

EDISON ELECTRIC LIGHT CO. v. BEACON VACUUM PUMP & ELECTRICAL CO. et al.

(Circuit Court, D. Massachusetts. February 18, 1893.)

No. 3,096.

PATENTS FOR INVENTIONS—ANTICIPATION—EVIDENCE—INCANDESCENT LAMPS.

An application for a preliminary injunction against the infringement of Edison's patent for an incandescent electric lamp, based on prior adjudications that this patent covered a broad and fundamental invention, was resisted on the ground of newly-discovered evidence of anticipation. This evidence consisted of several incandescent electric lamps rudely fashioned of glass, with carbon filaments and iron or copper leading-in wires sealed by fusion of the glass, which the accompanying affidavit of the maker, G., stated that he had made in the fifties, producing a vacuum in the lamps by the Torricellian method. He further stated that he had used them for the purpose of display and of advertising his business of clockmaker, and that they gave a steady and lasting light, in which he was corroborated by the affidavits of numerous credible witnesses. A number of electrical experts testified, on the contrary, that the exhibits did not constitute practical lamps, inasmuch as the vacuum was originally imperfect, and was subject to further impairment because of the varying rates of expansion of glass and iron or copper. All these exhibits at the time of the trial had been damaged so as to be useless as lamps. After the argument G. produced another lamp of far superior workmanship, having a U-shaped carbon burner and leading-in wires of platinum, which he stated was made prior to 1872. It appeared, however, that this lamp bore internal evidence that it had not been exhausted by the Torricellian method, as stated by G.; and that at various times before this trial negotiations were had with G. by both the Edison Company and its rivals, wherein he was pressed to produce a practical lamp made by him before the Edison patent issued, and when it would have been greatly to his advantage to do so; and yet at such times no such lamp was forthcoming. Furthermore, while he testified that in a period of some 20 or more years he had made over a hundred lamps, continually improving them in construction and workmanship, he was only able to produce three crude examples, made in the fifties, and the one fair specimen mentioned. It was shown that he had ample opportunity to learn of the Edison patent, though he testified that he had no knowledge of it; and he never applied for a patent on his lamp, though during the period as to which he testified patents were issued to him for other articles. *Held*, that not only did this evidence lack that degree of probability which would warrant a refusal of the preliminary injunction, but, even if it were true, it would show only experiments made by G., and abandoned, which did not amount to an anticipation of the Edison invention.

In Equity. Suit by the Edison Electric Light Company against the Beacon Vacuum Pump & Electrical Company and others for the infringement of a patent. On motion for preliminary injunction. Granted.

Fish, Richardson & Storow, C. A. Seward, and Richard N. Dyer, for complainant.

Witter & Kenyon and Louis D. Brandeis, for defendants.

COLT, Circuit Judge. In May, 1885, the plaintiff brought suit in the United States circuit court for the southern district of New York against the United States Electric Lighting Company for infringement of the patent now in controversy, which was granted to Thomas A. Edison, January 27, 1880, for an improvement in electric

lamps; and on July 23, 1891, a decree was entered, adjudging the validity of the patent, and ordering an injunction and account. 47 Fed. Rep. 454. Upon appeal to the circuit court of appeals for the second circuit the decree was affirmed in October, 1892. 3 C. C. A. 83, 52 Fed. Rep. 300. Another suit was then brought in the same court against the Sawyer-Man Electric Company, and a preliminary injunction was granted pro forma until a decision could be had by the circuit court of appeals, which, on December 19, 1892, affirmed the order, and directed an injunction. Suits were then immediately brought against the Westinghouse Electric Company in Pennsylvania, the Perkins Electric Lamp Company, and the Mather Electric Company in Connecticut, and preliminary injunctions obtained. The present bill was filed January 10, 1893, and the plaintiff now moves for a preliminary injunction against the defendants, based upon the foregoing prior adjudications. This motion is resisted on the ground of newly-discovered evidence bearing on the question of novelty of the Edison invention, which was not before the courts in the other cases. As to these other cases, it is said that there has been but one final adjudication upon the merits, which was in the suit against the United States Electric Lighting Company; that the defendants in the other prior suits were so connected with that company that they were in privity with it, and that therefore injunctions were granted as a matter of course.

The suit against the United States Company was thoroughly and obstinately contested, as is shown by the record which covers about 6,000 printed pages. The general rule is that where the validity of a patent has been sustained by prior adjudication, and especially after a long, arduous, and expensive litigation, the only question open on motion for a preliminary injunction in a subsequent suit against another defendant is the question of infringement, the consideration of other defenses being postponed until final hearing. *Brush Electric Co. v. Accumulator Co.*, 50 Fed. Rep. 833; *Robertson v. Hill*, 6 Fish. Pat. Cas. 465; *Cary v. Domestic Co.*, 27 Fed. Rep. 299; *Coburn v. Clark*, 15 Fed. Rep. 804; *Mallory Manufacturing Co. v. Hickok*, 20 Fed. Rep. 116; *Green v. French*, 4 Ban. & A. 169; *Blanchard v. Reeves*, 1 Fish. Pat. Cas. 103; *Goodyear v. Rust*, 6 Blatchf. 229; *Cary v. Manufacturing Co.*, 24 Fed. Rep. 141; *Sargent Manufacturing Co. v. Woodruff*, 5 Biss. 444; *Kirby Bung Manufacturing Co. v. White*, 1 McCrary, 155, 1 Fed. Rep. 604; *Putnam v. Bottle Stopper Co.*, 38 Fed. Rep. 234; *Consolidated Bunting Apparatus Co. v. Peter Schoenhofen Brewing Co.*, 28 Fed. Rep. 428; *Newall v. Wilson*, 2 De Gex, M. & G. 282; *Davenport v. Jepson*, 4 De Gex, F. & J. 440; *Bovill v. Goodier*, 35 Beav. 427.

The only exception to this general rule seems to be where the new evidence is of such a conclusive character that, if it had been introduced in the former case, it probably would have led to a different conclusion. The burden is on the defendant to establish this, and every reasonable doubt must be resolved against him. *Ladd v. Cameron*, 25 Fed. Rep. 37; *Cantrell v. Wallick*, 117 U. S. 689, 6 Sup. Ct. Rep. 970; *Winans v. Eaton*, 1 Fish. Pat. Cas. 181; *Machine Co. v. Adams*, 3 Ban. & A. 96; *Spring Co. v. Hall*, 37 Fed. Rep. 691;

Lockwood v. Faber, 27 Fed. Rep. 63; Glaenzer v. Wiederer, 33 Fed. Rep. 583; Cary v. Spring Bed Co., 26 Fed. Rep. 38.

There is no denial of infringement in the present case under the construction given to the patent in prior adjudications. The contention of the defendants is that this motion should be denied on the ground that they have recently discovered that Henry Goebel, a German watchmaker, living in New York, invented the Edison incandescent lamp as early as 1854, and that, therefore, the Edison patent is void for want of novelty, or at least must be limited to the coiled form of filament. This is the same line of attack upon the patent which was unsuccessfully made in the case against the United States Company. It was there urged that the Starr lamp of 1845, the Roberts lamp of 1852, the Lodyguine, Konn, and other lamps which appeared between 1872 and 1876, the Bouliguine lamp of 1877, the Sawyer and Man lamp of 1878, and the Edison platinum lamp of 1879, limited the Edison patent to narrow inventions, or rendered it void for want of patentable novelty. But the court, with a most exhaustive review of the prior art before it, refused to take this view, and held that the second claim of the patent, read with the specification, covered a broad and fundamental invention, namely, an incandescent lamp, composed of a carbon filament, hermetically sealed in an all glass chamber exhausted to a practically perfect vacuum, and having leading-in wires of platinum. Judge Wallace, in his opinion in the circuit court, says:

"Read by those having this knowledge, the radically new discovery disclosed by the specification is that a carbon as attenuated before carbonization as a linen or cotton thread, or a wire seven one thousandths of an inch in diameter, and still more attenuated after carbonization, can be made which will have extremely high resistance, and be absolutely stable when maintained in a practically perfect vacuum. It informs them of everything necessary to utilize this discovery, and to incorporate it into a practical lamp. It describes, with the assistance of the recital in the second claim, as the vacuum in which the burner is to be maintained, a bulb made wholly of glass, exhausted of air, sealed at all points by the fusion of the glass, and in which platinum leading wires are sealed by the fusion of the glass. It describes the materials of which the burner is to be made, and instructs them that the materials are to be shaped into their ultimate form before carbonization. It describes the use of platinum for the leading wires, and a method of securing the leading wires and filaments, intended to dispense with clamping, which consists in moulding tar putty about the joints, and carbonizing the whole in a closed chamber."

By this invention Edison disclosed to the world for the first time a practical, commercial incandescent lamp, adapted for domestic uses. The problem was by no means easy of solution.

To subdivide the electric light, and embody it in a cheap and durable domestic lamp, capable of successfully competing with gas, had for years baffled the science and skill of the most eminent electricians in this country and in Europe. The difficulty lay in the practical construction of a durable incandescent lamp, rather than in a knowledge of the elements which should compose such a structure. Carbon burners, platinum wires, exhausted glass receivers, were old and well known. As early as 1845, Starr suggested in the King patent a lamp composed of a thin pencil of carbon, inclosed in a

Torrillian vacuum; and Roberts, in 1852, proposed to cement the neck of the glass globe into a metallic cup, and to provide it with a tube for exhaustion by means of a hand pump. Later, Lodyguine and others provided their lamps with several short carbon pencils, which were successively brought into circuit as the pencils were consumed, also various devices for perfecting the joints between the metal base and the glass globe, while Sawyer and Man, in 1878, made the bottom plate of glass instead of metal, and charged the lamp with an atmosphere of nitrogen gas, to avoid destruction of the burner from oxidation. In his 1879 lamp Edison used a platinum burner, which proved a failure, because the platinum melted near the point of incandescence. Mr. Schwendler, a noted English electrician, said in 1879:

"Unless we shall be fortunate enough to discover a conductor of electricity with a much higher melting point than platinum, and which at the same time does not combine at high temperature with oxygen, we can scarcely expect that the principle of incandescence will be made use of for practical illumination."

The arc lamp was known as early as 1844, but its great light made it unfit for use in dwellings. The question was how to divide the electric light for domestic purposes. Many scientists considered the problem as hardly within the range of possibility. From the results of the experiments of Fontaine, the French scientist, published in 1877, it would seem that almost insurmountable obstacles, founded on the operation of natural laws, stood in the way of the successful division of the electric light. Mr. Preece, the electrician for the British general post office, pronounced early in 1879 that "the division of the electric light is an absolute ignis fatuus."

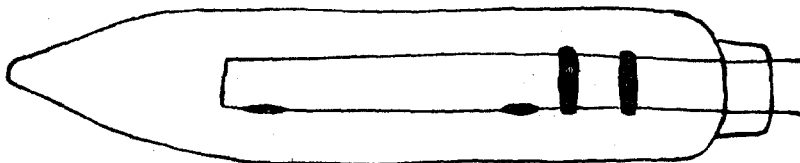
Those who dissented from this view were Mr. Edison in this country, and Mr. Lane-Fox in England, who both reached the conclusion that the subdivision of the electric light could be accomplished, provided the radiating surface of the burner of the lamp was reduced in extent, so that only a moderate volume of light would be emitted, while at the same time the resistance of the burner was increased so as to enable the employment of relatively small conductors for leading the electric current to the lamps; or, shortly stated, the burner should have a high ratio of resistance to radiating surface. Edison first embodied this discovery in his platinum lamp in 1879, but this lamp was unsatisfactory, and the problem remained unsolved. While experimenting with the platinum lamp, Edison discovered that the passage of a current through the platinum during the process of exhausting the inclosing chamber would drive out occluded gases and thereby raise the melting point of the burner. This led him to secure greater perfection in the vacuum by the employment of a highly exhausted glass chamber similar to those used by Crookes, made entirely of glass, and with all the joints closed by the fusion of the glass. After the failure of the platinum lamp, it occurred to Edison to substitute a short filament of carbon in place of the long platinum burner, into the nearly perfect vacuum chamber, and it was found that such filament was stable at high temperature, and free from disintegration and oxidation. It was thus made known that

the disintegration of the carbon burner was not caused by the electric current, but was due to "air washing," or the attrition produced by the passage of the air over the highly heated surface of the carbon.

As late as 1878, Mr. Sawyer, in a patent to Sawyer and Man, stated that no incandescent lamp had yet been devised which was practically operative, because of the defective methods employed for charging the lamp with artificial atmosphere, which resulted in the disintegration of the carbon; second, because it was impossible, under varying degrees of heat and pressure, to maintain perfect joints; third, because unequal expansion of the carbon and its holder had resulted in fractures of the burner. But Edison overcame these obstacles, and produced a practical lamp. When we review the literature which preceded this invention, the subtle force with which it had to deal, whose laws had to be intelligently investigated and understood, the well-nigh perfect workmanship necessary in construction, and the slow steps by which the end was finally reached, it seems on its face almost incredible that the incandescent lamp of Edison was in fact invented and operated by Henry Goebel in New York 40 years ago, and publicly exhibited before hundreds of people.

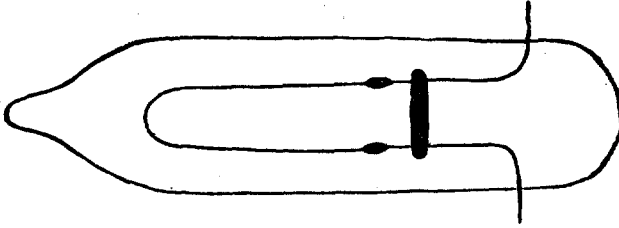
Goebel's story runs thus: He came to this country from Germany in 1848. He was a watchmaker and optician by trade, and opened a shop on Monroe street in New York. While in Germany he received instruction in physics from Prof. Munchhausen of Hanover, and assisted him in making experiments, such as obtaining light from electricity, and making galvanic batteries. Through this means he learned to make the arc lamp, and he believed that an incandescent lamp could be produced by a small continuous carbon inclosed in an exhausted glass tube hermetically sealed. He also became familiar with the use of the common air pump, the blowpipe, the method of producing the Torricellian vacuum, and the making of carbon conductors. He says he learned at this time that the coefficient of the expansion of glass and platinum were the same. As soon as he obtained money enough from his regular business, he began experimenting with electricity in his shop in New York. Soon after his arrival he exhibited an arc lamp on the top of his house, which called out the fire engines, and caused his arrest. He then turned his attention to incandescent lamps, and made a number of them. The first form of lamp he constructed was called a "fiddle bow" or "meat saw," and it consisted of an exhausted tube, made of glass, in one piece, with leading-in wires sealed into the inclosing chamber by fusion of the glass. The wires, with the carbon burner attached, resembled in form a fiddle bow.

Goebel Fiddle Bow Lamp.



The next style of lamp was called the "hairpin," from the shape of the carbon burner.

Goebel Hairpin Lamp.



A third form of lamp was also made about this time, presenting the carbon and connecting wires in a straight line, but this proved unsatisfactory as the burner broke with the heat. The leading wires were sometimes made of platinum, but generally of iron or copper, which was less expensive. The carbons used were less than one one-hundredth of an inch in diameter, and were made from flax, reed, and black cane. The first lamps were exhausted by the common air pump, but, not getting a good vacuum, they were subsequently exhausted by filling the tubes with mercury, inverting them, and allowing the mercury to run out, and then sealing them off. Before sealing, the incandescent conductor was heated slightly, which, together with a little shaking, made the mercury that stuck to the carbon fall off. The ends of the leading wires were flattened, then twisted into a spiral tube, into which the ends of the carbons were inserted, and the tubes were then compressed. The joints were generally cemented with heated stove polish, though sometimes the ends of the carbon were electro-plated with copper, and an amalgam of gold and mercury applied to the joints, which adhered to the copper; and sometimes a platinum sponge was used for this purpose. The electric current was produced by chemical action from batteries. The first lamps were made from cologne bottles, but afterwards from glass tubes.

A large number of the fiddle bow and hairpin lamps were made while living on Monroe street, between 1850 and 1872, and there was no six months up to the year 1880 when a number were not made, and prior to 1879 more than a hundred were constructed. No secret was made of any part of their construction, and they were lighted and shown to whomever desired to see them, and there was no time until after 1880 when several of the lamps were not in his possession. If the carbons did not burn up as soon as the current was turned on, the life of the lamp was almost indefinite, but it could not be run very long at a time because the battery would give out. These lamps were used upon a wagon carrying a telescope, which was taken to Union Square and Cooper Institute for exhibition. For looking through the telescope a small fee was charged, and the lamps were used partly for light and partly to attract attention. Many hundreds of people saw these lamps while so exhibited. Another lamp was arranged to illuminate the face of a clock which hung in his bed

room, and this use was continued in his Grand street house. After removing to 468 Grand street, which was in 1877, he made a mercury vacuum pump, the idea having been suggested by hearing of the Geissler pump. In using the old process to exhaust the lamps, particles of mercury adhered to the interior parts, and it was with considerable difficulty that these particles were got out. A patent was obtained on this pump January 24, 1882. In 1881, he was employed by the American Electric Light Company. He refused to leave his shop, but his son Adolph, now dead, worked for the company at its factory. About this time Mr. Crosby, who was connected with the company, called upon him several times, and was much interested with his lamps, and engaged him to make carbons and exhaust lamps. Until he worked for the company he never heard of Edison, or his incandescent lamp, or of a dynamo machine for electric lighting, and had never read anything on the subject in the public prints. He does not read English, but speaks and understands it fairly well. The Goebel lamp, Exhibits 1, 2 and 3, he recognizes as his own manufacture, and says that these very lamps were made before gas was put into his house on Monroe street. These lamps are of the fiddle bow form. He is positive they were made before gas was introduced into his house, because they are discolored by smoke from an oil lamp flame employed in the use of the blow-pipe.

After arguments on the motion, Goebel filed a supplemental affidavit, and produced another lamp, known as "Exhibit 4." This lamp has leading-in wires of platinum, and is of much superior workmanship and finish. He also produced several tools for making carbons, and describes their use. He declares that before 1872 he had arrived at a definite conclusion as to the best material for making carbons, and had settled upon bamboo. He had also decided upon platinum as the best leading-in wire, and stove polish as the best material for cementing the joints. He says that lamp No. 4 has been in his possession since before moving from Monroe street in 1872; that he made it and burned it a good many times before and since; that he made other lamps, both in Monroe and Grand streets, with carbonized bamboo burner, platinum leading wire connections, and glass tube, similar to No. 4, but he doubts if in any other lamps the glass feature was as handsome as in this exhibit. He has recently been informed that Mr. Pope had given as a reason why he did not think this lamp was made by the Torricellian vacuum that there would in such case be a deposit of mercury upon the surface of the copper wire which connects the carbon with the platinum wire, and that he discovered no such appearance. He told Mr. Pope he was mistaken, provided that distilled mercury was used in producing the vacuum. The mercury that he used in producing the vacuum in these lamps was carefully distilled, sometimes three or four times, before it was used, and the process was always performed in a dry atmosphere, and other safeguards used, such as heating the mercury slightly. He had also employed, previous to 1872, a mercury pump, in which no mercury was present in the glass part of the lamp, but he succeeded better with the Torricellian process than with this early

mercury pump. As compared with the incandescent lamps of to-day, these early lamps gave a fairly good light. He declares he has received no money for his affidavits, and has no interest in this suit, and that he has given his evidence reluctantly, and after considerable urging.

I have given the substance of the leading points of Goebel's affidavits, because this case rests largely upon them. With respect to the age and history of lamp No. 4, it may be said that the evidence rests entirely upon his affidavits and that of his son, Henry Goebel, Jr.

The defendants produce some forty affidavits in confirmation of the statement of Goebel respecting his lamp. Of these witnesses, five are his children, one his niece, and the remainder nearly all friends or acquaintances. So far as appears, these people are respectable and truthful. They testify generally to seeing the Goebel electric lamp in his shop and on his wagon containing the telescope, at various times between 1850 and 1882, the time and the circumstances in many instances being given in detail, and some 20 witnesses identify the early fiddle bow lamps as the same as those which they saw. Several witnesses also observed the lamp connected with the clock. To some, Goebel explained how the lamps were made, and several assisted him in their construction. Some declare the light was good, but do not state the length of time the lamp would burn. Generally speaking, the testimony is confined to the old fiddle bow lamp, and relates to a period prior to or about 1860. A number of witnesses testify as to the good character, honesty, and truthfulness of Henry Goebel.

It appears from the affidavit of Mr. Bull, an attorney at law, that Henry Goebel, Jr., delivered lamp No. 1 to him at his office in New York, October 18, and lamp No. 2, November 28, 1892, and that when received both the carbons were detached from the leading-in wires, and that he was then informed by Goebel that both the carbons were intact when he put the lamps in his pocket to bring them to his office. Henry Goebel, Jr., states that he delivered lamp No. 3 to Mr. Bull at the same time with No. 2, and that he broke the carbons in lamps 1 and 2 on the way to Mr. Bull's office. From Mr. Williams' affidavit, it seems that gas was introduced in Monroe street in or about the year 1854. This, with the testimony of the elder Goebel and other witnesses, fixes the date of the construction of lamps 1, 2, and 3, as early as 1854. Mr. Curtis, the counsel for the defendants in the New York cases, states that he first heard of Henry Goebel in the early part of 1882, and that in answer to his questions he said that he had made incandescent lamps like Edison's as early as about 1850. Owing to Goebel's imperfect English, he had difficulty in understanding him. He gathered from the conversation that Goebel had not made any use of the lamps except for laboratory experiments, and that his work was not continued for more than a year or two after 1850. He asked him to produce some lamps, and he said he would look them up. His recollection is that he saw Goebel again, but that he had no further information to impart. In the latter part of 1890, Mr. Bull, who had been counsel for the Consol-

idated Electric Company, informed him that Goebel's sons corroborated their father's statement, and that further additional evidence could be procured, but, after consultation with Gen. Duncan, they concluded that the evidence was not sufficient to warrant an application to reopen their case to admit it. At the time of the injunction motion in the Sawyer-Man case in November, 1892, he made further inquiry in regard to Goebel, and was informed that some additional evidence had been obtained. Upon consultation with his associates, Mr. Wetmore and Mr. Root, it was concluded that the matter had not been sufficiently developed to present it as a defense in that case. Mr. Curtis goes on to state that, had he known of anything like the character and extent of the Goebel evidence as presented in this case, he should have regarded it of the greatest importance as constituting one of the best defenses in their cases.

In further support of the Goebel anticipation, several experts give affidavits to the effect that the Goebel lamp, assuming that it was made prior to 1879, contains the broad invention covered by the second claim of the Edison patent, as it embodies the same combination of a carbon filament with an all glass exhausted receiver and conductors passing through the glass. Mr. Pope declares that Goebel lamps 1, 2, and 3 have a carbon filament, within the meaning of the second claim of the Edison patent, as defined by the court, a receiver made entirely of glass, and exhausted of air, and conductors passing through the glass; and all these elements combined for the purpose set forth in the patent; that these structures embodied the conception that carbon would stand high temperature, even when very attenuated, if operated in a high vacuum without the phenomenon of disintegration. He finds these particular lamps are not now in a condition to be operated, but he is satisfied that when first constructed they were capable of such operation, and had in fact been so operated. He knows of no reason why these lamps should not have been made long prior to 1879, and should not last as long and be as practically useful as many forms of lamp described by Edison in his patent. He finds the leading-in wires in lamps 1 and 2 to be of iron, and in 3 of copper. In No. 3 he finds the leading-in wires are sealed by fusion into the lower end of the glass chamber, the glass being pressed around them when hot. The filament is made of carbonized woody fiber, apparently of bamboo or cane, and has a diameter approximately of eight to ten one thousandths of an inch. The glass chamber is five inches long and seven eighths of an inch in diameter, but is now cracked near the bottom, and consequently there is no vacuum.

Mr. Cross confirms these statements, and calls particular attention to the fact that the Goebel carbon is, by reason of its small diameter, a "filament," as distinguished from a "rod," according to Prof. Barker's tables, and in the sense in which that term is used in the Edison patent as judicially construed.

In a second and supplementary affidavit, Mr. Pope says, with respect to the highly finished Goebel lamp No. 4, which has platinum leading-in wires and hairpin-shaped carbon, that at first he had

doubts whether it was constructed as early as Goebel and his son Henry said, or prior to 1872. This arose from the circumstance that the joint between the carbon and copper wire appears to have been made in part by electro-plating, and his experience led to the opinion that if the lamp had been first filled with mercury and then exhausted by inverting the tube, in one of the ways Goebel practiced, the mercury would have united with the surface of deposited copper, and some traces of it remained, but, as no such traces appeared visible in this lamp, he was led to believe that it must have been exhausted upon a vacuum pump. Upon questioning Goebel, however, he found that he had used chemically pure or distilled mercury. Afterwards, Mr. Pope, by experiments, discovered that chemically pure mercury did not adhere to copper, nor leave any discoverable trace. This is the reason why this lamp was not before the court at the arguments on this motion.

Mr. Pope is unable to get a current through this lamp because the circuit is somewhere broken. He sees no reason why it might not have been made before 1872. He is of opinion that it represents an advance over the prior Goebel lamps in details of construction and general workmanship, and that it is entirely capable, with the break repaired, of practical use as an incandescent lamp. He thinks it would burn, without doubt, three or four hundred hours, and that it clearly embodies the invention of the second claim of the Edison patent, as construed by the court. He is also of opinion that iron leading-in wires are practicable in the construction of an incandescent lamp, and the next best thing to platinum. Mr. Cross, in a supplemental affidavit, confirms these statements. Mr. Cary, the electrician of the defendant company, states in an affidavit that, from experiments he has recently tried, incandescent lamps capable of practical use can be made with iron leading-in wires.

There was filed at the same time with the foregoing supplemental affidavits other affidavits of persons who knew Goebel and saw his lamps. The light from the Goebel lamp seems to grow brighter and more steady as the affidavits multiply. For example, Mr. Voss, in his second affidavit, says: "Some of the larger lamps were attached in the store like gas fixtures. * * * I have seen the store lighted with these electric lamps alone when the gas was turned off, and the light in the store was a nice brilliant light of, I should say, from eight to ten candle power to the lamp." Again, Mr. Hall states that the store was entirely lighted up by these lamps, which were brighter than gas jets; in fact, too bright; and that the light was very steady. Mrs. Stark says the lamps were brighter than an oil lamp or gas flame, and would burn an hour. George Pasbach, who married Goebel's niece, declares he could see to read by their light, and do fine work. Edward F. Mulligan says the lamps in the Monroe street store gave a nice, bright light, whiter and much better than gas, and that you could easily read or do work by it.

To meet this alleged Goebel anticipation, the plaintiff introduces the prior adjudications upon the Edison patent, the affidavits of Edison and Barker relating to the history of the invention and the prior state of the art, and the affidavit of Upton, showing that the

defendant company was incorporated in 1890, and is now an active competitor in manufacturing and selling incandescent lamps. The plaintiff also produces the affidavit of Prof. Elihu Thomson to the effect that the Goebel lamps, like Exhibits 1, 2, and 3, could not have been useful for ordinary lighting purposes, and were never a practically operative light. One reason for this is because the leading-in wires are of iron or copper, under which conditions a vacuum cannot be maintained, since the rate of expansion of iron and copper is very different from glass, the result being that the lamp begins to lose its vacuum as soon as it is heated and cooled. Another reason is that the leading-in wires are poorly and crudely sealed in, the glass work being thoroughly bad, and the lamps cracked and blackened on the ends by improper flame. While these lamps, in spite of leakage, might have been used for a short time, they could not have had a sufficient brilliancy for ordinary lighting purposes, nor possessed any commercial value. The vacuum not being maintained, the heat would be carried away from the incandescent body by currents of gas, and this waste of energy robs the burner of its light-giving power. This statement, by Prof. Thomson, is agreed to and confirmed by the affidavits of John W. Howell and John E. Randall. Prof. Thomson further says that he remembers Henry Goebel as far back as 1881 or 1882, and that he visited his shop at that time, and that an endeavor was made to impress him with the value of the Goebel anticipation.

The plaintiff, also, by permission of court, filed affidavits after the arguments on the motion. These are important, not only as contradicting statements found in the affidavits of defendants, but for other reasons. A number of these witnesses who were neighbors or acquaintances of Goebel, or had other means of knowledge, deny that he exhibited any electric lights in connection with his telescope or in his shop about 1860 or the years following. There are the affidavits of John W. Howell and Frank Holzer, electricians, who corroborate the statement of Prof. Thomson that the Goebel lamps, 1, 2, and 3, were never practically operative by reason of a defective vacuum, and never possessed any commercial value. Several witnesses state that Goebel spoke English well, and it is also proved that articles relating to the subject of incandescent lamps and Edison's inventions were printed during 1880 in the *Staats-Zeitung*, a German daily newspaper, published in New York. But the more important evidence has reference to those persons who saw or dealt with Goebel, and who investigated his claim to have anticipated Edison in the art of incandescent lighting.

William C. Dreyer states that he undertook to form a company to purchase from Henry Goebel his inventions and patents, and that in 1882 he did procure from him an option for three months of all his inventions relating to electric lighting upon payment to him of \$500, and an extension of the option for another three months, for which an additional \$425 was paid. Goebel was also to have a large compensation from the company if formed. At that time he said he had patented or applied for patents on a mercury pump, and a spiral holder for the carbon in an incandescent lamp. He said he had made

small incandescent lamps called the "fiddle bow." It was considered of great importance to have one of these lamps, and he made every effort to find one, but never succeeded. The conversations with Goebel were carried on in German. The production of an old lamp was vital in this matter. During this time negotiations with the Edison Company were attempted through S. B. Eaton. The whole subject was gone over with E. N. Dickerson, the patent lawyer, who said that, even if Goebel did what he claims, it was nothing but an abandoned experiment. The negotiations with the Edison Company were in consequence dropped.

Albert Hetschel, a manufacturer of thermometers and scientific apparatus, states that in 1881 he was in the employ of the American Electric Light Company, and was directed to work with and help Henry Goebel, and was at his shop for several months. Hetschel describes how Goebel in a crude way made three or four little incandescent lamps with the use of a poor vacuum pump; that he was unable to make a successful lamp; and he is certain that if he had possessed at that time any incandescent lamps he would have shown them.

Otto A. Moses, a mining engineer, then in the service of the Edison Company, visited Goebel in 1884. Goebel made some carbons for him. During this time, being much interested in the subject, he inquired of Goebel what he had done in the field of incandescent lamps. He examined all the lamps Goebel had, and asked him to produce some of his old ones. Goebel requested permission to visit his laboratory, and did so, and afterwards solicited employment for himself and his son. Under these circumstances, he says it is improbable that Goebel at that time had any old meat-saw or hairpin lamps in his possession.

Ludwig K. Bohm, an electrical expert, who was associated with Edison in 1879, and afterwards, in 1881, electrician of the American Electric Light Company, had several conversations with Goebel at the office of the company. At that time Edison's invention had been published in the English and German papers in New York. He conversed with Goebel in German on the subject of incandescent lighting, and he is certain that he would have mentioned his historical lamps if he had made them. He then proceeds to discuss the lamps described in Goebel's affidavit, and declares that a vacuum sufficiently high to enable a filamentary carbon to last could not be made by filling the tube with mercury, and then inverting it, because there is always air in the mercury, and that air also clings to the glass walls. In making standard barometers by the Torricellian vacuum it was found necessary to boil them out for hours in specially constructed apparatus. Further, owing to the specific gravity of mercury, the filamentary carbon would be broken during the operation of filling and inverting the chamber. The lamps are likewise imperfect from the use of iron or copper leading-in wires, and no one of them shows any evidence that it ever contained a good vacuum.

William McMahon, in 1880, was interested in starting a company to compete with the Edison lamp, and he and his associates, George Crosby and Edwin Fox, organized the American Electric Light Company in 1881. Crosby took him and his brother to Goebel's

shop to talk over electrical matters. Goebel showed him an arc lamp, but said he had never made any incandescent lamps. He remembers also seeing some carbons and a vacuum pump, which appeared like a swinging pump. Goebel's son was soon after employed by the American Company. There was intense excitement at this time over the Edison incandescent lamp. Everybody recognized that Edison had made the invention. There was every reason at the time why Goebel and his son should have disclosed fully what they had done in this direction. If any one had preceded Edison in his invention, unlimited capital could have been secured for an opposition company. The American Company wanted to make the Edison lamp, but did not dare to. For these reasons he is satisfied that Goebel never made an incandescent lamp prior to March, 1881. Thomas G. McMahon, his brother, confirms this story in his affidavit.

Sherburne B. Eaton, the legal adviser of the Edison Company, states that in May, 1882, the law firm of Dickerson & Dickerson called his attention to the alleged inventions of Henry Goebel. They said that he claimed to have invented an incandescent lamp resembling the Edison. Goebel's representative in this matter was William C. Dreyer. No price was made, but they were asked to look into the matter. The subject was laid before the executive committee of the Edison Company, and it was decided that Goebel had nothing worth buying. Mr. Dickerson's opinion was that, if Goebel had made the inventions he claimed, they amounted to nothing more than an abandoned experiment. On November 28, 1882, Henry Goebel, Jr., called upon him, as representing the Edison Company, and made another offer to sell the inventions and good will of his father, naming the price of \$20,000, and the matter was again submitted to the company. On December 12, 1882, he called again, and was informed that the company did not wish to buy.

A patent was issued to Henry Goebel for an improvement in electric incandescent lamp, October 24, 1882. This invention has reference to securing and cementing the carbon burner into flattened and spirally coiled ends of the conducting wires. The second claim, as drawn in the original application, was rejected by reference to the Edison patent now in suit.

Upon consideration of the whole evidence on this motion I have reached the following conclusion:

It is extremely improbable that Henry Goebel constructed a practical incandescent lamp in 1854. This is manifest from the history of the art for the past 50 years, the electrical laws which since that time have been discovered as applicable to the incandescent lamp, the imperfect means which then existed for obtaining a vacuum, the high degree of skill necessary in the construction of all its parts, and the crude instruments with which Goebel worked.

Whether Goebel made the fiddle bow lamps 1, 2, and 3 it is not necessary to determine. The weight of evidence on this motion is in the direction that he made these lamps, or lamps similar in general appearance, though it is manifest that few, if any, of the many witnesses who saw the Goebel lamp could form an accurate judg-

ment of the size of the filament or burner. But assuming they were made, they do not anticipate the invention of Edison. At most they were experimental toys, used to advertise his telescope, or to flash a light upon his clock, or to attract customers to his shop. They were crudely constructed, and their life was brief. They could not be used for domestic purposes. They were in no proper sense the practical commercial lamp of Edison. The literature of the art is full of better lamps, all of which were held not to anticipate the Edison patent. The prior art demonstrates that to protect a carbon filament ten one thousandths of an inch in diameter from speedy disintegration the lamp chamber must maintain a nearly perfect and stable vacuum, and every part of the structure must be composed of such materials, and so put together, as not to imperil this vital condition. Leaving out other defects, it is abundantly shown that the Goebel lamp did not possess this requirement, and could not by reason of the elements which entered into its composition, and the mode in which it was constructed. Goebel says he made more than a hundred lamps, and that a continual improvement took place in their construction, and yet the only three lamps produced at the hearing by his own confession were made as early as 1854, or before gas was introduced into his house. Where are the other lamps, which show these improvements, except Exhibit 4, which I will deal with presently? The evidence of Goebel and his witnesses points to the conclusion that work ceased on these lamps in the "fifties," and was not revived until Edison, 20 years later, startled the electric world with his invention. Goebel brought from Germany the ideas contained in the old lamp of Starr, with its carbon pencil inclosed in a Torricellian vacuum, and he probably constructed some lamps after that pattern. In doing this he was up to and in line with the art as it existed at that early day, but to say that with a sudden bound he jumped from Starr to Edison passes the limits of credulity. The history of great inventions shows a gradual and labored progress. Each new investigator records some advance until it may be the desired discovery is almost within his grasp, but it is only after many attempts and many failures that some one appears who accomplishes the long sought-for result. The discovery of the domestic incandescent lamp is no exception to this rule, as the record in the New York case bears witness. Speaking from the standpoint of the art of incandescent lighting in 1854 and in 1892 are two different things, and it is therefore quite easy for witnesses to think that Goebel did much more than there is any legitimate reason to suppose.

As for lamp No. 4, I cannot but view it with suspicion. It presents a new appearance. The reason given for not introducing it before the hearing is unsatisfactory. This lamp, to my mind, envelops with a cloud of distrust the whole Goebel story. It is simply impossible, under the circumstances, to believe that a lamp so constructed could have been made by Goebel before 1872. Nothing in the evidence warrants such a supposition, and other things show it to be untrue. This lamp has a carbon filament, platinum leading-in wires, a good vacuum, and is well sealed and highly fin-

ished. It is said that this lamp shows no traces of mercury in the bulb because the mercury was distilled, but Goebel says nothing about distilled mercury in his first affidavit, and twice he speaks of the particles of mercury clinging to the inside of the chamber, and that for this reason he constructed a Geissler pump after he moved to 468 Grand street, which was in 1877. Again, if this lamp has been in his possession since before 1872, as he and his son swear, why was it not shown to Mr. Crosby, of the American Company, when he visited his shop in 1881, and was much interested in his lamps? Why was it not shown to Mr. Curtis, the leading counsel for the defendants in the New York cases, when he was asked to produce a lamp and promised to do so? Why did not his son take this lamp to Mr. Bull's office in 1892, when he took the old fiddle bow lamps 1, 2, and 3? Why did not his son take this lamp to Mr. Eaton's office in 1882, when he tried to negotiate the sale of his father's inventions to the Edison Company? A lamp so constructed and made before 1872 was worth a large sum of money to those interested in defeating the Edison patent, like the American Company, and Goebel was not a rich man. Both he and one of his sons were employed in 1881 by the American Company. Why did he not show this lamp to McMahon when he called in the interests of the American Company and talked over electrical matters? When Mr. Dreyer tried to organize a company in 1882, and procured an option from him of all his inventions relating to electric lighting, for which \$925 was paid, and when an old lamp of this kind was of vital consequence, and would have insured a fortune, why was it not forthcoming? Mr. Dreyer asked Goebel to produce an old lamp, and was especially anxious to find one pending his negotiations with the Edison Company for the sale of Goebel's inventions. Why did he not produce this lamp in his interviews with Bohm of the American Company, or Moses of the Edison Company, when it was for his interest so to do? The value of such an anticipation of the Edison lamp was made known to him. He was desirous of realizing upon his inventions. He was proud of his incandescent lamps, and was pleased to talk about them with anybody who would listen. Is it conceivable, under all these circumstances, that he should have had this all-important lamp in his possession from 1872 to 1893, and yet no one have heard of it or seen it except his son? It cannot be said that ignorance of the English language offers an excuse. He knew English very well, although Bohm and Dreyer conversed with him in German. His children spoke English. Neither his ignorance nor his simplicity prevented him from taking out three patents,—the first in 1865 for a hemmer, and the last in 1882, for an improvement in incandescent lamps. If he made lamp No. 4 previous to 1872, why was it not also patented?

There are other circumstances which throw doubt on this alleged Goebel anticipation. The suit against the United States Electric Lighting Company was brought in the southern district of New York, in 1885. Large interests were at stake, and the main defense to the Edison patent was based upon prior inventions. This Goebel claim was then investigated by the leading counsel for the defense.

Mr. Curtis. It was further inquired into in 1892, in the case against the Sawyer-Man Company. It was brought to the attention of and considered by the Edison Company in 1882. It was at that time known to the American Company, who hoped by this means to defeat the monopoly under the Edison patent. Dreyer tried to organize a company for its purchase. Young Goebel tried to sell it. It must have been known to hundreds of people. And now, when the Edison Company, after years of litigation, leaving but a short time for the patent to run, have obtained a final adjudication establishing its validity, this claim is again resurrected to defeat the operation of the judgment so obtained. A court of equity should not look with favor on such a defense. Upon the evidence here presented, I agree with the first impressions of Mr. Curtis, and with the opinion of Mr. Dickerson, that whatever Goebel did must be considered as an abandoned experiment.

It has often been laid down that a meritorious invention is not to be defeated by something which rests in speculation or experiment, or which is rudimentary or incomplete. The law requires not conjecture, but certainty. It is easy, after an important invention has gone into public use, for persons to come forward with claims that they invented the same thing years before, and to endeavor to establish this by the recollection of witnesses as to events long past. Such evidence is to be received with great caution, and the presumption of novelty arising from the grant of the patent is not to be overcome except upon clear and convincing proof. *Coffin v. Ogden*, 18 Wall. 120; *Brush v. Condit*, 132 U. S. 39, 10 Sup. Ct. Rep. 1; *The Telephone Cases*, 126 U. S. 1, 2, 8 Sup. Ct. Rep. 778; *American Bell Tel. Co. v. People's Tel. Co.*, 22 Fed. Rep. 309; *Motte v. Bennett*, 2 Fish. Pat. Cas. 642; *Parham v. Buttonhole Co.*, 4 Fish. Pat. Cas. 468; *La Baw v. Hawkins*, 1 Ban. & A. 428; *Gottfried v. Brewing Co.*, 5 Ban. & A. 4; *Worswick Manuf'g Co. v. City of Buffalo*, 20 Fed. Rep. 128.

When the defendant company entered upon the manufacture of incandescent lamps in May, 1891, it well knew the consequences which must follow a favorable decision for the Edison Company in the New York case. Owing to the large interests involved, I have carefully considered this motion, and I am satisfied upon the evidence, and the law applicable thereto, that it should be granted.

Injunction granted.

SAWYER SPINDLE CO. et al. v. W. G. & A. R. MORRISON CO.

(Circuit Court, D. Connecticut. February 13, 1893.)

No. 735.

1. PATENTS FOR INVENTIONS—ANTICIPATION—SPINDLE BEARINGS.

Letters patent No. 253,572, granted February 14, 1882, to John E. Atwood, for an improved support for spindles in spinning machines, is not anticipated by patent No. 82,049, granted September 8, 1868, to David M. Weston, for an improved self-balancing centrifugal machine, wherein the shaft revolves in a box at its base, having an easily yielding spring, made of rubber or other elastic material, around its outer circumference, and