1913, Burnie Lee Benbow at General Electric Lamp Works in Cleveland invented the coiled-coil filament, U.S. Patent 1,247,068 (issued 20 Nov 1917). A coiled-coil filament has less heat loss to convection than a single-coil filament, especially if the filament is vertical when the lamp is operated.
- In 1915-17, Dr. Aladar Pacz at General Electric in Ohio developed nonsag tungsten wire, by adding potassium silicate to the tungsten. U.S. Patent 1,410,499 (issued 21 Mar 1922).
- In 1925, Marvin Pipkin at General Electric Lamp Works in Ohio invented a way to use hydrofluoric acid to "frost" the inside of a lamp bulb, thereby avoiding glare from a lamp with a clear bulb, and without substantially weakening the mechanical strength of

the bulb. U.S. Patent 1,687,510 (issued 16 Oct 1928).

- In 1947-48, Pipkin at General Electric Lamp Works in Ohio introduced silica coating on the inside of a lamp bulb, called a "soft white" bulb. U.S. Patent 2,545,896 (issued 20 Mar 1951).
- In 1959, Elmer Fridrich and Emmett Wiley at General Electric Lamp Works in Ohio invented a practical tungsten-halogen lamp. U.S. Patent 2,883,571 (issued 21 April 1959).

Ordinary gas-filled tungsten filament lamps operate with a filament temperature of approximately 2800 kelvin. Increasing the gas pressure and adding iodine inside the lamp allows the coiled filament to be operated at a temperature of 3200 kelvin, which improves the efficiency of the lamp (increases lumens/watt) and provides more blue light, without shortening the lifetime of the lamp. The addition of iodine causes evaporated tungsten to be redeposited on the filament, instead of blackening the inside of the glass bulb. This patent discloses a lamp with an efficiency of more than 20 lumens/watt and a lifetime of more than 2000 hours.

Consolidation in Industry

The General Electric Corporation held an enormous number of U.S. Patents on electric lamp technology, from (1) the patents of Edison, (2) the patents of Sawyer and Man (owned by Thomson-Houston), and (3) the patents from General Electric Research Laboratories. In 1901, a group of independent lamp manufacturers founded what would later be called the National Electric Lamp Association (NELA) in Cleveland, Ohio to conduct research and testing in competition with General Electric. Ironically, General Electric provided 75% of the initial investment for NELA and remained a silent partner until the year 1911, when General Electric purchased all of NELA. That is why the General Electric Lighting Division was located in a suburb of Cleveland.

In 1925, the U.S. Government sued General Electric and Westinghouse under the Anti-Trust Act. The U.S. District Court, affirmed by the U.S. Supreme Court, dismissed the litigation. The U.S. Supreme Court noted the role of Patents in making General Electric dominant in the marketplace:

The General Electric Company is the owner of three patents — one of 1912 to Just & Hanaman, the basic patent for the use of tungsten filaments in the manufacture of electric lamps; the Coolidge patent of 1913, covering a process of manufacturing tungsten filaments by which their tensile strength and endurance is greatly increased; and, third, the Langmuir patent of 1916, which is for the use of gas in the bulb, by which the intensity of the light is substantially heightened. These three patents cover completely the making of the modern electric lights with the tungsten filaments, and secure to the General Electric Company the monopoly of their making, using, and vending.

The total business in electric lights for the year 1921 was \$68,300,000, and the relative percentages of business done by the companies were: General Electric, 69 per cent.; Westinghouse, 16 per cent.; other licensees, 8 per cent.; and manufacturers not licensed, 7 per cent.

U.S. v. General Electric Co., 272 U.S. 476, 480-481 (1926) (*affirming* 15 F.2d 715 (N.D. Ohio 1925)).

In 1949, the U.S. Government found General Electric had engaged in anti-competitive practices, in violation of the Sherman Anti-Trust Act. The U.S. District Court concluded:

The record of General Electric's industrial achievement has been impressive. Its predecessors pioneered the lamp industry and it organized through the years an establishment that stands as a model of industrial efficiency. It early established the policy of making the best lamps as inexpensively as possible and to this end developed a lamp research, engineering, and production system which established it in the first position of industrial leadership in the incandescent electric lamp field not only in the United States but in the world. By means of extensive research initiated by such scientists as Steinmetz, Whitney, Langmuir and Coolidge, mechanical and technological advances were accomplished which made possible a progressive price reduction policy. Therefore, it was able in the twenty year period between 1922 and 1942 to reduce the prices of large lamps, 78.6%; miniature lamps, 70.3% with an average for both types of 77.2%. It can take just pride in the more graphic statistic that the price of a 60 watt bulb was 45 cents in 1922 and 10 cents in 1942. By the efficiency which it employed in its business, the use of research to improve its lamps, the development of new lamps and new uses for old lamps to increase the market, there was established a firm foundation for leadership.

On the other hand there can be no doubt that it paced its industrial achievements with efforts to insulate itself from competition. It developed a tremendous patent framework and sought to stretch the monopoly acquired by patents far beyond the intentment of those grants. It constructed a great network of agreements and licenses, national and international in scope, which had the effect of locking the door of the United States to any challenge to its supremacy in the incandescent electric lamp industry arising from business enterprise indigenous to this country or put forth by foreign manufacturers. Its domestic licenses gave fiat to a few licensees whose growth was carefully limited to fixed percentages of its own production and expansion so that over the years its share of the business was not materially diminished and its dominant proportion was never exposed to any hazard in that direction.

U.S. v. General Electric Co., 82 F.Supp. 753, 905 (D.N.J. 1949) (citation to exhibits omitted here). General Electric did not appeal this decision.

In this anti-trust case in 1949, the patent strategy of General Electric was explained:

It is argued that there has been a high mortality rate in the number of companies engaged in the manufacture of lamps, all due to the industrial climate created by General Electric, and pointed to Exhibit 24-G which lists the number of companies that at one time or another had been licensees of General Electric. It contended that between 1912 and 1940 some 36 different companies were licensed by General Electric. Of this number 18 were large lamp manufacturers; 14 were miniature lamp

manufacturers; 2 manufactured large and small lamps; and one manufactured special lamps. However, the Government claimed that in 1940 only 3 companies were licensed to manufacture large lamps; 2 companies licensed to manufacture miniature lamps; and one company licensed to manufacture large and miniature lamps. That this number was partly reduced by consolidation and acquisition by remaining licensees the Government contended was immaterial. It asserted that only three independent miniature lamp manufacturers in business prior to 1927 are in the field today and that no substantial new capital had been invested in the large lamp business after 1927.

General Electric argued that when the court sustained the Just and Hanaman patent in 1916, *General Electric Co. v. Laco-Philips Co.*, 2 Cir., 233 F. 96 approximately twenty-five incandescent lamp manufacturers were infringing this patent. With substantial investments and numerous employees they would have been in serious straits had it sought to enforce its patents against them. Not desiring this and at the same time in order to protect its patent position, it offered to all tungsten lamp manufacturers then in existence licenses with certain restrictions based upon the amount of business conducted by these infringers in the past. All but one infringer, it contended, accepted licenses.

U.S. v. General Electric Co., 82 F.Supp. 753, 899-900 (D.N.J. 1949) (citations to the trial record omitted here).

In the year 1936, seven companies in the USA were licensed to use General Electric's patents in incandescent lamp technology:

1. Westinghouse Electric & Manufacturing Co.,
2. Hygrade Sylvania Corporation,
3. Chicago Miniature Lamp Works,
4. Tungsol Lamp Works, Inc. in Newark, New Jersey,
5. Kentucky Electric Lamp Co. (sold to Ken-Rad, which was sold to Westinghouse in 1945),
6. Economic Electric Lamp Co. (acquired by Sylvania in 1936), and
7. Consolidated Electric Lamp Co. in Lynn, Massachusetts.

Ibid., 82 F.Supp. at 768, 874, 900; *U.S. v. General Electric Co.*, 115 F.Supp. 835, 869 (D.N.J. 1953) (date Westinghouse purchased Ken-Rad).

Consolidated Electric Lamp Co. in Lynn, Massachusetts was also known as "Champion Lamp Works". This company was sold to Norelco, a subsidiary of Philips in the Netherlands.

Since the 1950s there are only three major manufacturers in the USA of electric lamps for use at 120 V:

1. General Electric was the leader in lamp technology. GE purchased many competitors during the early 1900s, as a quick way to acquire more production capacity, as well as eliminate competitors. As mentioned above, GE licensed their patents to some competitors.
2. Westinghouse, which sold their lamp business in 1983 to the Dutch firm, Philips

3. [Sylvania](#), which was created in 1931 from the merger of Hygrade Incandescent Lamp Company in Massachusetts and the Novelty Incandescent Lamp Company (NILCO) in Pennsylvania. In 1993, Sylvania was sold to the German firm, Osram.
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Patent Cases in USA

The following is a list of patent infringement cases involving electric lamps in the U.S. Supreme Court, and some of the more significant electric lamp cases in the U.S. Courts of Appeals. I also cite the cases in the courts below, to give the complete history. Note that not all opinions of the U.S. Court of Appeals are published, and opinions of federal trial courts were rarely published before 1933. I list the names of the parties in the conventional trial court format: *Plaintiff v. Defendant*.

1. *Brush v. Condit*, 20 F. 826 (S.D.N.Y. 1884), *aff'd*, 132 U.S. 39 (4 Nov 1889) (Patent on improved carbon arc lamp.).
2. *Edison Electric Light Co. v. United States Electric Lighting Co.*, 47 Fed. 454 (S.D.N.Y. 1891) *aff'd*, 52 Fed. 300 (2dCir. 4 Oct 1892) (Edison's U.S. Patent Nr. 223,898 infringed.).
3. *Edison Electric Light Co. v. Sawyer-Man Electric Co.*, 53 Fed. 592 (2dCir. 15 Dec 1892) (Edison's U.S. Patent Nr. 223,898 infringed. "As the result of negotiations between the Consolidated Electric Lighting Company and the Thomson-Houston Company, the Sawyer-Man Company, the present defendant, was organized in September 1886. Nine tenths of its stock was owned by the Thomson-Houston Company. It received from the Consolidated Company a license to manufacture lamps under the Sawyer-Man patents, and thereupon began the business of manufacturing the infringing lamp,").
4. *Edison Electric Light Co. v. Beacon Vacuum Pump & Electrical Co.*, 54 Fed. 678 (D.Mass. 18 Feb 1893) (Edison's U.S. Patent Nr. 223,898 infringed.).
5. *Edison Electric Light Co. v. Mt. Morris Electric Light Co.*, 57 F. 642 (S.D.N.Y. 1893), *preliminary injunction modified*, 58 F. 572 (2dCir. 8 Nov 1893) (Edison's U.S. Patent Nr. 223,898 infringed. Edison entitled to a preliminary injunction.).
6. *Edison Electric Light Co. v. Waring Electric Co.*, 59 F. 358 (D.Conn. 1894), *aff'd*, 69 F. 645 (2dCir. 1894) (per curiam) (Edison's U.S. Patent Nr. 223,898 infringed. Edison entitled to a preliminary injunction.).
7. *Edison Electric Light Co. v. Davis Electrical Works*, 58 F. 878 (D.Mass. 1893) *aff'd*, 60 F. 276 (1stCir. 9 Feb 1894) (Edison's U.S. Patent Nr. 223,898 infringed by repairing burned-out filament.).

8. *Edison Electric Light Co v. Electric Manufacturing Co.*, 57 F. 616 (E.D.Wis. 1893), *aff'd*, 61 F. 834 (7th Cir. 1 May 1894) (Edison's U.S. Patent Nr. 223,898 infringed. Edison entitled to a preliminary injunction.)
9. *Edison Electric Light Co v. Philadelphia Trust, Safe-Deposit & Insurance Co.*, 60 F. 397 (E.D.Pa. 1894), *aff'd*, 65 F. 551 (3d Cir. 11 Jan 1895) (Edison's U.S. Patent Nr. 223,898 infringed. Edison entitled to a preliminary injunction.).
10. *Consolidated Electric Light Co. v. McKeesport Light Co.*, 40 F. 21 (W.D.Pa. 1889), *aff'd*, 159 U.S. 465 (11 Nov 1895) (Plaintiff alleged infringement of a Patent issued in the year 1885, to the Electro-Dynamic Light Company, assignee of inventors Sawyer and Man. The U.S. Supreme Court held: "claims of this patent, ..., are too indefinite to be the subject of a valid monopoly.").
11. *General Electric Co. v. Laco-Philips Co.*, 233 F. 96 (2d Cir. 7 June 1916) (Just & Hanaman U.S. Patent Nr. 1,018,502 infringed.). Laco-Philips was a subsidiary of the great Dutch company, Philips.
12. *General Electric Co. v. Nitro Tungsten Lamp Co.*, 261 F. 606 (S.D.N.Y. 1919), *aff'd*, 266 F. 994 (2d Cir. 2 June 1920) (Langmuir's U.S. Patent, Nr. 1,180,159 infringed.).
13. *Weber Electric Co. v. E.H. Freeman Electric Co.*, 253 F. 657 (D.N.J. 1918), *rev'd in part*, 262 F. 769 (3d Cir. 1919), *aff'd*, 256 U.S. 668 (6 June 1921) (Patent on improved socket, claims valid, but not infringed.).
14. *General Electric Co. v. Continental Lamp Works*, 280 F. 846 (2d Cir. 3 April 1922) (Langmuir's U.S. Patent, Nr. 1,180,159 at issue, preliminary injunction issued.).
15. *General Electric Co. v. Alexander (and Alpha Laboratories, Inc.)*, 277 F. 290 (S.D.N.Y. 1921), *aff'd*, 280 F. 852 (2d Cir. 10 Apr 1922), *cert. den.*, 260 U.S. 727 (1922) (Just & Hanaman's Patent and Langmuir's U.S. Patent, Nr. 1,180,159 both infringed.).
16. *General Electric Co. v. P.R. Mallory & Co.*, 286 F. 175 (S.D.N.Y. 1923) and 294 F. 562 (S.D.N.Y. 1923), *General Electric v. Save Electric Corp.*, 294 F. 567 (E.D.N.Y. 1923), two cases *aff'd*, 298 F. 579 (2d Cir. 7 April 1924), *cert. den.*, 266 U.S. 609 (1924), (Just & Hanaman's Patent Nr. 1,018,502 and Langmuir's U.S. Patent, Nr. 1,180,159 both infringed.).
17. *General Electric Co. v. Desmond Incandescent Lamp Co.*, 27 F.2d 590 (3d Cir. 16 July 1928) (affirming preliminary injunction), 52 F.2d 725 (3d Cir. 1931) (tersely affirming final order) (Just & Hanaman's Patent Nr. 1,018,502 and Langmuir's U.S. Patent, Nr. 1,180,159 both infringed.).
18. *General Electric Co. v. Atlas Specialty Co.*, 27 F.2d 593 (3d Cir. 16 July 1928) (Just & Hanaman's Patent Nr. 1,018,502 infringed; preliminary injunction granted.).

19. *General Electric Co. v. Sunray Lamp Co.*, 27 F.2d 595 (3dCir. 16 July 1928) (Infringement of Just and Hanaman Patent Nr. 1,018,502 and the Langmuir Patent No. 1,180,159; preliminary injunction granted.).
20. *General Electric Co. v. Republic Electric Co.*, 27 F.2d 595 (3dCir. 16 July 1928) (Infringement of Just and Hanaman Patent Nr. 1,018,502 and the Langmuir Patent No. 1,180,159; preliminary injunction granted.).
21. *General Electric Co. v. De Forest Radio Co.*, 17 F.2d 90 (D.Del. 1927), *aff'd in part*, 28 F.2d 641 (3dCir. 18 Sep 1928), *cert. den.*, 278 U.S. 656 (1929) (Held Coolidge's U.S. Patent 1,082,933 also applied to tungsten filaments in vacuum tube for electronics.).
22. *General Electric Co. v. Lipson*, 31 F.2d 105 (3dCir. 15 Feb 1929) (Infringement of Just and Hanaman Patent Nr. 1,018,502 and the Langmuir Patent No. 1,180,159; preliminary injunction granted.).
23. *General Electric Co. v. Santa Fe Electric Co.*, 52 F.2d 603 (3dCir. 16 Sep 1931) (Infringement of the Langmuir Patent No. 1,180,159. "Disposing of the case on the theory of the decision in *Desmond Incandescent Lamp Company v. General Electric Company* (C.C.A.) 27 F.(2d) 590, we shall assume the validity of the claims of the patent in suit, many times sustained by other courts,").
24. *General Electric Co. v. Anraku (under name "Tokyo Lamp Company")*, 10 F.Supp. 935 (S.D.Cal. 1935), *aff'd*, 80 F.2d 958 (9thCir. 20 Dec 1935), *cert. den.*, 298 U.S. 678 (1936) (Pacz's U.S. Patent Nr. 1,410,499 valid and infringed in part.).
25. *General Electric Co. v. Save Sales Co.*, 20 U.S.P.Q. 199 (N.D.Ohio 1934), *rev'd*, 82 F.2d 100 (6thCir. 6 Mar 1936) (U.S. Patent 1,687,510 for inside frosted bulbs valid and infringed.).
26. *General Electric Co. v. Wabash Appliance Corporation*, 17 F.Supp. 901 (E.D.N.Y. 1937), *rev'd*, 91 F.2d 904 (2dCir. 1937), *aff'd*, 304 U.S. 364 (16 May 1938) (Pacz's U.S. Patent Nr. 1,410,499 on improved tungsten filaments not valid, because of indefinite disclosure.).
27. *General Electric Co. v. Wabash Appliance Corporation*, 19 F.Supp. 887 (E.D.N.Y. 1937), *rev'd*, 93 F.2d 671 (2dCir. 3 Jan 1938), *cert. den.*, 303 U.S. 641 (1938) (U.S. Patent 1,687,510 for inside frosted bulbs is valid and infringed.).
28. *General Electric Co. v. Jewel Incandescent Lamp Co.*, 47 F.Supp. 818 (D.N.J. 1942), *aff'd*, 146 F.2d 414 (3dCir. 1944), *aff'd*, 326 U.S. 242 (5 Nov 1945) (U.S. Patent 1,687,510 on improved inside frosted lamp bulbs not valid in view of prior art.).
29. *Sylvania Electric Products, Inc. v. Dura Electric Lamp Co.*, 144 F.Supp. 112 (D.N.J. 1956), *aff'd*, 247 F.2d 730 (3dCir. 27 Aug 1957) (blue dot on photographic flash bulbs was functional and could not be trademarked).

30. *Application of Ehringer*, 347 F.2d 612 (Cust. & Pat.App. 24 June 1965) (U.S. Patent Office denied patent for improved tungsten filament, Court reversed Patent Office.). Incidentally, the invention was assigned to Westinghouse.

General Electric's key incandescent lamp patents were issued during 1912-1922, which means they expired before 1940. By 1950, there were only three major manufacturers of electric lamps in the USA, and General Electric was clearly dominant, as mentioned [above](#). So it is not surprising that there are few reported appellate court cases (in the U.S. Courts of Appeals or U.S. Supreme Court) involving incandescent lamp technology after the year 1945.

Note that several key patents assigned to General Electric (e.g., Nr. 1,410,499 on nonsag tungsten; Nr. 1,687,510 on inside frosted bulbs) were held valid by some judges, but finally declared invalid. These inconsistent results may arise from having judges who were *not* knowledgeable about science or engineering decide patent cases. It is bizarre that a judge who is *not* qualified to write a patent application can decide the validity of a patent, but that is routine practice in federal courts in the USA. In the year 1982, a specialized U.S. Court of Appeals for the Federal Circuit was created to decide appeals of patent cases. Several judges on the Federal Circuit have earned a Ph.D. in science or engineering, in addition to a law degree.

poor business ethics

In the late 1920s, several corporate managers infringed General Electric's Patents. When General Electric sued their corporations for infringement, the infringers organized new companies and *continued* infringing the same Patents. A judge wrote in 1928:

In 1925 General Electric Company sued Standard Lamp Works, Inc., Benjamin S. Lipson, Harry Lipson and others for infringement of the Just & Hanaman and Langmuir patents. A final consent decree enjoining the Standard Lamp Works and Benjamin S. Lipson from further infringement was entered. On a representation, satisfactory to the plaintiff, that Harry Lipson was not implicated, he was not included in the decree.

In 1926 the same plaintiff sued Benjamin S. Lipson and Harry Lipson for infringement of the same patents. Here again a final consent decree was entered, this time enjoining Harry Lipson from further infringement, but on a satisfactory representation that Benjamin was not involved, he was left out of the decree. Then followed three proceedings, two for contempt against these two Lipsongs for violating these injunctions, *Lipson v. General Electric Co.* (C.C.A.) 31 F.(2d) 106, this day reviewed; and, another, the instant infringement suit against Barney Lipson and Jack Lipson, brothers of Harry and Benjamin, and against Samuel Lipson, father of the other Lipsongs, who either by the consent decrees or their own affidavits are shown at one time or another and in some measure or another to have been engaged in making infringing lamps, laterally at the works and under the name of Cosmo Manufacturing Company, in the management of Harry Lipson and the repudiated though uncertain ownership of Benjamin Lipson, from whence the lamps were shipped to and sold under the name of Sterling Products

Company, a concern which had no known composition or habitation and did business only through a post office letter box in Newark, New Jersey.

General Electric Co. v. Lipson, 31 F.2d 105, 106 (3d Cir. 1929). The companion case at 31 F.2d 106 affirms a judgment by the District Court that the defendants, including Harry Lipson, are in contempt for violating injunctions.

In another case, a judge wrote in 1931:

This case had its rise in other litigation, that of Sunray Lamp Company, Inc., and C. F. Leonard v. General Electric Company (C.C.A.) 27 F.2d 595, in which we sustained a decree of the District Court granting a preliminary injunction which enjoined those defendants from further infringing the Langmuir patent. Later the Sunray Company submitted to final decree. Then Wesley H. Backer, an employee and officer of that company — whether a real officer or dummy officer is of no consequence — organized two corporations; one, the Santa Fe Electric Company, and the other the Imperial Appliance Corporation (both parties to this suit), of which he became an officer, general manager and the principal stockholder.

General Electric Co. v. Santa Fe Electric Co., 52 F.2d 603 (3d Cir. 1931) ("... plaintiff has made a *prima facie* case of infringement by the [Imperial] Appliance Corporation as maker and the Santa Fe Company.").

Links

Old Electric Lamps

There are a number of websites devoted to antique electric lamps:

- [Edward J. Covington](#), the definitive lamp history website
- [Edisonian.com](#) nice photographs of many lamps from the 1880s, evidence in patent infringement cases
- [Schenectady Museum](#), how to identify old Edison or GE lamps
- [Shelby](#) Electric Company in Shelby, Ohio manufactured lamps from 1898 until Shelby was purchased by GE in 1914. Shelby's Mazda trademark was then used by GE. A carbon-filament lamp made by Shelby has burned continuously since June 1901 at the [Livermore](#), California Fire Department, making it the longest burning lamp in history.
- [SparkMuseum](#) photos of old lamps by John D. Jenkins.
- [kilokat](#) (pseudonym) copies of more than three hundred U.S. [Patents](#) on incandescent lamps during the years 1879 to 1919
- list of [Edison's Patents](#)

[ElectricMuseum](#) Thomson-Huston electric arc lamp, manufactured between 1880 and 1883. Early carbon-filament lamps produced only a few tens of candlepower, while an arc lamp could produce several thousand candlepower.

- auf deutsch: [LampenMuseum](#) von Rigo Richter,
Wolfram-Glühlampen = tungsten incandescent lamps,
[StefansLichtParade](#) von Stefan Eichhorn.
 - [Smithsonian Institute](#) (elementary level), [Edison's](#) U.S. Patent Nr. 223,898.
 - [NILCO](#) history
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End of Incandescent Lamps

On 19 December 2007, President George W. Bush signed the Energy Independence and Security Act of 2007, which is Public Law 110-140, published at 121 Stat. 1550. The requirements for "general service incandescent lamps" are found at 42 U.S.C. 6295:

- On 1 Jan 2012, general service incandescent lamps are required to have an efficiency of at least 20 lumens/watt and a maximum power dissipation of 72 watts, which effectively bans the popular 100 watt incandescent lamps.
- On 1 Jan 2013, general service incandescent lamps are required to have an efficiency of at least 20 lumens/watt and a maximum power dissipation of 53 watts, which effectively bans the popular 60 watt incandescent lamps.
- On 1 Jan 2014, general service incandescent lamps are required to have an efficiency of at least 17 lumens/watt and a maximum power dissipation of 43 watts.
- On 1 Jan 2014, general service incandescent lamps are required to have an efficiency of at least 10 lumens/watt and a maximum power dissipation of 29 watts.
- After the year 2014, general service electric lamps are to have a minimum efficiency of 45 lumens/watt.

The definition of "general service incandescent lamp" is contained in 42 U.S.C. 6291(30)(D) and 10 C.F.R. 430.2 (Jan 2011):

- rated for service between 110 and 130 volts
- between 310 and 2600 lumens
- medium screw base (E26)
- and *excluding* 22 specific types of incandescent lamps:
 - appliance lamp for use in ovens and refrigerators (maximum of 40 watts),
 - colored bulbs,
 - infrared heating lamp,
 - reflector lamp,
 - rough-service lamp,
 -

U.S. Department of Energy [webpage](#) has details of this legislation and subsequent

regulations.

General Electric Soft-White 100 watt lamps with a rated lifetime of 750 hours have an initial luminous efficiency of 17 lumens/watt. The long-life (1500 hour) version has an initial luminous efficiency of 15 lumens/watt. Both of these common lamps will fail both the efficiency and maximum power dissipation requirements after 1 Jan 2012. In contrast, compact fluorescent lamps have initial luminous efficiencies of approximately 60 lumens/watt.

As of August 2011, it seems that incandescent lamps with power ratings of 30 watts or less will continue to be available in the USA for the foreseeable future. These low-power lamps produce less than 310 lumens, and thus are *not* within the "general service incandescent lamp" standards in the statute. Similarly, incandescent lamps for automobiles operate at about 14 volts, and are also *not* within the "general service incandescent lamp" standards in the statute.

this document is at <http://www.rbs0.com/wlamp.pdf>
first posted 6 Sep 2011, modified 17 Sep 2011

Go to my [history](#) subhomepage, which links to my webpages about old buildings.

Go to my personal [homepage](#).