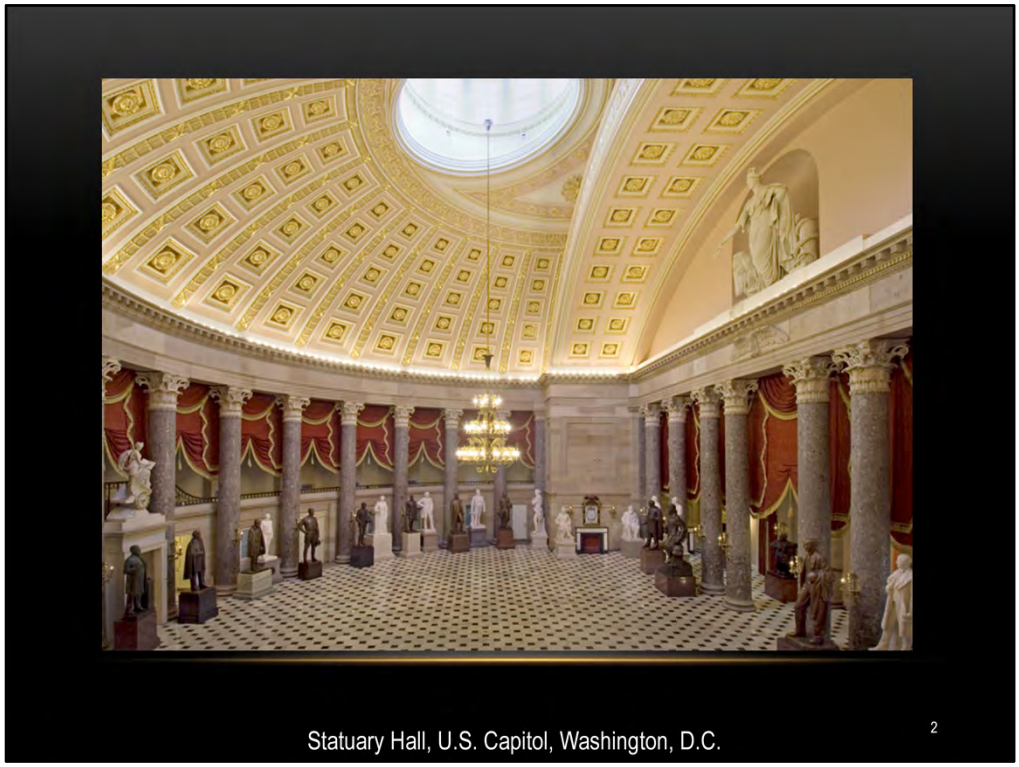
Well, I have to tell you at the outset that the topic of my essay is no more risqué than the Kit Kat Club, itself – sorry if that's a disappointment. I will also give you the hint that the real topic of tonight's essay occurs _-?-_ times in this very room.



Our journey tonight begins in the National Statuary Hall at the U.S. Capitol in Washington, D.C. Statuary Hall was established in the old chamber of the House of Representatives once the House and Senate expansion wings were completed in 1857. The idea was for each state to contribute two statues of persons of State and National significance. Today there are 100 such statues, installed all around the Capitol, as the capacity of the original space was exceeded. According to the State's web site, "Ohio seeks to bring the history of Ohio's ingenuity to the forefront and celebrate the state's unique entrepreneurial spirit" with its representatives.

The two statues currently representing Ohio are President James A. Garfield and Governor William Allen. These two statues have stood in National Statuary Hall for almost 127 years, with Garfield installed in 1886 and Allen in 1887.

I think these are interesting choices . . . on several levels. President Garfield – our 20th President, was in office for only six months before being assassinated in Washington, D.C. Prior to that has was an Ohio Senator, a Major General in the Union Army, and a member of the House of Representatives, where he distinguished himself as an expert in public finance. President Garfield was the last U.S. President to have been born in a log cabin. An interesting side note is that he was elected to the U.S. Senate and to the Presidency at the same time in 1880. At any rate, he is one of Ohio's Presidents, and a man with a rich heritage of public service to the State and the nation. His statue

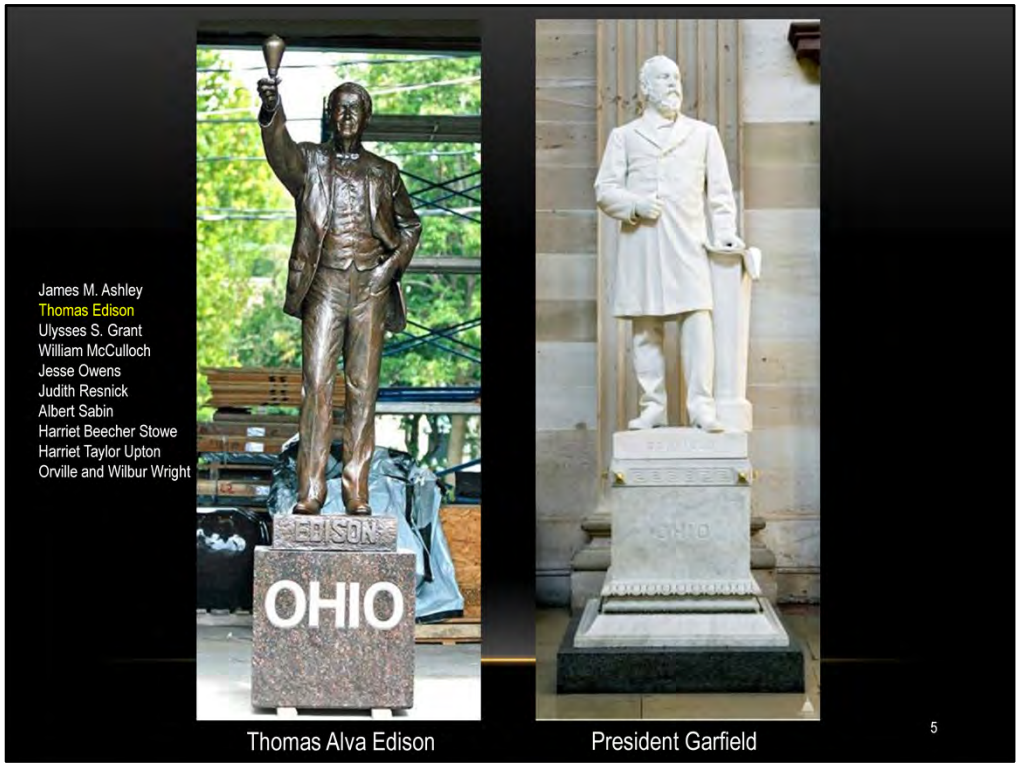
currently stands in the Capitol Rotunda.

Governor Allen, known as “Earthquake Allen” for his voracious debating skills, was a lawyer who grew up in Chillicothe. He was a one-term member of the U.S. House of Representatives starting in 1832, and a two-term U.S. Senator who favored westward expansion. He backed slavery and was a vocal critic of the Lincoln administration, calling himself a “Peace Democrat.” In 1873, he was elected as Ohio’s 31st governor by 817 votes; he was defeated for a second term by Rutherford B. Hayes.

The states are allowed to adjust their representation in Statuary Hall, and a few changes have been made over the years.

In 2012, after an extensive public campaign and voting process, Governor Kasich signed legislation to replace Governor Allen's statue with one honoring Thomas Alva Edison, primarily in response to Governor Allen's pro-slavery stance.

Since I grew up in New Jersey, where Edison lived most of his adult life and where most of his inventions were conceived, I remember thinking it was kind of odd that Ohio would choose him for the Capitol.



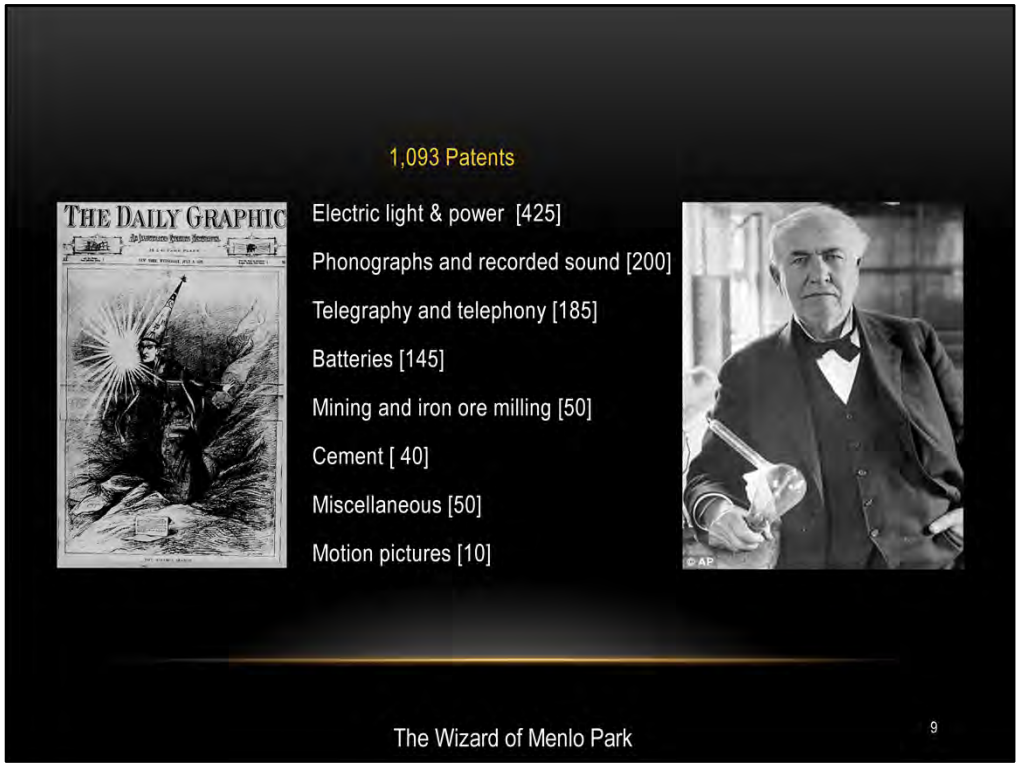
Thomas Edison was born in 1847 in Milan, Ohio, the seventh and last child of Samuel and Nancy Edison, who were Canadians who fled to Ohio after Samuel's participation in a short-lived 1837 armed rebellion against British rule. When he was seven his family moved to Port Huron, Michigan and Edison lived there until he struck out on his own at the age of sixteen. He had very little formal education as a child, attending school only for a few months. He was home schooled by his mother, but was always a very curious child and taught himself much by reading on his own. This belief in self-improvement remained throughout his life.

Plans have been made for October of this year to return Governor Allen's statue to Ohio and replace it with a bronze sculpture of Thomas Edison, by Zanesville artist, Alan Cottrill.

Just off the Rotunda in the Ohio Statehouse is a very large 1950 painting by Zanesville artist Howard Chandler Christy, called "Dawn of a New Light," depicting the famous inventor at various stages of his life.

And, yes, there is a sign and a museum at Edison's birthplace in Milan.

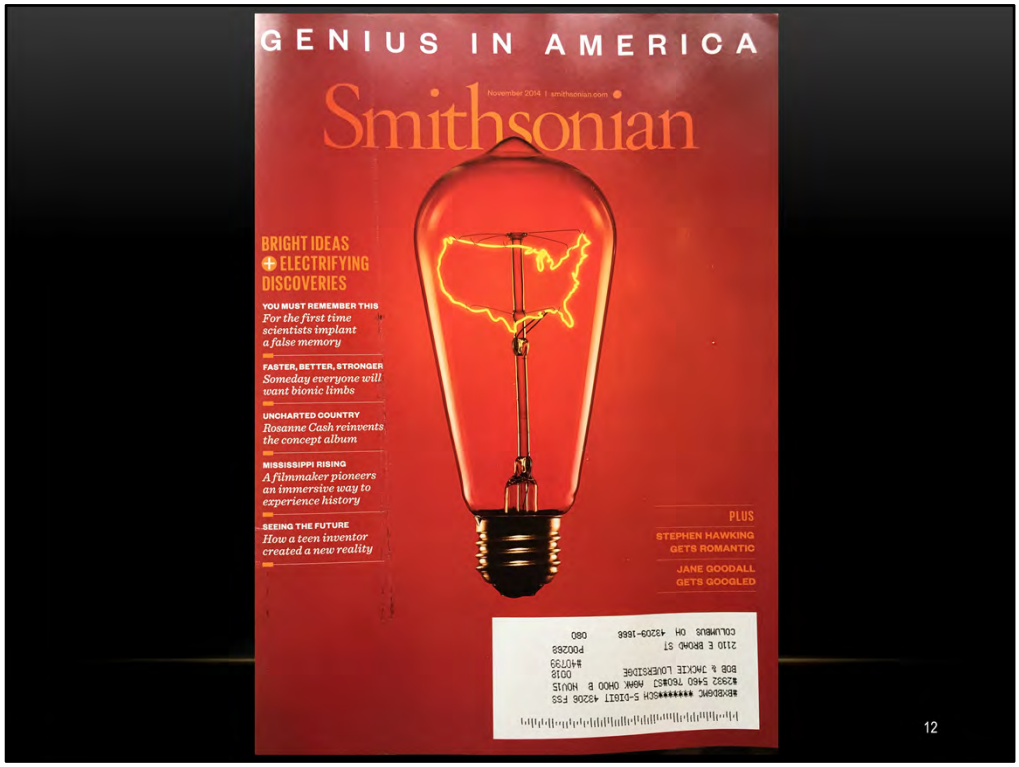
This detail of the painting shows both the birthplace and a depiction of Edison at the time he lived in Ohio.



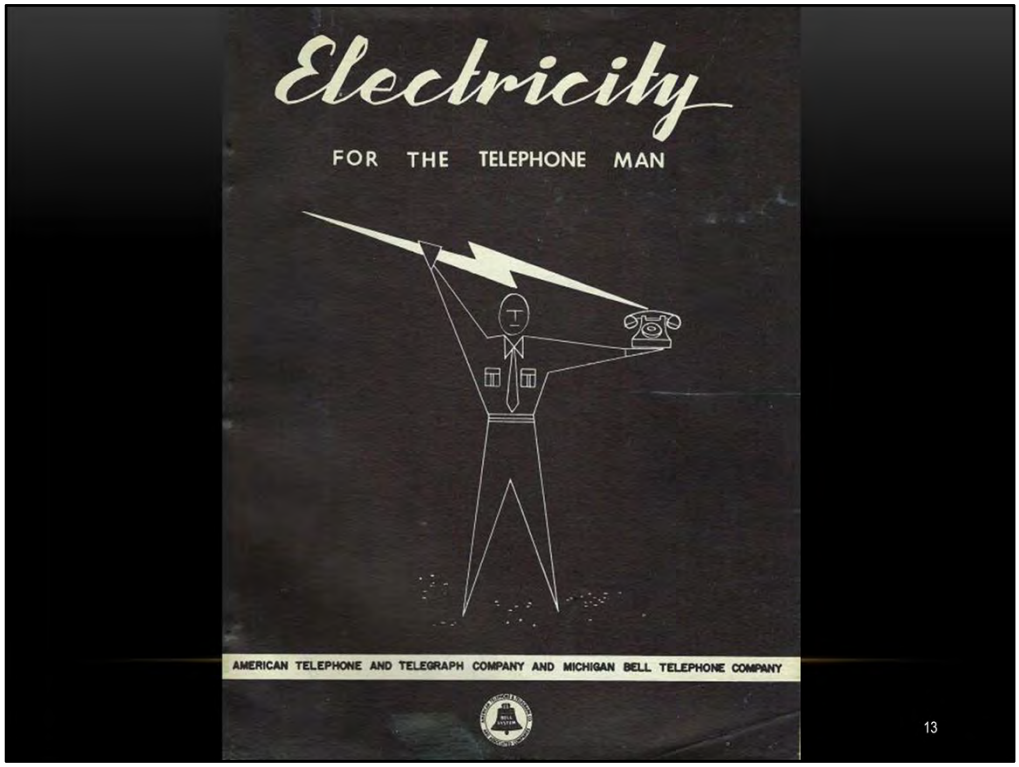
At any rate, even if his “Ohio credentials” are a bit thin, you have to admit that Thomas Edison was an incredible human being – certainly one who meets the criteria mentioned earlier of ingenuity and entrepreneurial spirit. He had over a thousand US patents. The man known as the “Wizard of Menlo Park” invented the phonograph; improved telegraphy, the telephone and moving pictures; made better batteries; made mining iron ore more efficient; and even made better cement. He did not, however, invent the light bulb.

But it is the light bulb, and the many improvements Edison contributed to it, that we are going to talk about tonight. This incredible invention not only changed life as we know it, but today it represents the very idea of “idea.”

This (see image) is what you get when you “Google” the word “idea.” Since Edison’s practical application of the incandescent light, we have come to think of the light bulb as the epitome of innovation. This is no mistake.

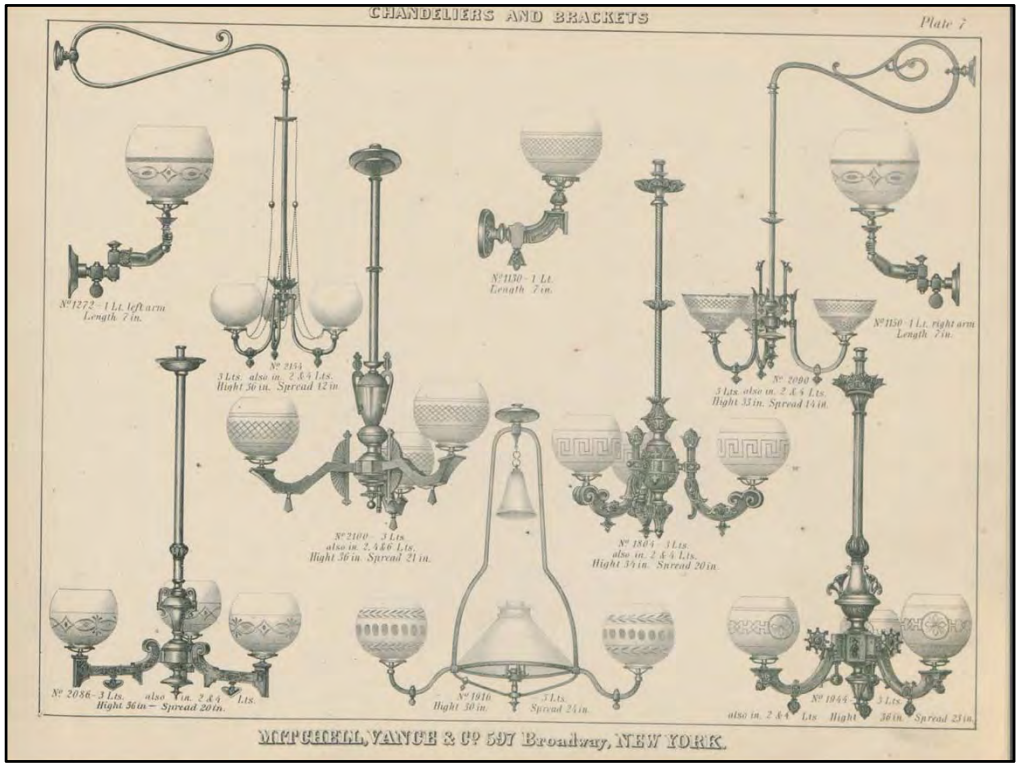


Even the venerable Smithsonian Institution recently used the Edison light bulb to symbolize “Bright Ideas and Electrifying Discoveries.”

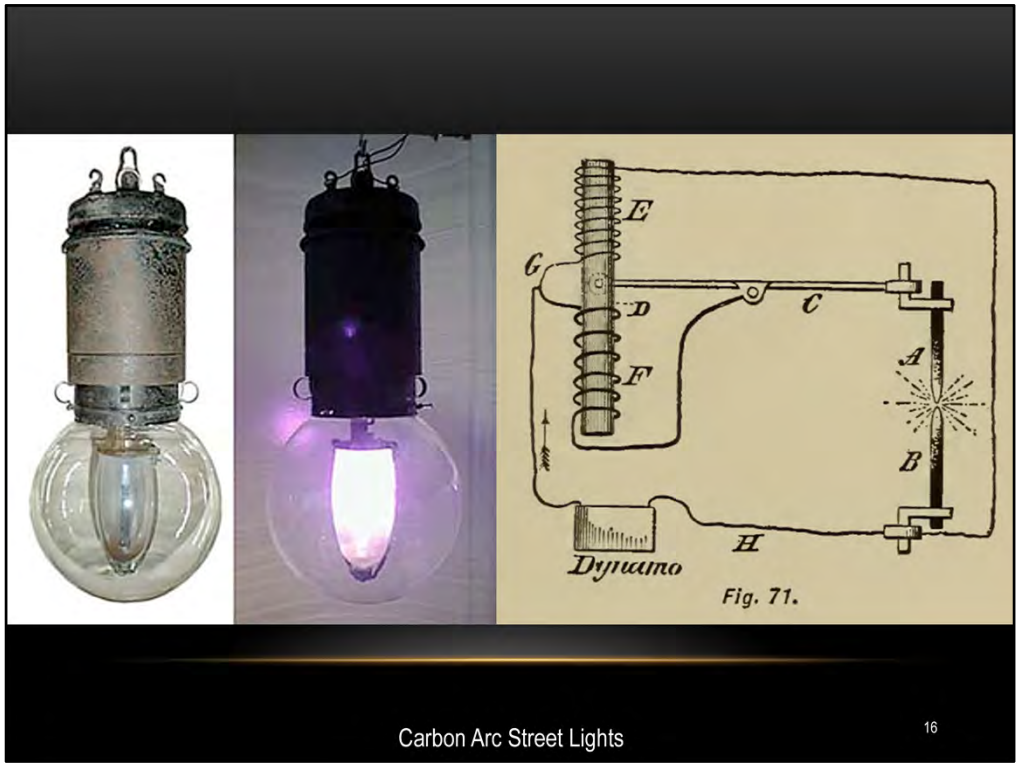


I have always been interested in electricity. My father was a New Jersey Bell Telephone installer, and he gave me this book and taught me fundamentals of electricity at an early age.

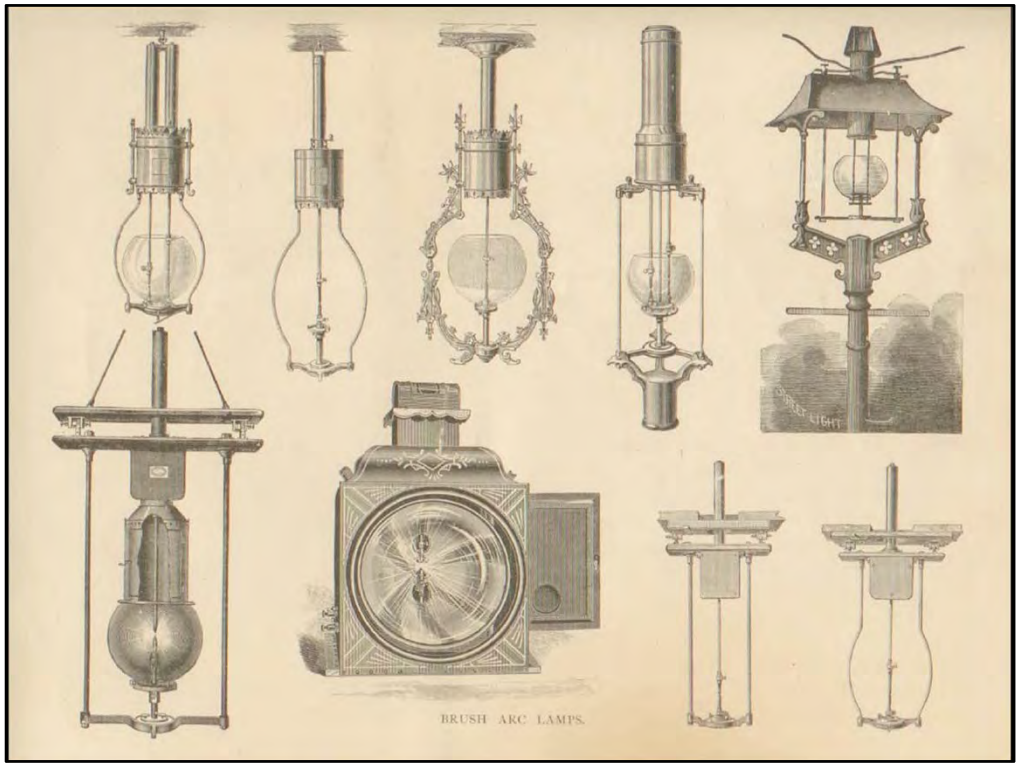
I even thought I might be an electrical engineer until I learned that math would be involved.



But, back to lighting. In the middle of the nineteenth century, gas lighting became generally available in most cities in the United States. Columbus had gas lights by the mid-1840s, and the Statehouse was lit brightly with gas at its opening in 1857. I am sure that this great house had gaslights as well.

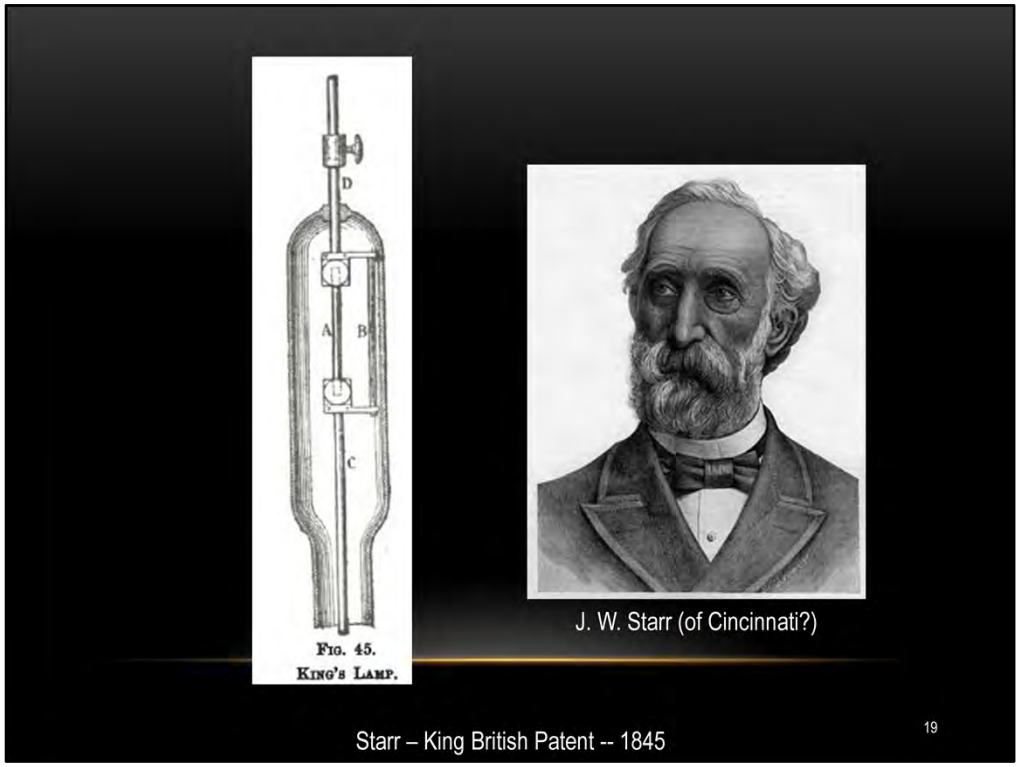


Then came the first practical electric lights – carbon arc lights that produced light by making lightning between rods of carbon. The light was bright and harsh, and applicable for street lighting and large factory spaces,



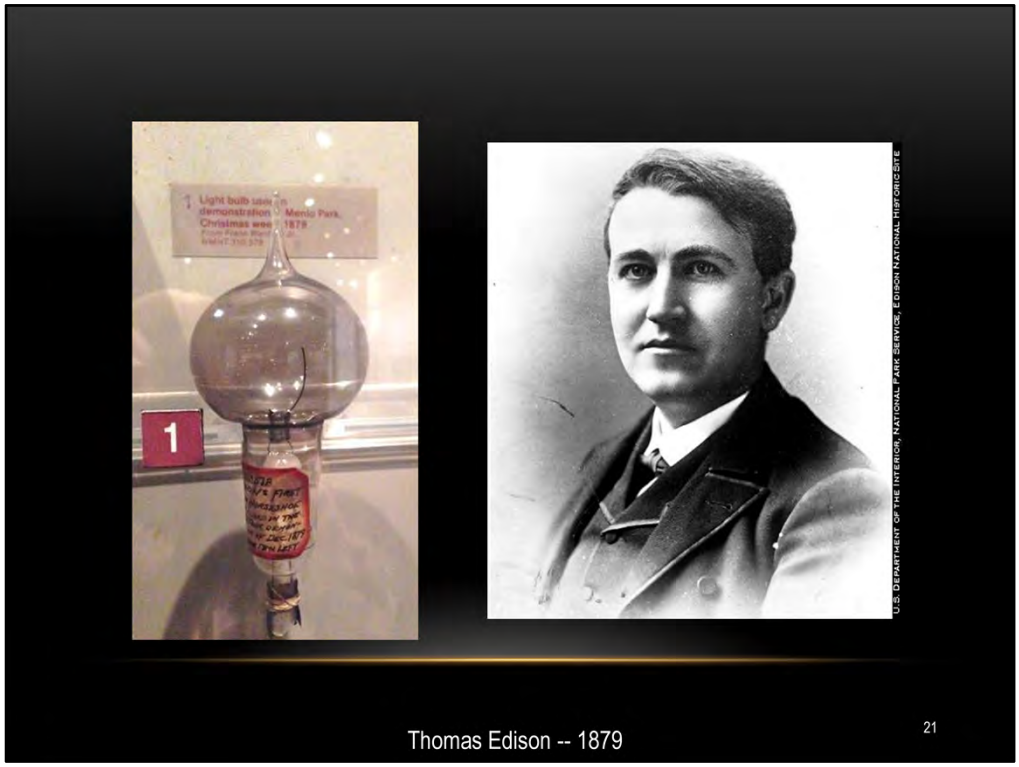
but when it was made into domestic fixtures, it was less satisfactory.

Many people experimented with what became incandescent light. Sir Willian Robert Grove made a light of sorts as early as 1840.

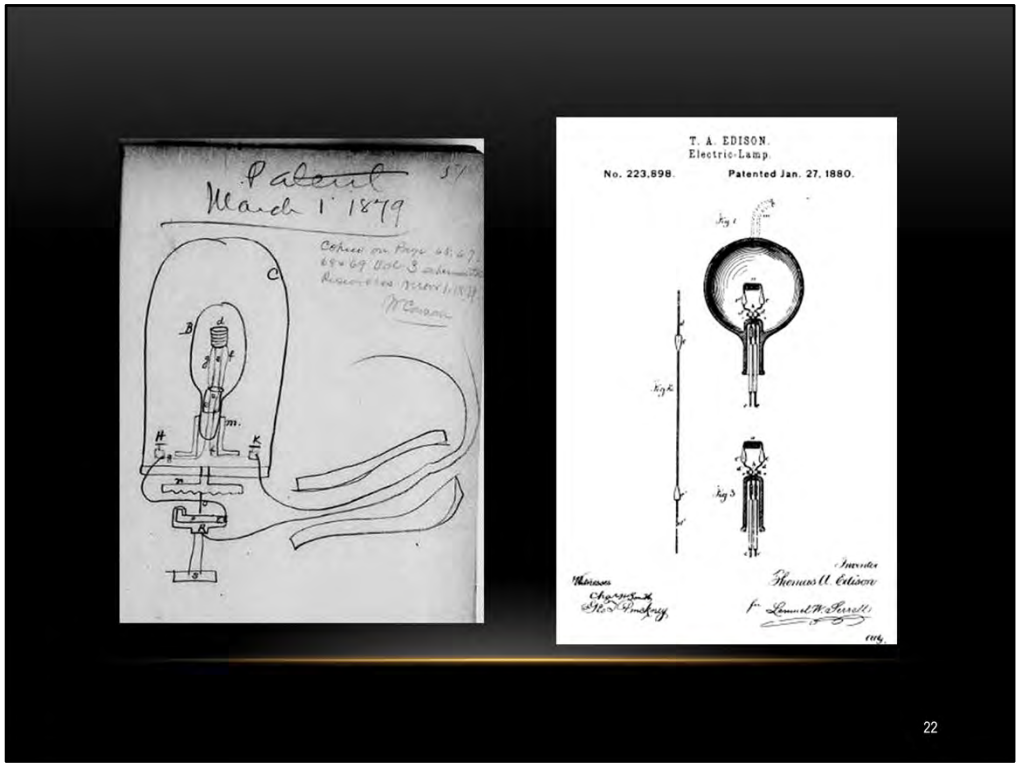


John W. Starr, who some sources say was from Cincinnati, had an idea for an incandescent lamp that included a glass bulb. Starr and Edward King were granted an English patent in 1845, but Starr died soon afterwards. The experiments by Grove and Starr and others at the time proved that certain materials, usually platinum, would glow brightly when connected to the crude batteries of the time. However, the lights would not last very long, as the extreme heat generated in the process would quickly burn out the light.

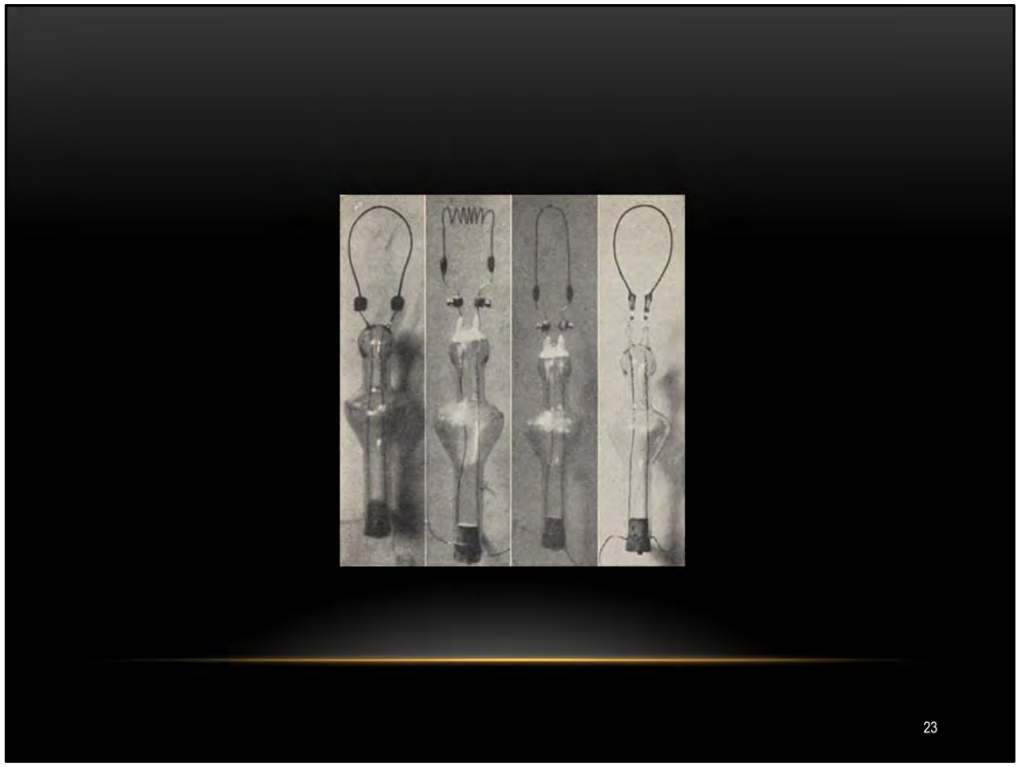
In 1879, British inventor Sir Joseph Swan experimented with his light, which had a glass bulb containing a carbonized paper filament in a partial vacuum. The vacuum helped keep the temperature down and kept the filament from burning up so quickly. He lit up a house with these bulbs and obtained a British patent in 1880.



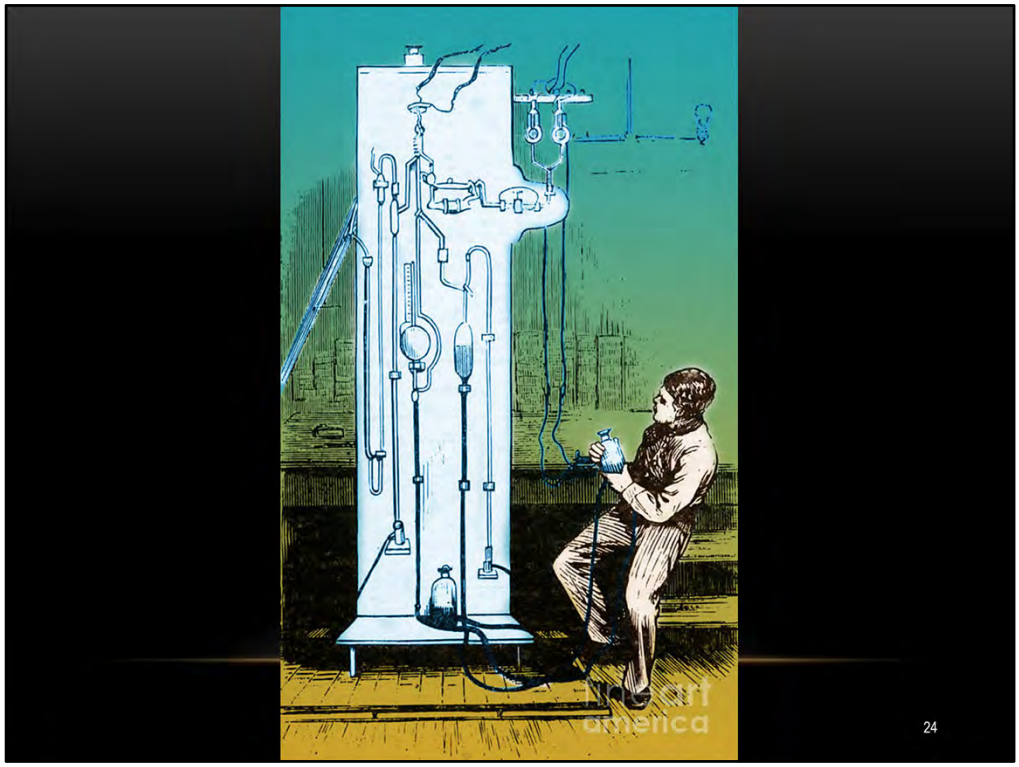
At the same time, in Menlo Park, New Jersey, Thomas Edison was experimenting – independently – with a vacuum-evacuated bulb, which he demonstrated to a large group of potential investors who journeyed to his laboratory by a special train from New York City in 1879.



Here you can see his actual notebook sketch of March 1879, and the original Edison bulb patent drawing of January 27, 1880. Edison is famous for his persistence in inventing and improving inventions.

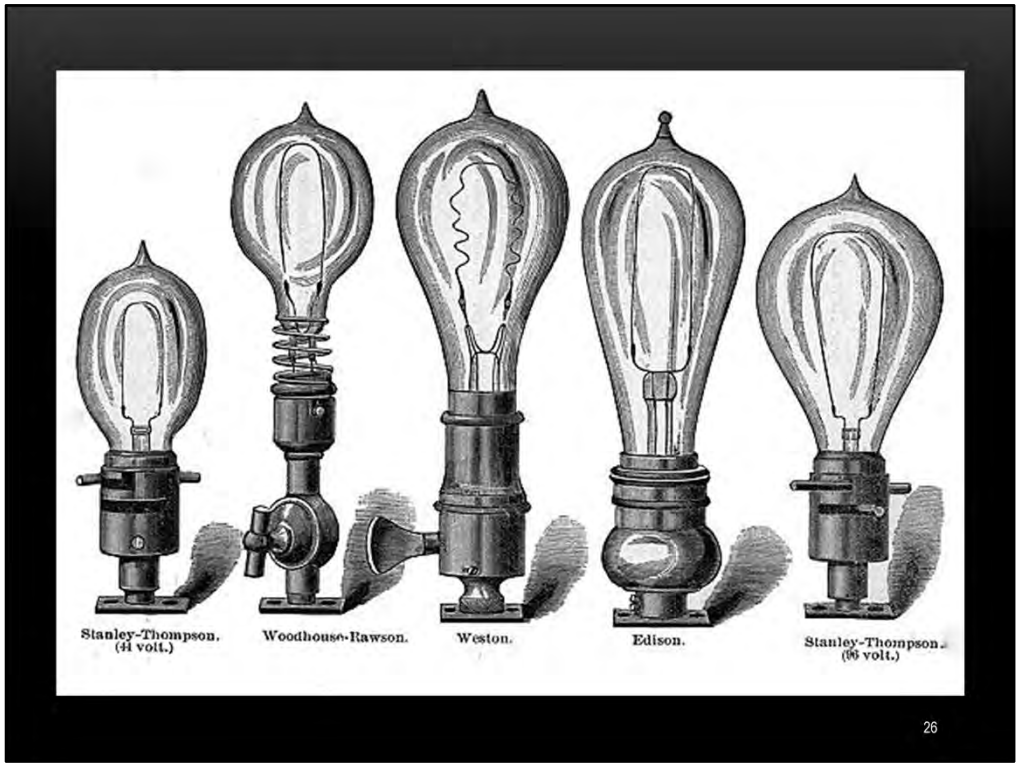


Whether or not it is true that Edison actually tested 10,000 materials in an effort to design a viable light bulb, it is clear that this was a gargantuan effort involving common and exotic materials from around the world. He and his team also had to invent the glass stem to hold the filament, connections of the filament to wires, ways of controlling the heat so it would not shatter the glass bulb,



and a practical way to achieve a pure vacuum within the bulb.

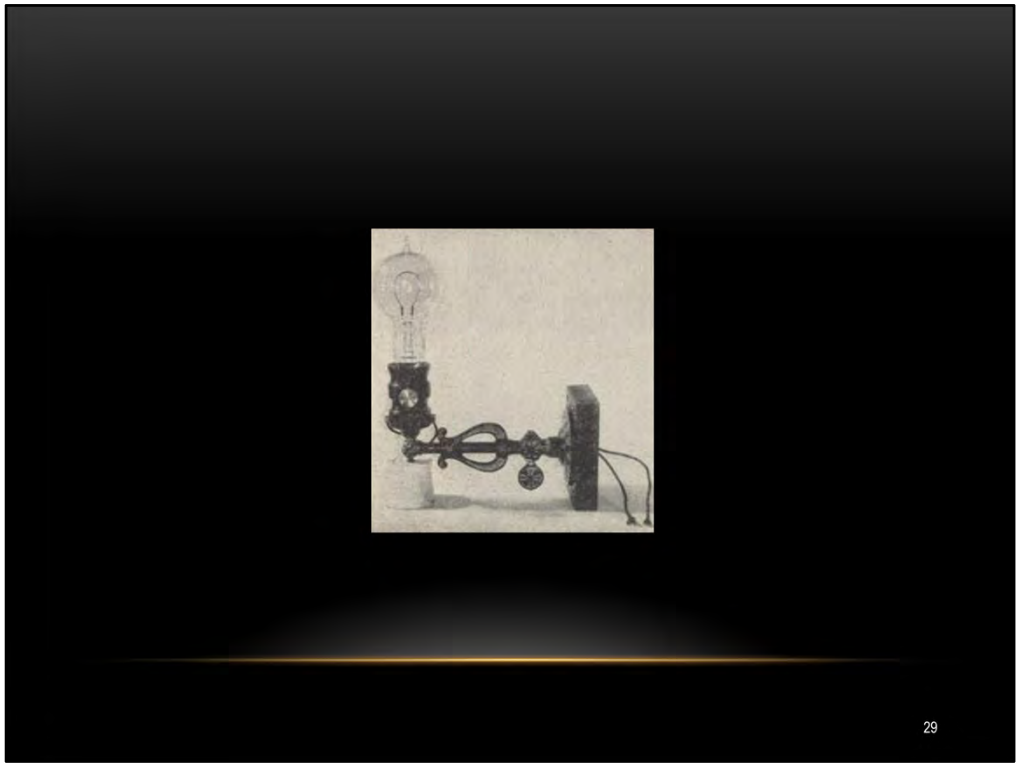
Keep in mind that everything had to be invented here, to make a practical, commercial electric lighting system.



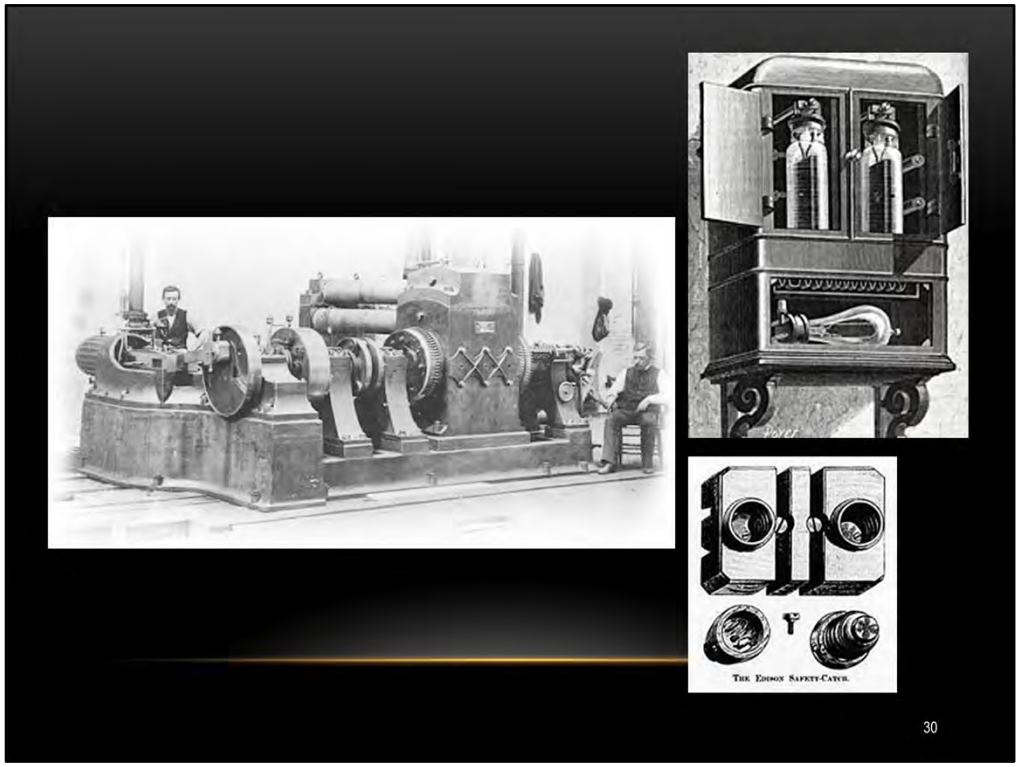
In 1885, the Franklin Institute in Philadelphia conducted tests on a number of different manufacturer's light bulbs, including Edison's, which excelled in all categories, except, oddly enough, energy efficiency

Meanwhile, Edison was not going to be content to invent a light bulb – he was intent on inventing a commercial enterprise that would make electric lighting available to the public, and which would be profitable. He made a detailed study of the already successful gas utility industry, with its central plants, underground distribution, individual control of lights, and metering capabilities.

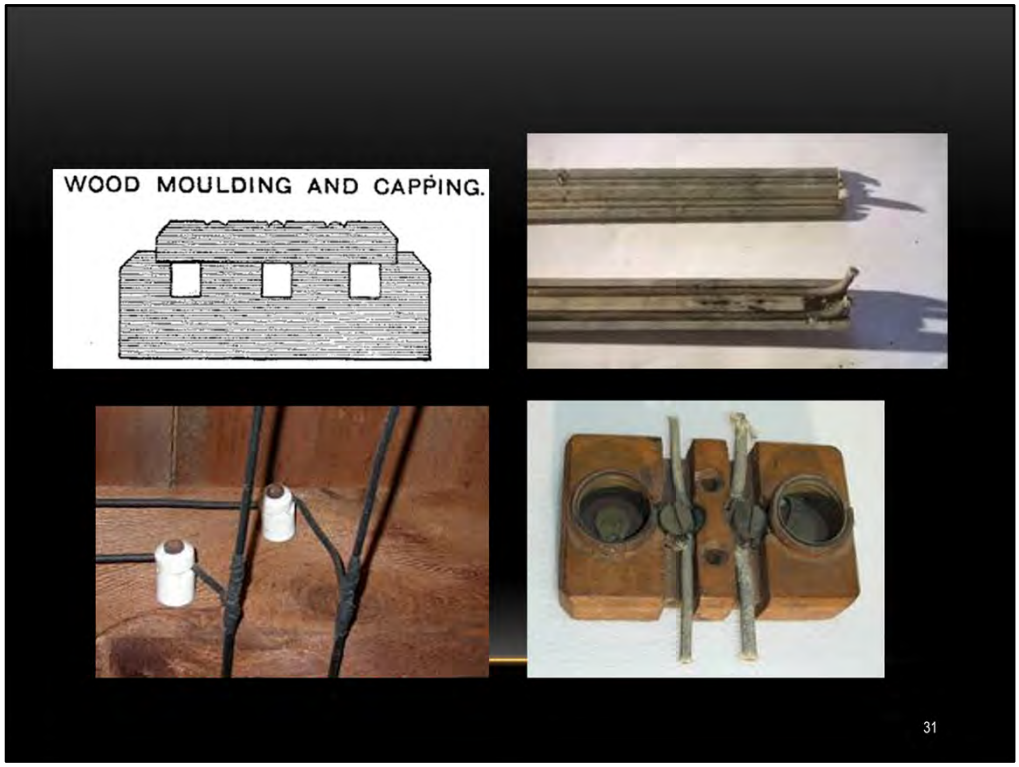
Edison determined to model his new system to compete directly with gas. Gaslights were noisy, dirty and somewhat dangerous, but they were very popular alternatives to oil lamps and candles.



The first light fixtures were, literally, gas fixtures that were wired for electricity. But, of course, it was not enough to have a fixture . . .

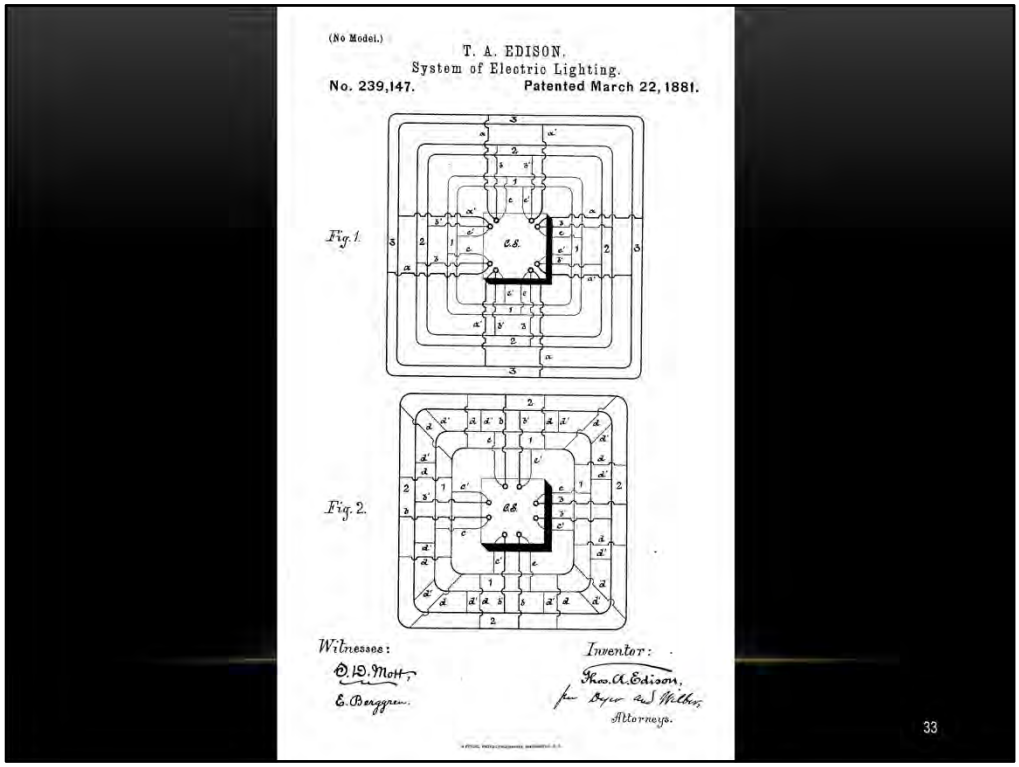


Edison invented large scale steam powered dynamos to produce power, fuses to keep it safe, chemical meters to measure the power consumed (so he could send a bill !),



wiring devices to safely distribute the current in houses,

switches,


(No Model.)

T. A. EDISON.

System of Electric Lighting.

No. 239,147. Patented March 22, 1881.

Fig. 1.

Fig. 2.

Witnesses:

Inventor:

Thos. A. Edison,

Attorneys.

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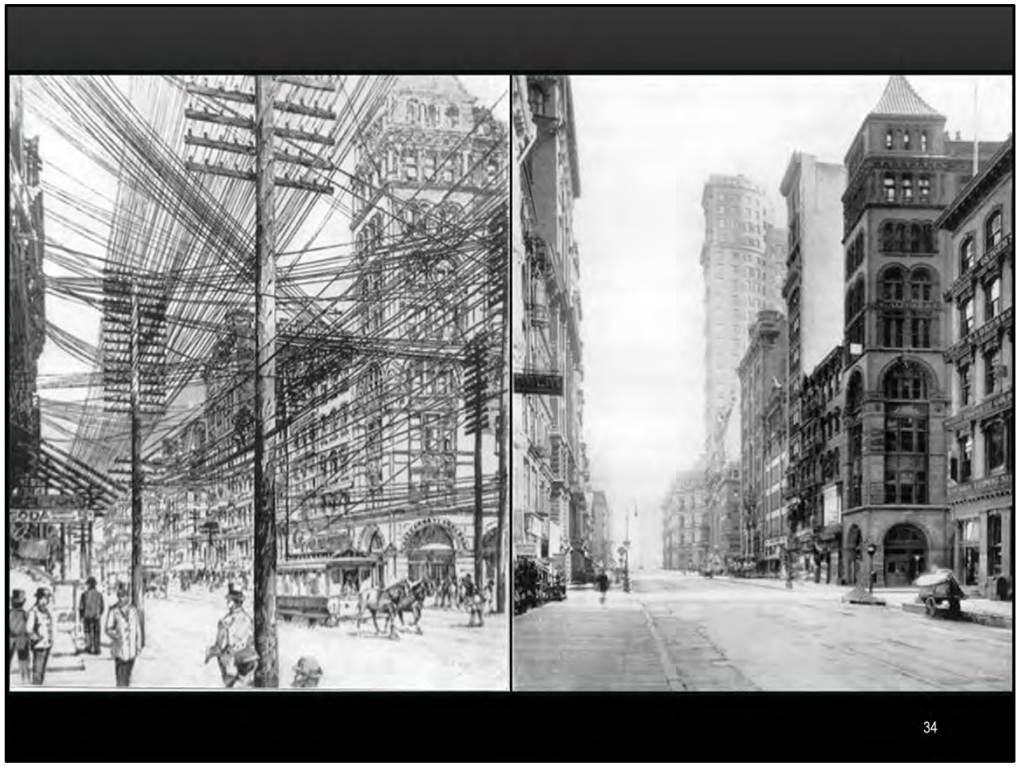
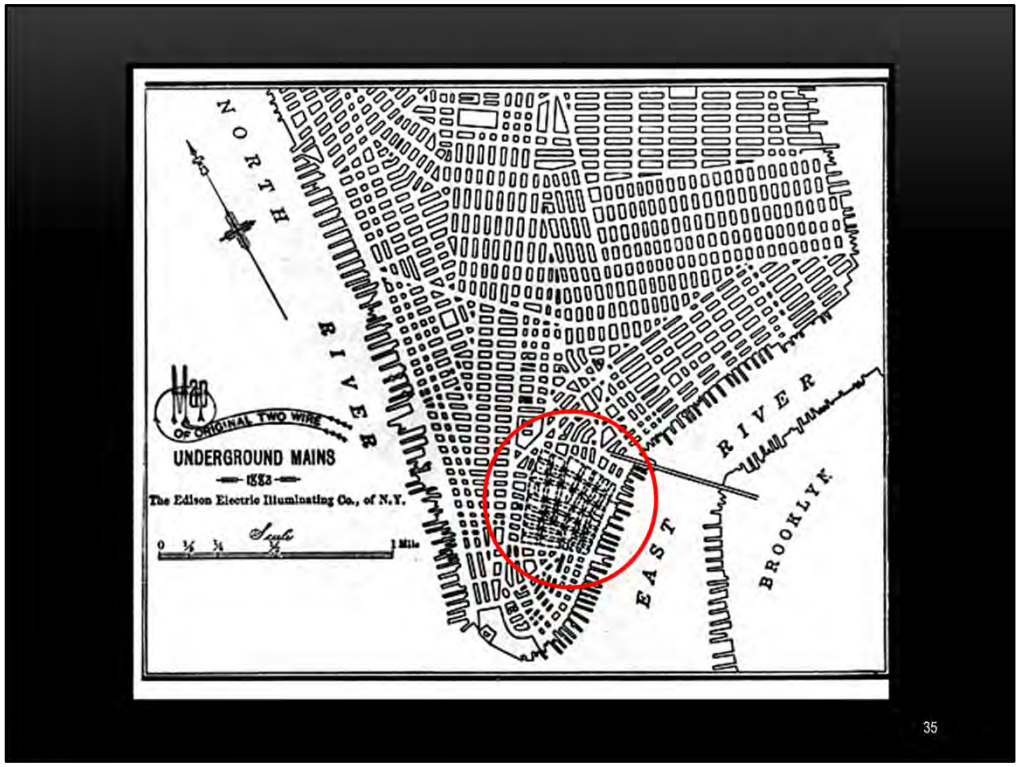
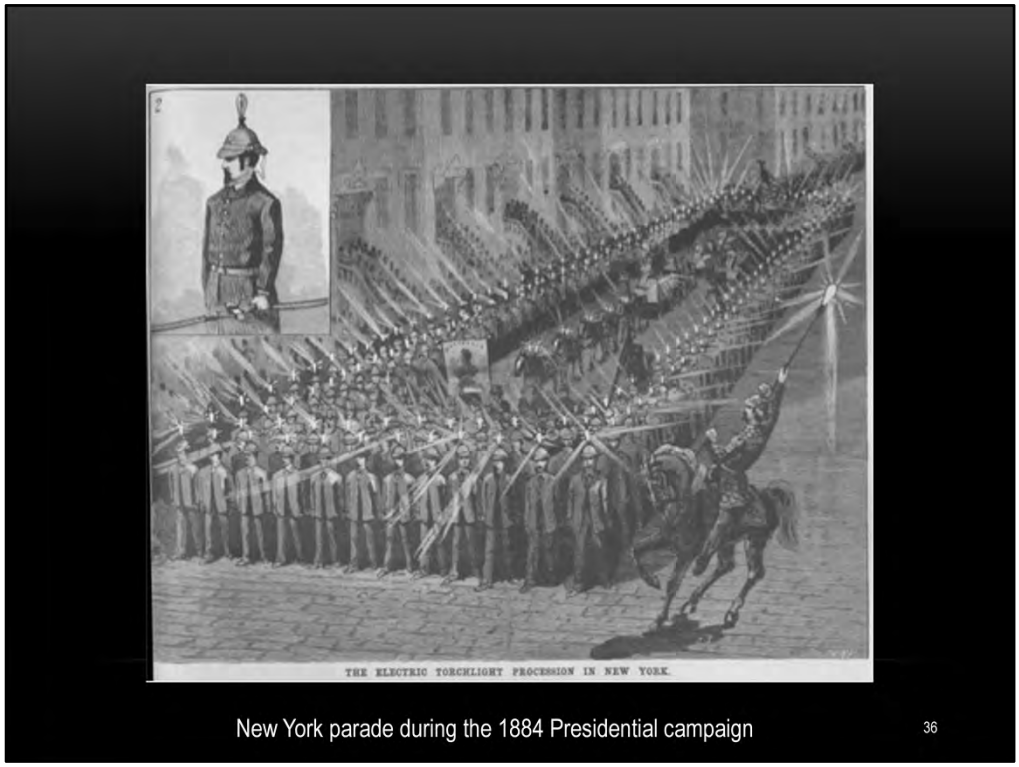
and, in 1881, he patented a distribution system for electricity that allowed multiple customers to be swerved by a central plant, and which kept the copper wires to a reasonable, cost effective size.



Edison developed an insulated underground conduit system with junction boxes to connect individual buildings, because he did not like the overhead telegraph and telephone wires that were clouding the sky in major cities – and because he thought it would be safer.

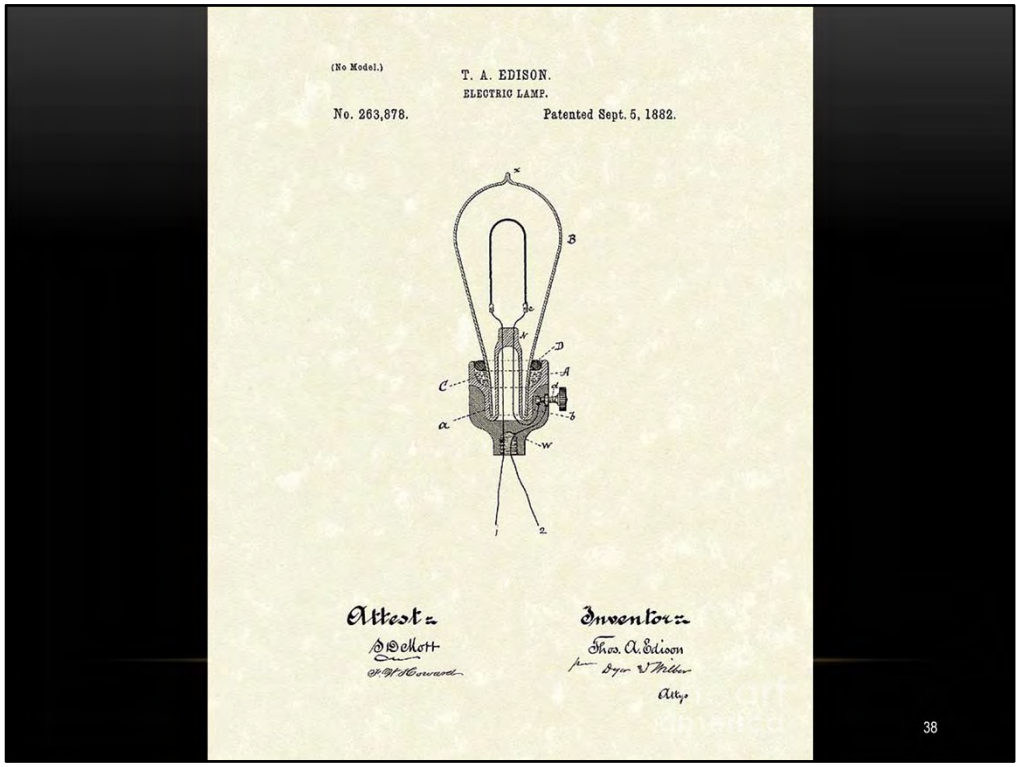


In 1881, the Edison Electric Illuminating Company of New York obtained permission to build a central plant and distribution system for this area of Manhattan. The Pearl Street Station was the first central plant, and it ran continuously until it burned down in 1892.



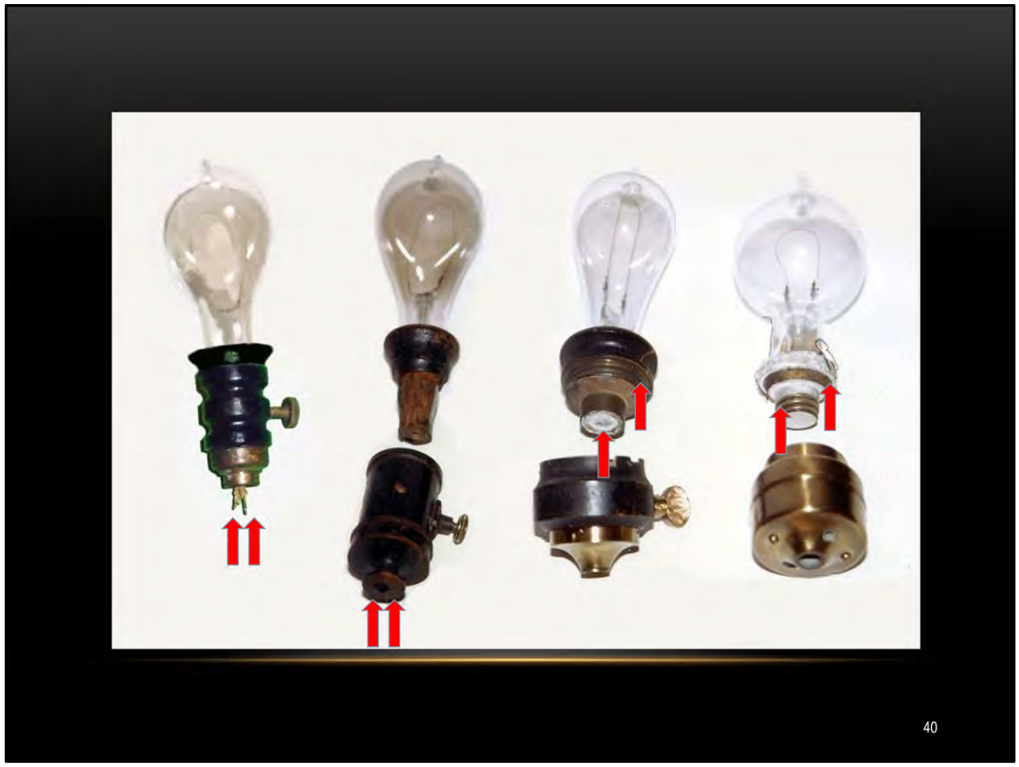
All kinds of schemes were employed to promote the new electric light. During the 1884 Presidential Campaign, this scene of marchers led a traditional torchlight campaign event in New York City with incandescent bulbs on their heads! The marchers surround a horse-drawn generating plant - dynamo, steam engine, boiler, and water tanks - and the electricity is conveyed to the bulbs on their heads by wires up their sleeves. New York Governor Grover Cleveland narrowly defeated former U.S. Senator James G. Blaine of Maine by a margin of just 1,047 votes. I'm not sure just what impact this promotion had on the election, but New York is said to have pushed the election over the top!

Now, if I seem to have glossed over the invention of incandescent lights, and left out a few details, it is because all of this is kind of a prelude to what I really wanted to talk about tonight. Again, this is the light bulb Edison first used. In the beginning, when you bought a lighting system, the Edison Company owned the lights, and would send out an electrician to replace a bulb when it burned out. Well, wiring and re-wiring bulbs every 400 hours or so wasn't really very practical, so a readily replaceable system was needed.



This 1882 patent drawing shows that the bulb is simply shoved down into a socket, with wires coming out from the bottom, kind of like the tiny holiday bulbs we use today. It would only stay in place in the socket in the upright position.

Here is another version. The screw on the side was a crude on-off switch, and the wires for current were attached to lugs on the outside. The socket itself is made of wood.

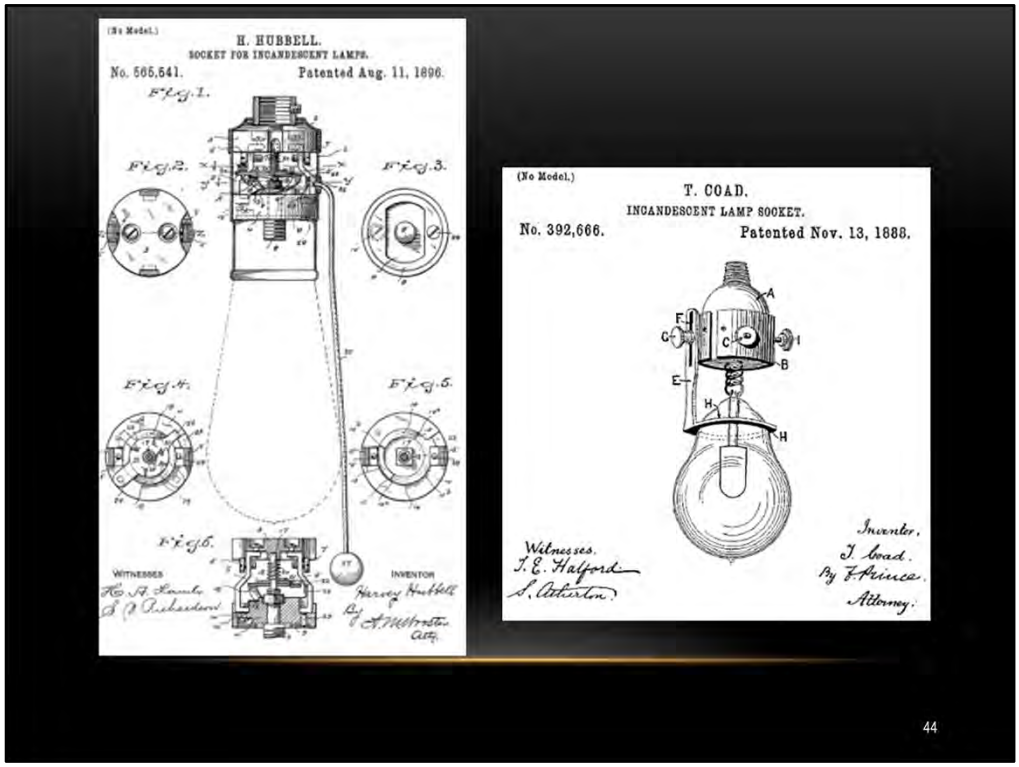


Over the next several years, Edison experimented with various sockets, evolving from the wood plug to some that would screw into place, and, ultimately, to a couple that had electrical connections built in – an interchangeable bulb.

Others were, of course, inventing their own solutions. Here is an interesting spring-loaded bulb. Not very practical, I think.

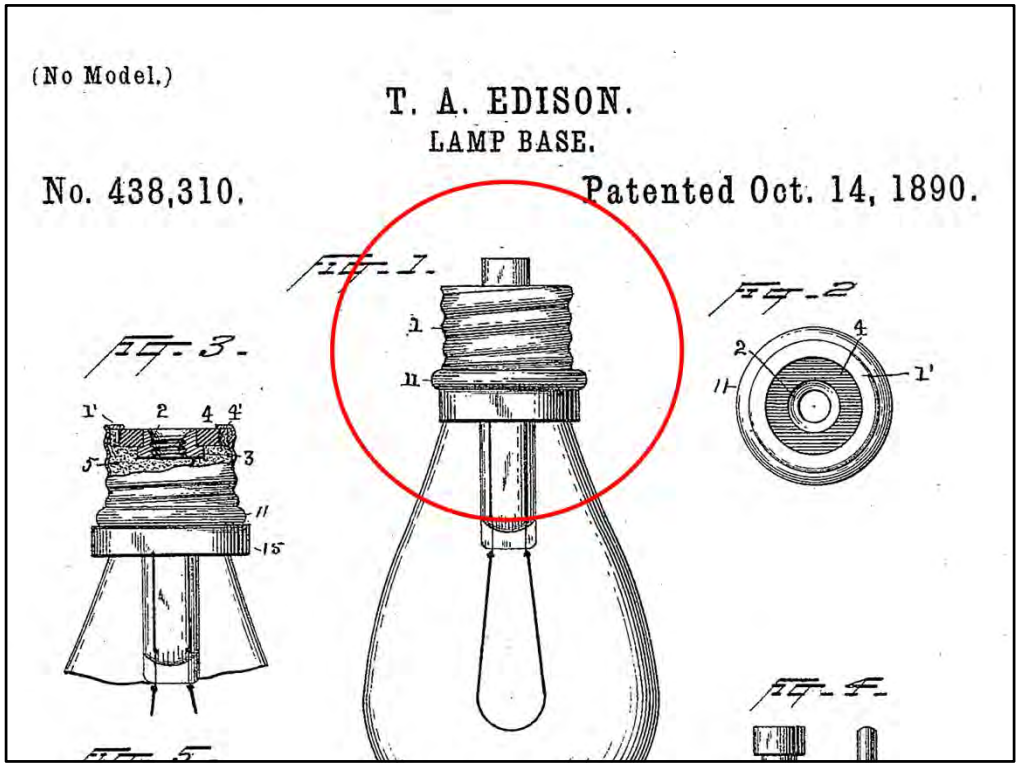
Here is another spring version,

Here is another spring version,



and another, this one by Hubble. There were many variations, but the problem of convenient bulb changing took some time. Note that each of these examples has a threaded connection on the bottom – for attachment to a standard gas fixture.

So, one day in the laboratory at Menlo Park, Thomas Edison looked over at a common kerosene can, and took note of the simple threaded cap. Urban legend has it that he remarked, “That certainly must make a bang up socket for the lamp.”



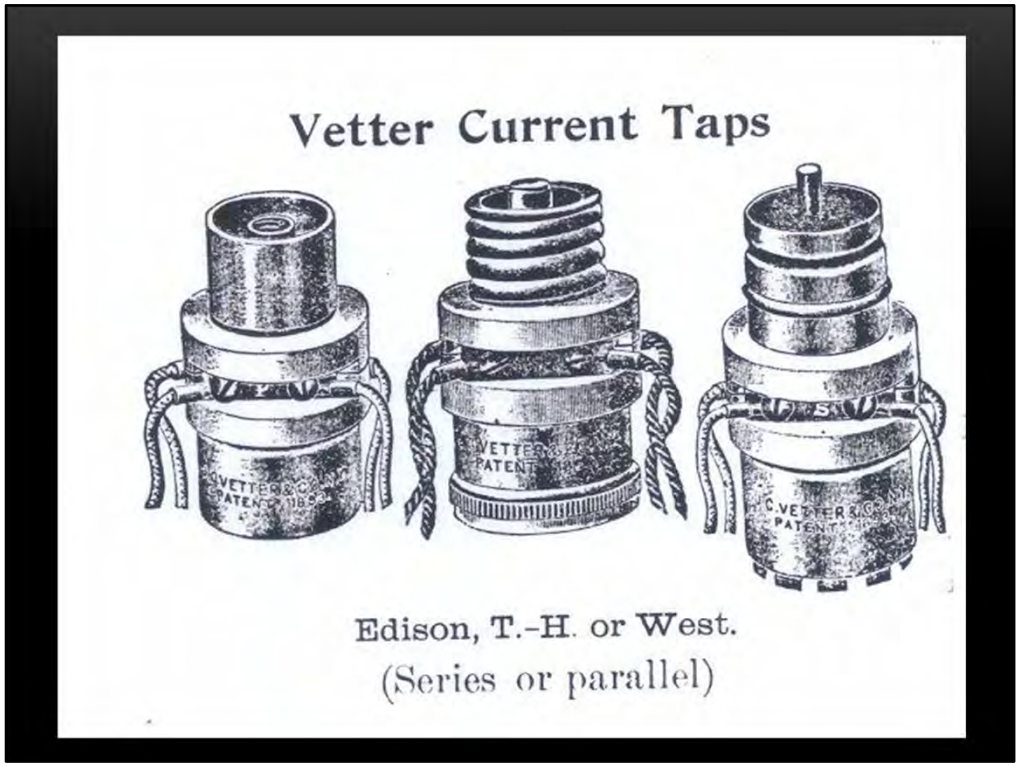
At any rate, in 1890, Edison patented what we now know as the "Edison medium screw base" for incandescent lights.

At the time many manufacturers were making and producing commercial incandescent light bulbs. Due to both entrepreneurial spirit and strict patent laws, many different base configurations were on the market. This is part of an exhibit at the Smithsonian National Museum of American History that shows the variety of bulbs and sockets being produced at this time.

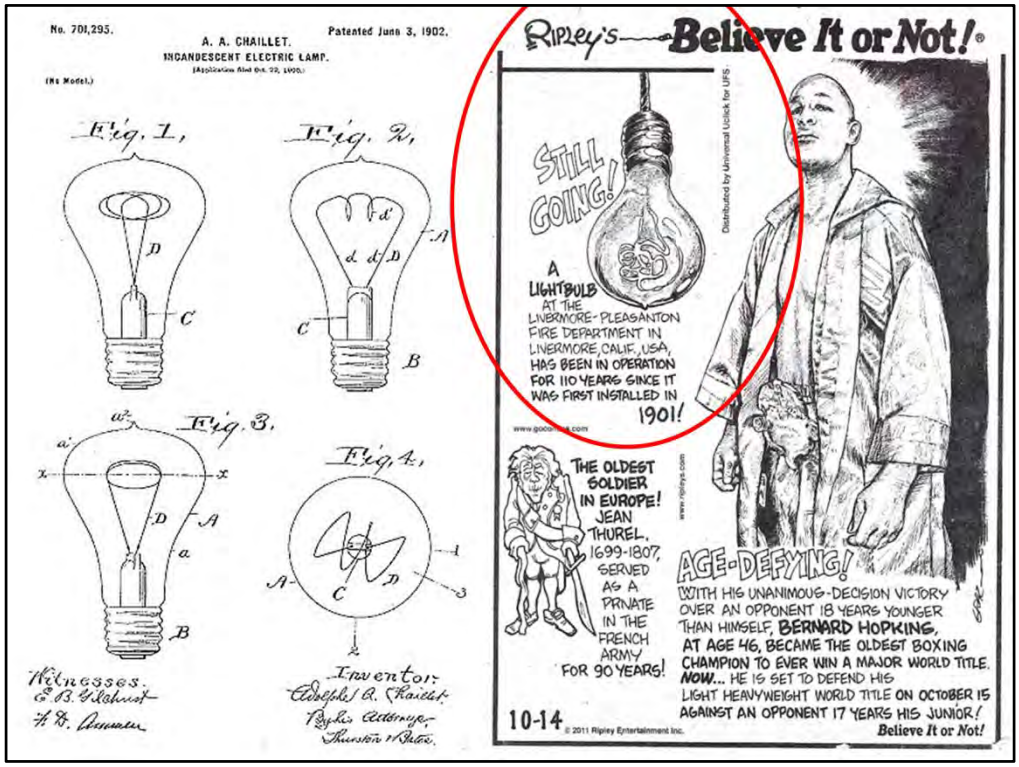
SOME OF THE VARIOUS BASES IN USE PRIOR TO 1900

This photo shows some of the bases in use,

and this photo shows a number of the most common sockets.

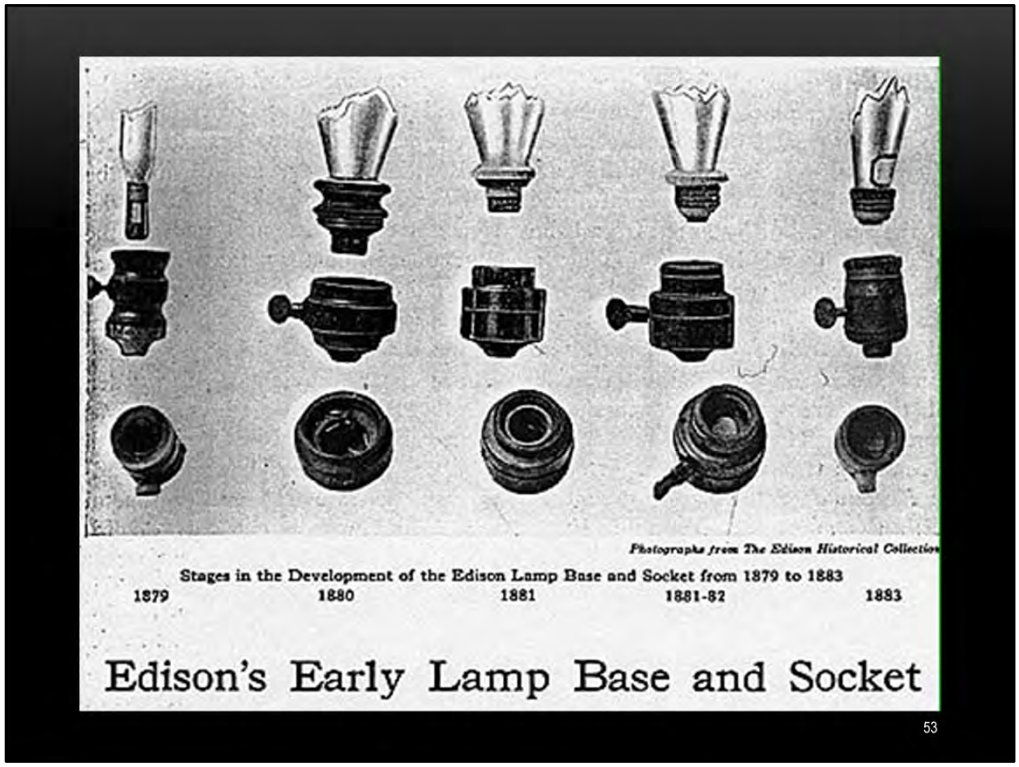


As the electrical industry expanded, the confusion mounted. Here is a clever product made to tap power from the lighting system for other purposes, but notice that the manufacturer had to produce it in three variations, for the most popular systems then on the market – Thompson-Houston, Edison, and Westinghouse.

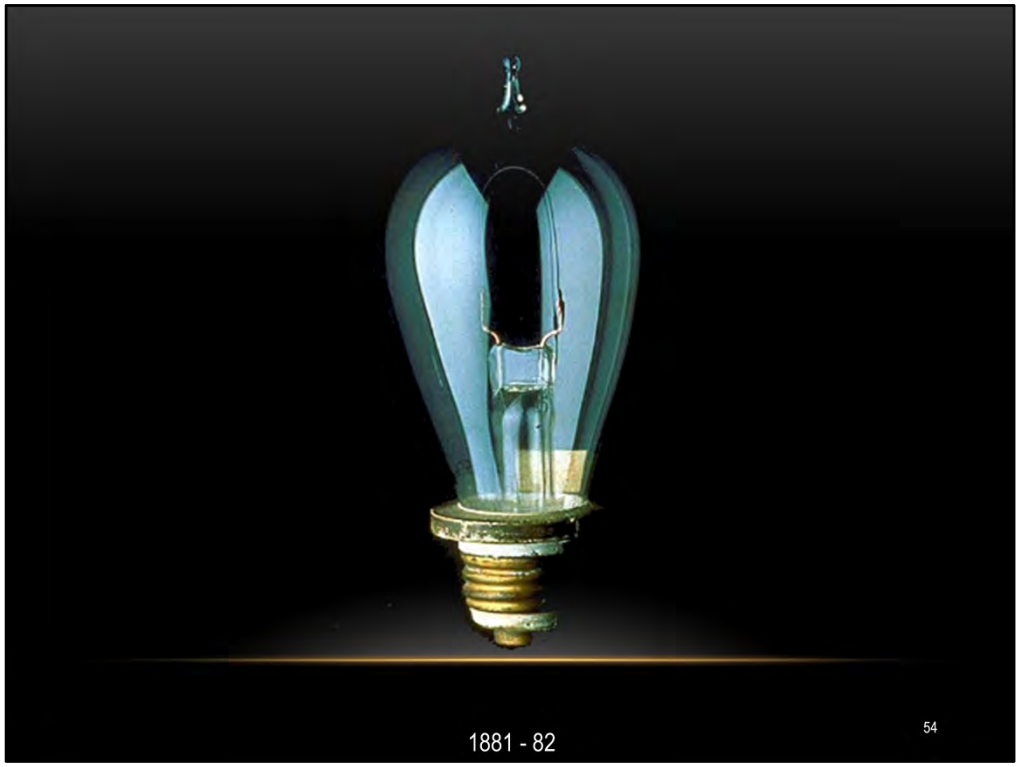


As Edison's original patents began to expire, many more companies got into the act. Just imagine the demand for this new product. The Shelby Lighting Company in Shelby, Ohio, made this bulb. They specialized in developing a longer life bulb, and, in fact, there is a Shelby bulb in California that is still burning after 100+ years! Notice that this bulb uses the Edison screw base.

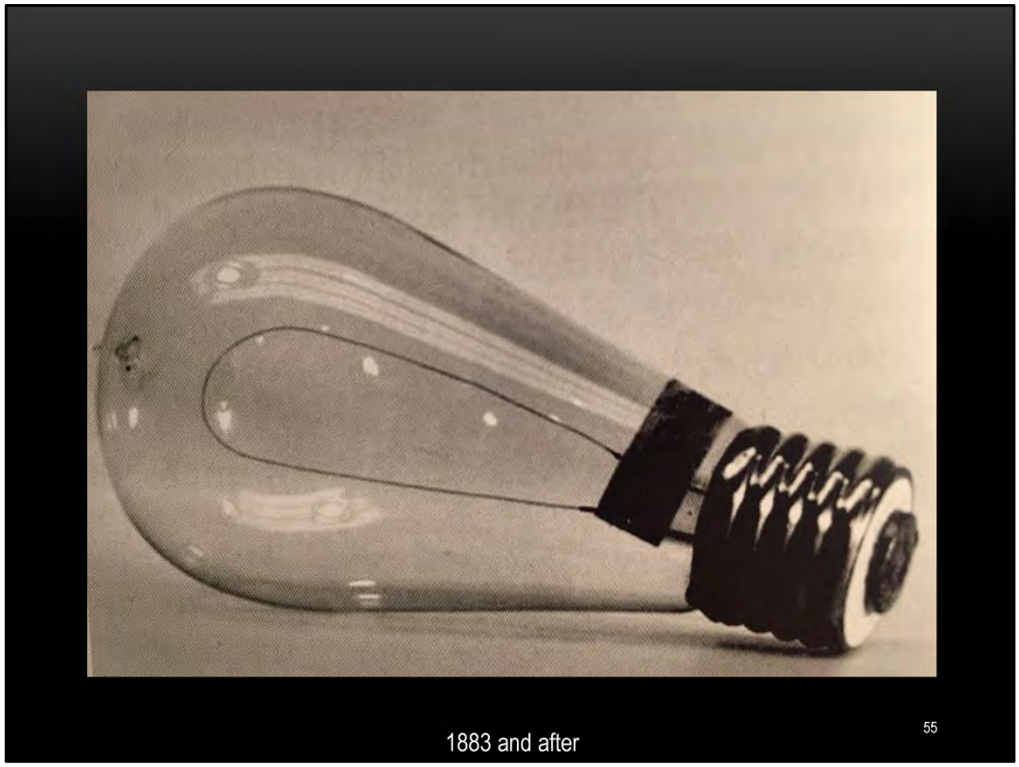
Here are a number of the bulbs and bases in use before 1900.
>>pass around examples from RDL's collection<<



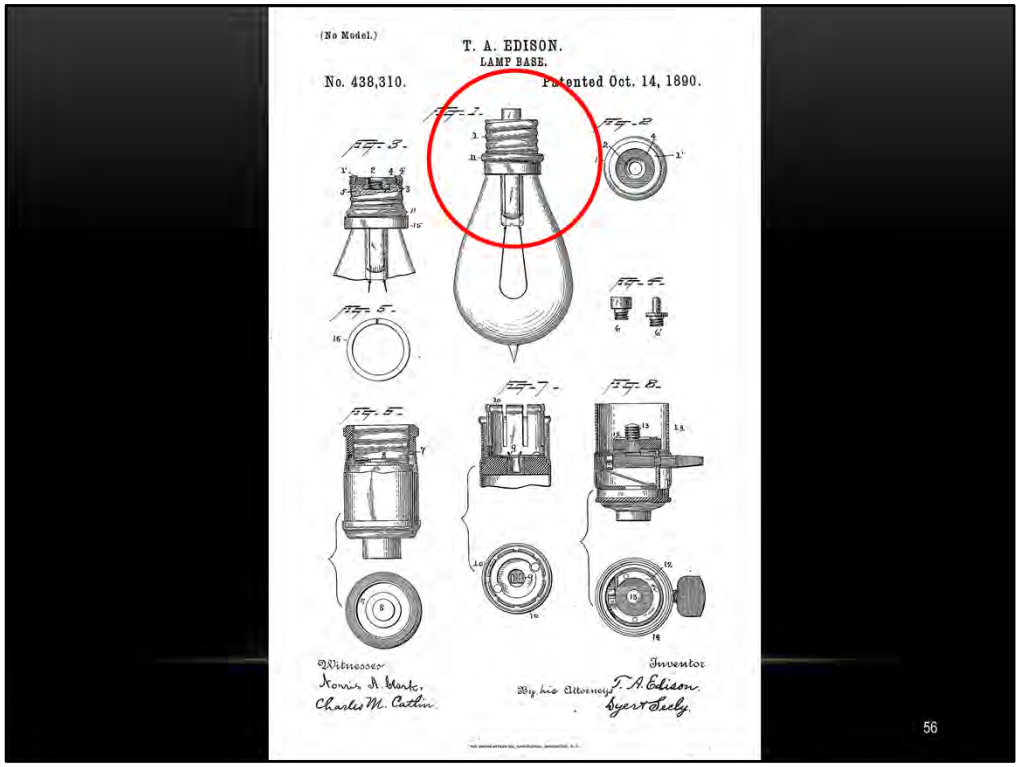
Edison continued to refine the bulb and base, with an eye towards making it sturdier and easier to manufacture.



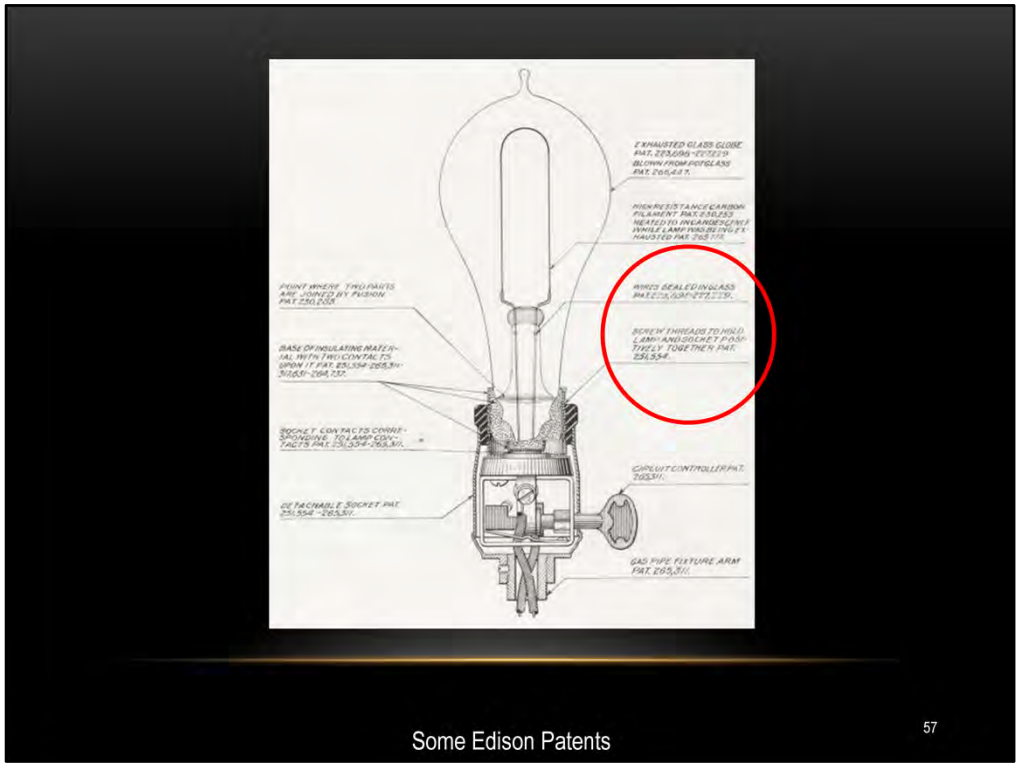
In 1881-82, the bulbs had a plaster ring that held the parts together. This was not a bad arrangement, except in damp locations, where the plaster deteriorated.



After 1883, they found a way to attach the bulb to the base without the plaster ring, and the bulbs began to take on the appearance of contemporary bulbs.



Still, there was the problem of interchangeability. In this original patent drawing for the screw base, Edison includes adapters for the other common bases of the day. Remember, he was trying to sell lighting systems, so all the products on the market had to be able to be attached to his network. During this time there were fierce legal battles over patent rights; there clearly was a huge demand for this technology and incentive to come out on top.



This drawing was part of Edison's patent defense, and it shows all the components of the lamp, base and socket he had invented. Eventually, Edison and his companies prevailed in many, but not all, of the patent wars.

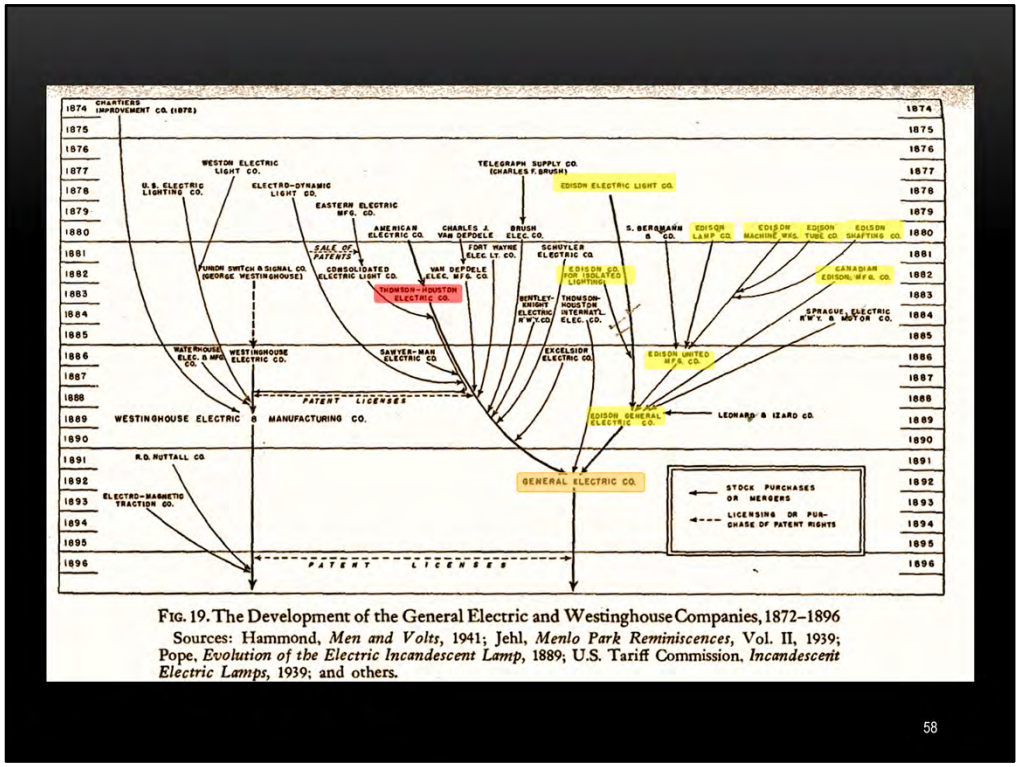


FIG. 19. The Development of the General Electric and Westinghouse Companies, 1872–1896
Sources: Hammond, *Men and Volts*, 1941; Jehl, *Menlo Park Reminiscences*, Vol. II, 1939; Pope, *Evolution of the Electric Incandescent Lamp*, 1889; U.S. Tariff Commission, *Incandescent Electric Lamps*, 1939; and others.

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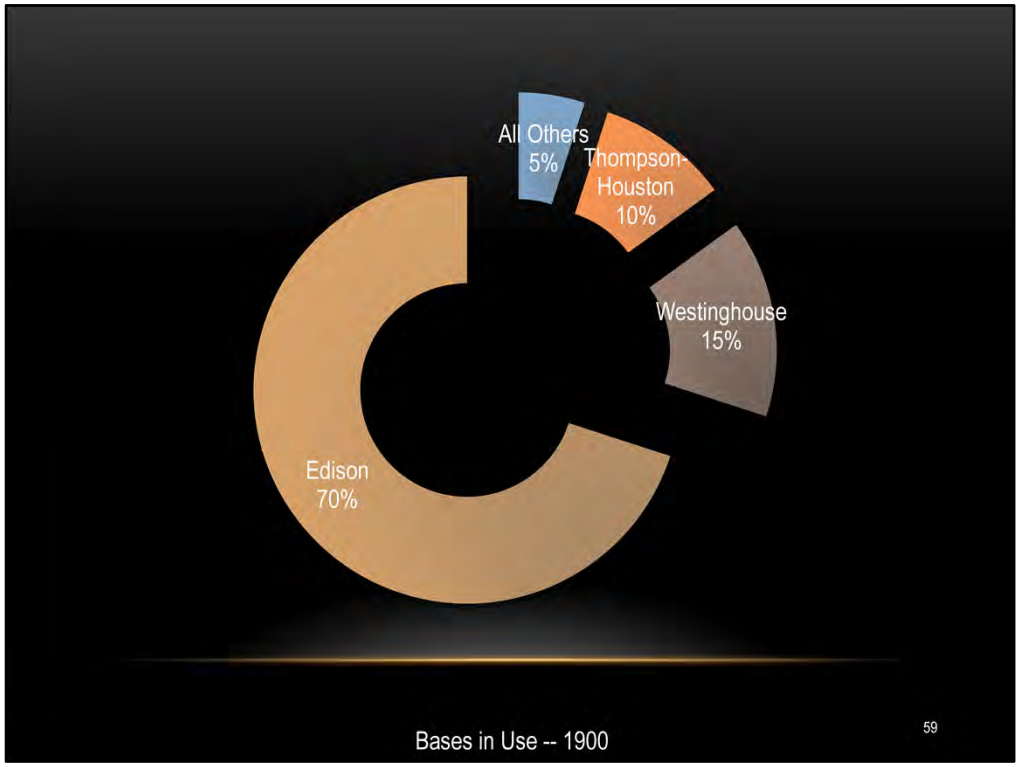
Meanwhile, the electrical lighting industry was growing by leaps and bounds. In 1889, four of the Edison companies merged to form Edison General Electric. In 1892, Edison General Electric merged with the Thomson-Houston Electric Company to form the General Electric Corporation. This merger made G.E. the leader in electric lamps in this country. That year the company employed 10,000 people and had $20 million in sales. These mergers allowed G.E. to control an enormous number of U.S. Patents on electric lamp technology.



Still, by 1900, there was no standardization of the base and socket for incandescent lights. Edison, Thompson-Houston and Westinghouse were the most common, but others were still in use, and manufacturers had to make bulbs with a variety of bases to keep up with demand.

Thompson-Houston Edison Westinghouse

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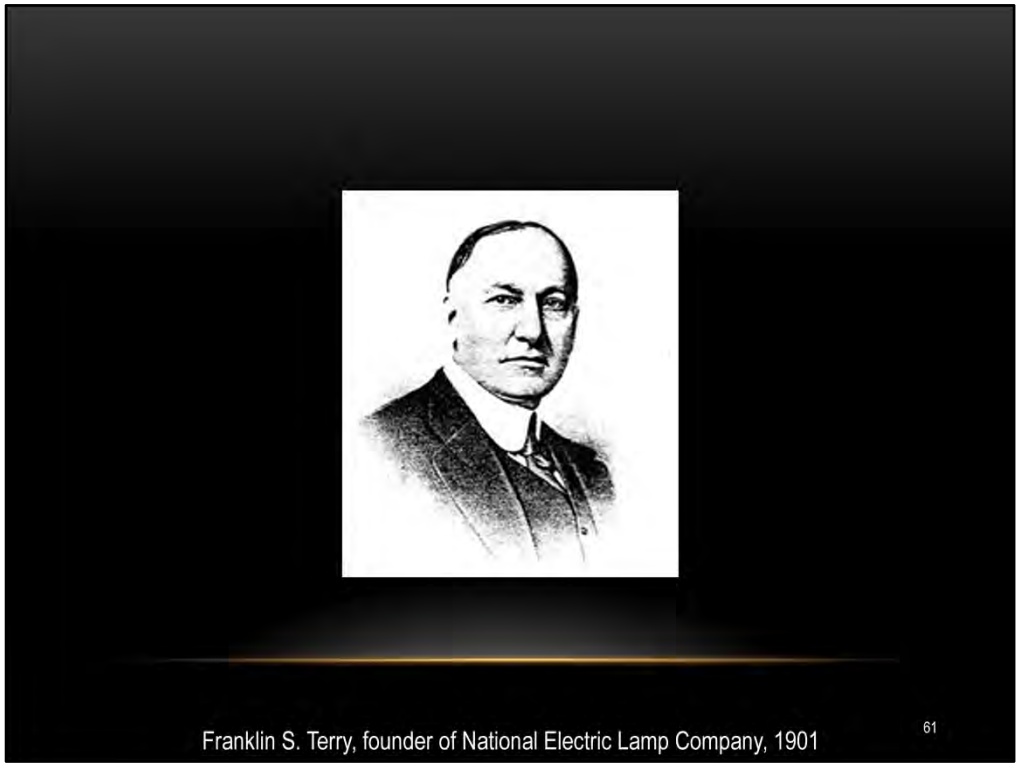
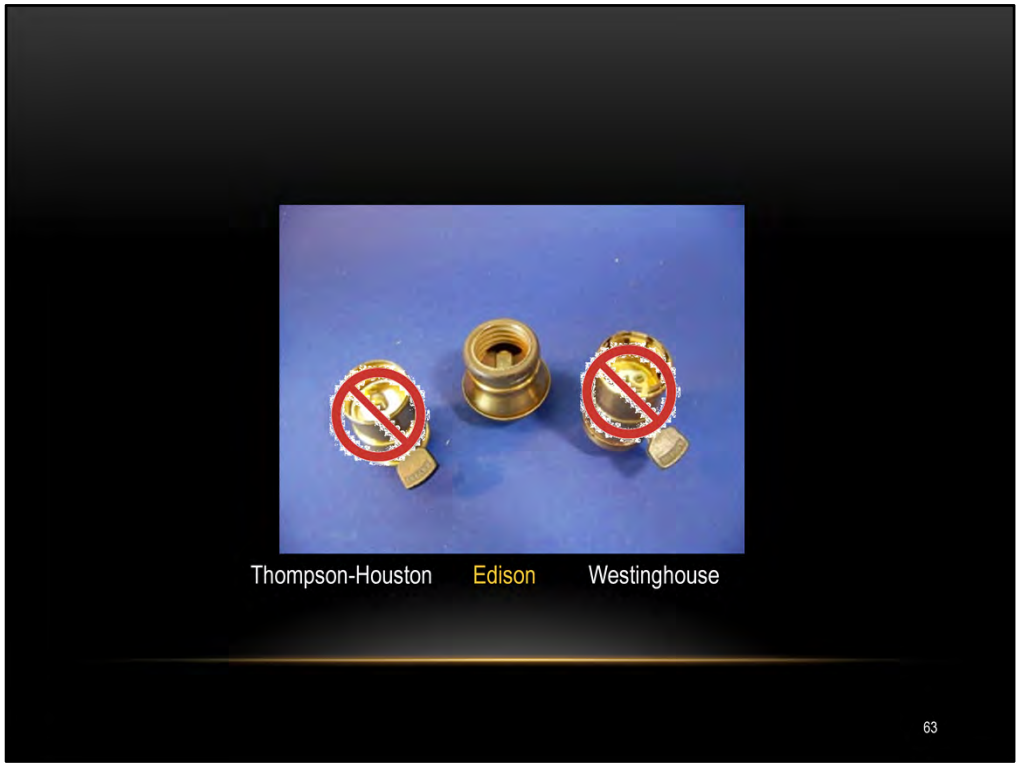


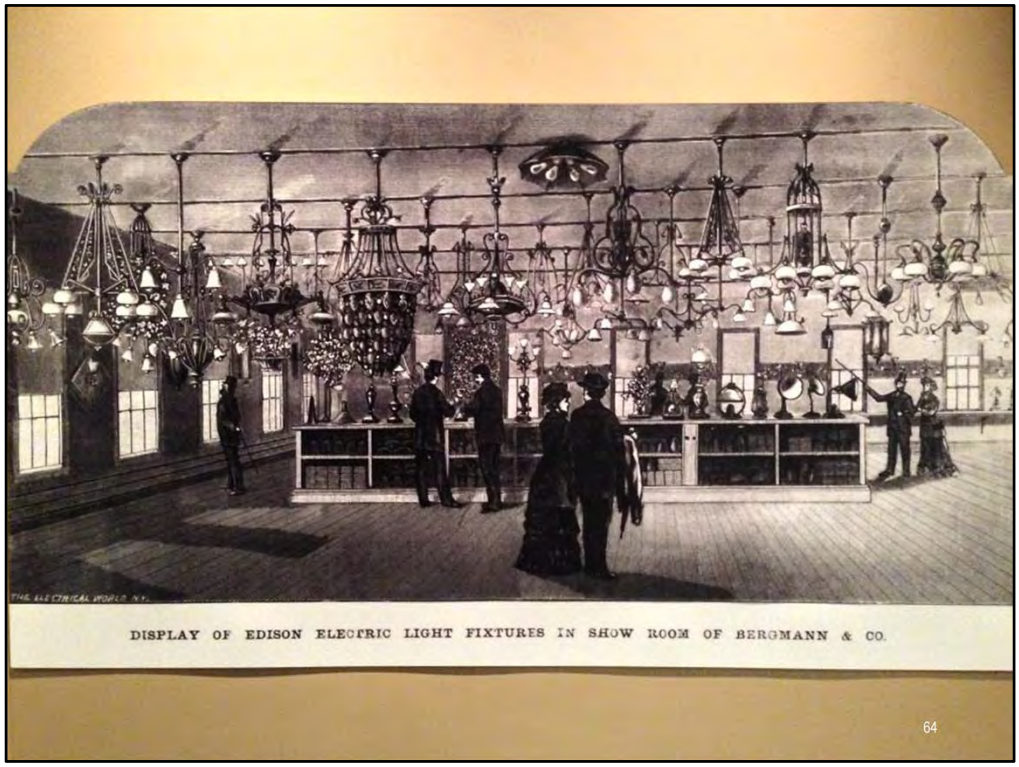
The National Electric Lamp Company was organized on May 3, 1901, by Franklin S. Terry (Sunbeam Incandescent Lamp Company), and Burton G. Tremaine, H. A. Tremaine and J. Robert Crouse (from the Fostoria Bulb and Bottle Company and the Fostoria Incandescent Lamp Company). Terry suggested that a number of smaller companies band together to operate an engineering department, conduct lamp research and development, improve manufacturing methods, and build better lamp-making machinery. He further proposed to raise capital from and share patents with General Electric. This built upon an earlier organization, the Incandescent Lamp Manufacturers Association, organized by G.E. in 1896. The new National Electric Lamp Company was a holding company in which – unknown even to many of the smaller companies' executives – G.E. held a controlling (75%) interest. In 1911, G.E.'s involvement with National became public during anti-trust proceedings. G.E. then

purchased the outstanding stock, absorbed the smaller companies and became the National Electric Lamp Association (NELA).

In 1913, NELA moved its administrative, research and manufacturing operations to NELA Park in Cleveland – one of the nation's first industrial parks. NELA Park still houses G.E.'s lighting research and educational outreach programs.

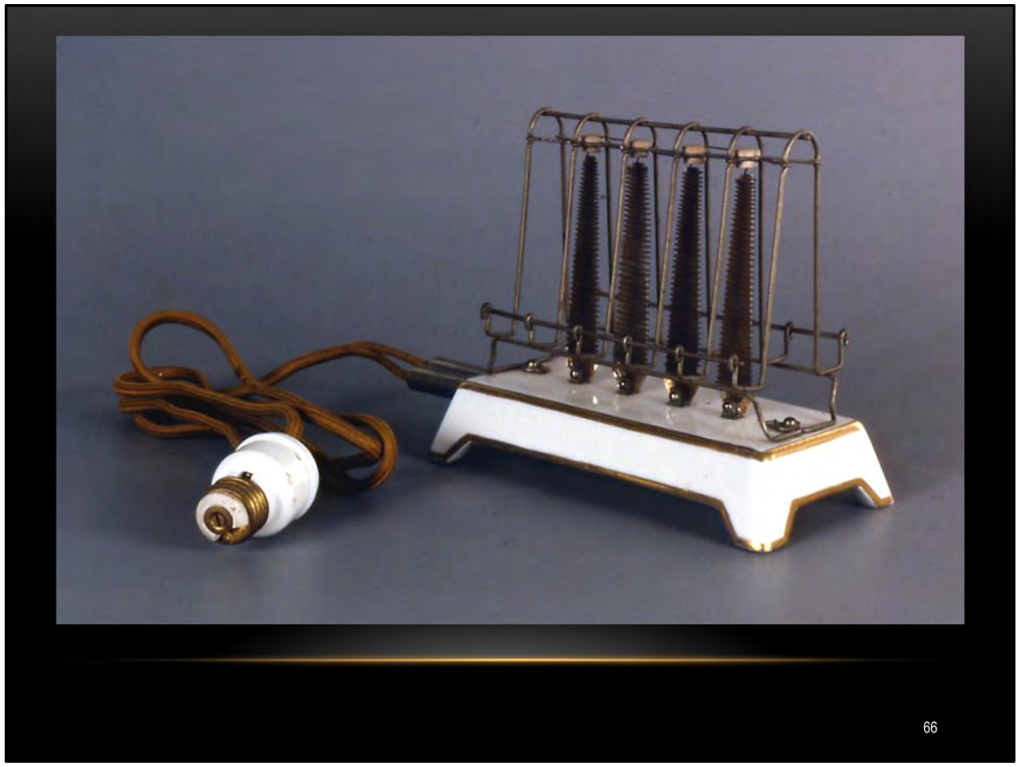


At any rate, while I was searching for a grand gesture that standardized the screw base for incandescent lighting, it appears that it may have just evolved. I never really found the definitive move that made the Edison base become the standard. It seems that after years of devious corporate competitive moves, which included price-fixing, rumors of an oil-industry-like cartel, patent sharing, expiration of patent rights, and consolidation after consolidation, the Edison screw base became the standard, at least in the United States, and many parts of Europe (England not withstanding, because of Swan, who used a bayonet base).



So, what was the consequence of standardization? Well, one would be the immediate explosion of lighting fixtures of all types and styles. With standardized bulbs available at a reasonable price from a variety of suppliers, manufacturers felt better about producing products to take advantage of the demand. New fixtures, as well as conversion kits to convert gaslights into the new electric lights, appeared everywhere. In some cases, combination gas/electric fixtures were preferred (although I can't imagine how we ever survived fixtures that included both).

Here is a photo of a gas/electric fixture at the White House. Note the extension cord from the light to a lamp on the desk. At this point, electricity was for lighting . . . there were no convenience outlets to plug things into.



Pretty soon, as more homes and businesses got connected, the demand for more and more electrical products increased. Electrical appliances began to be developed. Here is a toaster,

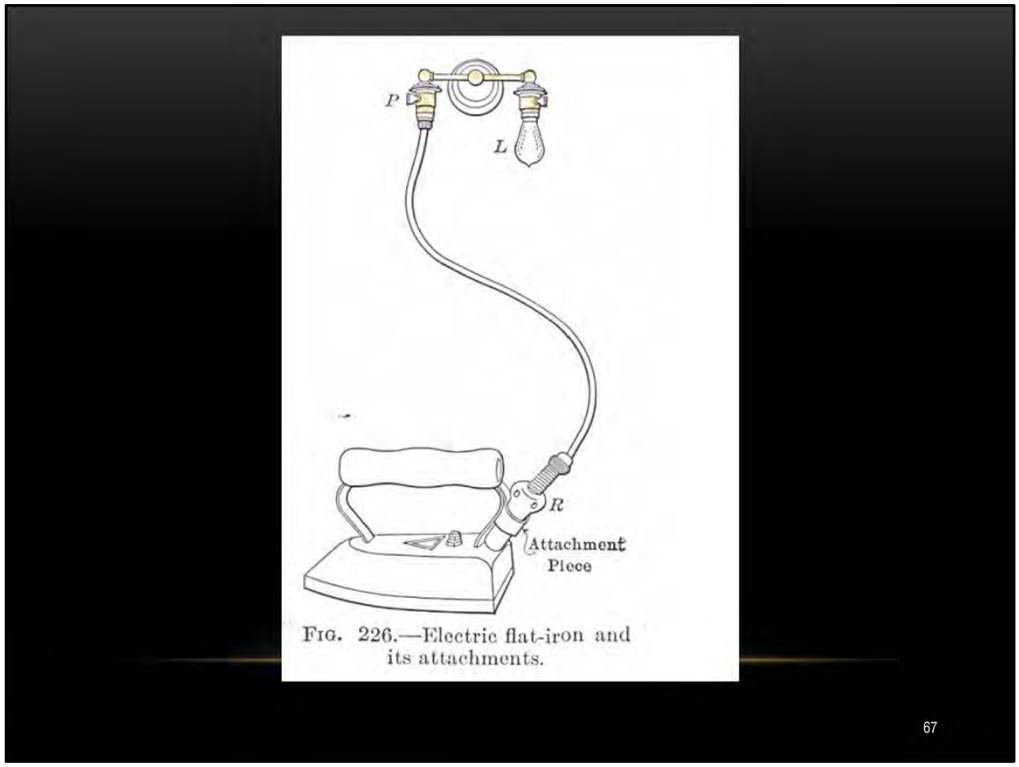
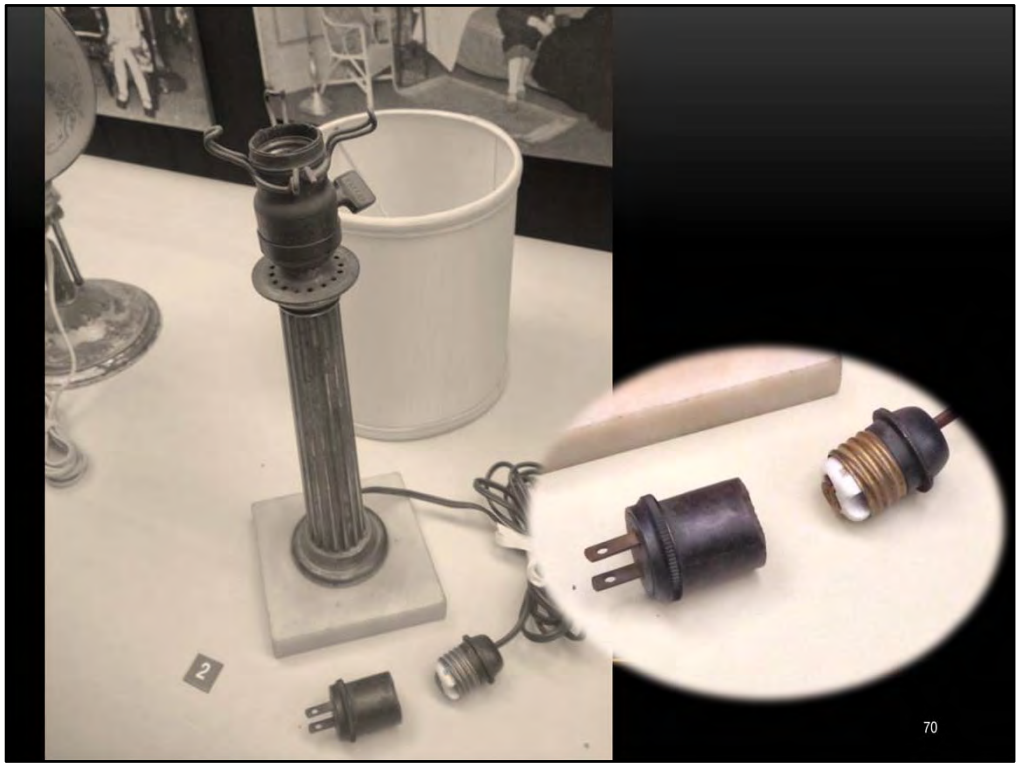


FIG. 226.—Electric flat-iron and its attachments.

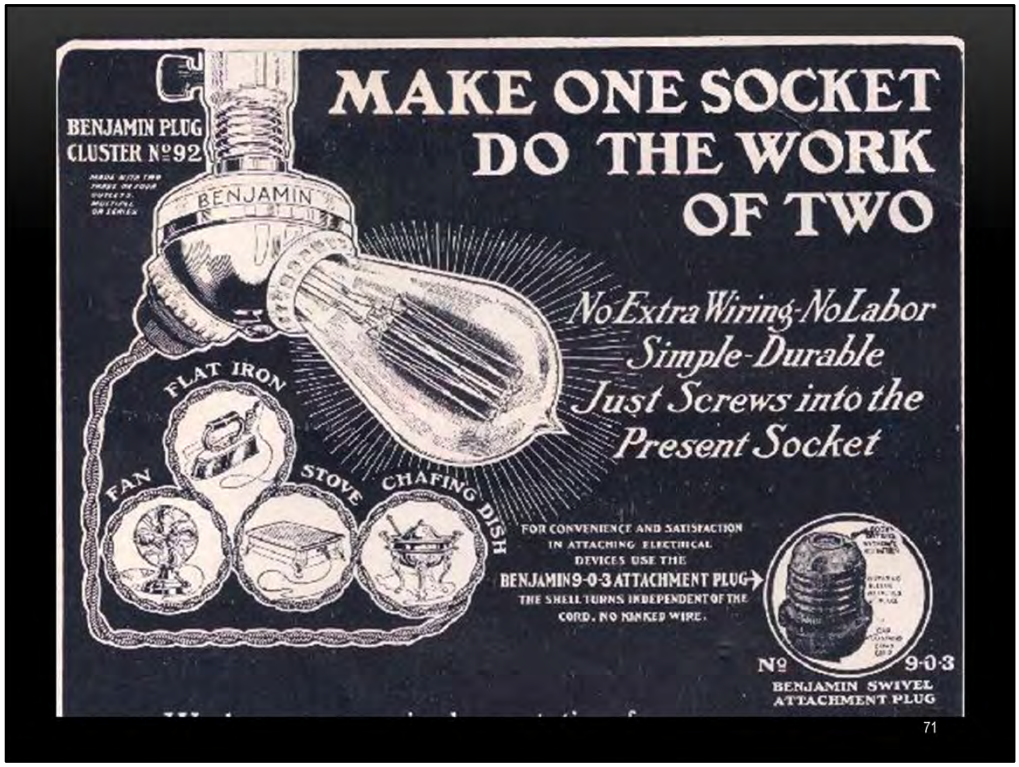
a flat iron,

a curling iron,

and even an Ohio-made vacuum cleaner – all attached to the electrical mains with an Edison screw base.

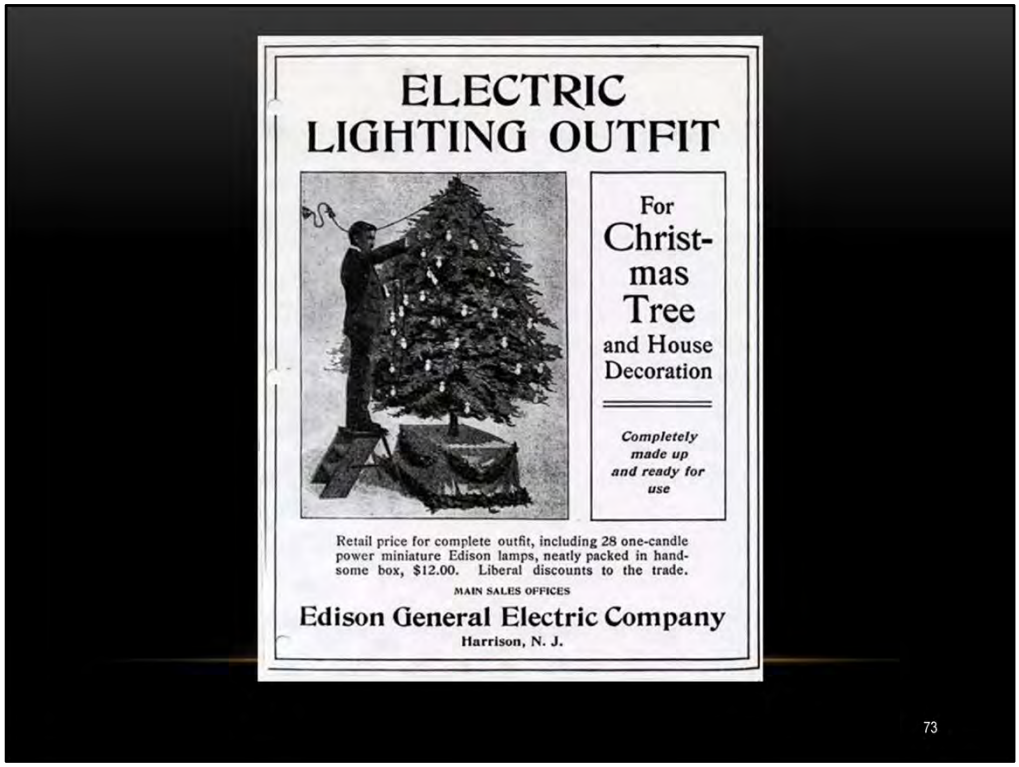


Even a bit later, when the two-blade convenience plug was developed, adapters to connect via the screw base were part of the available kit of parts.

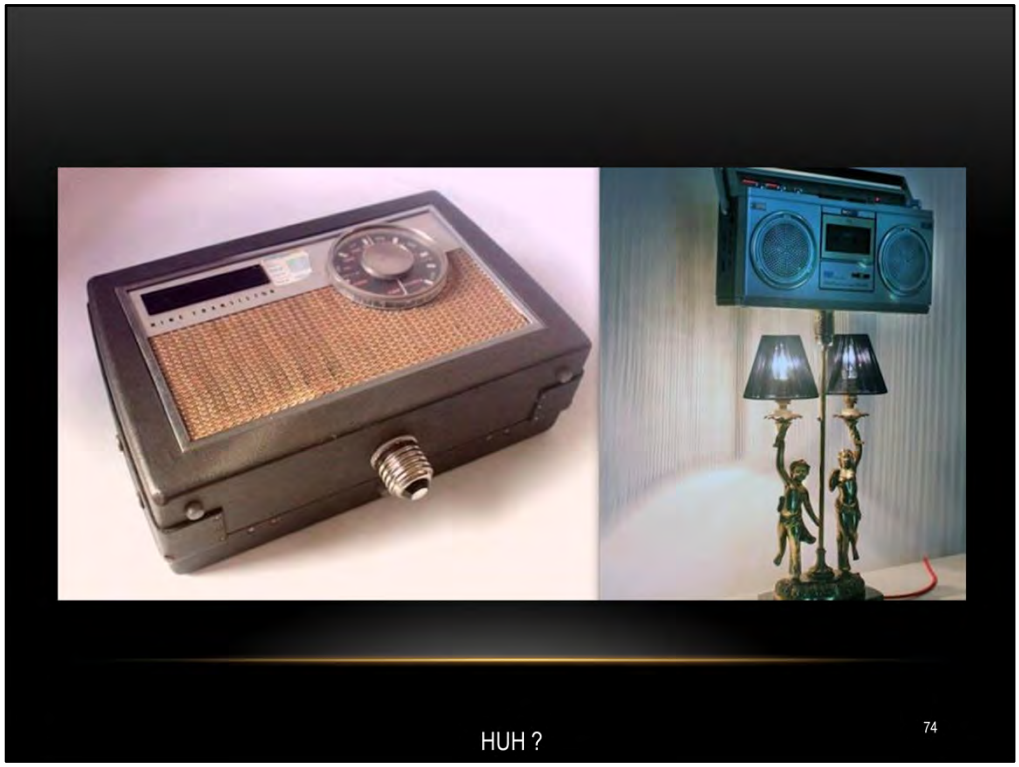


This is an early adapter to add appliances to light fixtures. Fortunately, Edison invented fuses to protect overloaded circuits!

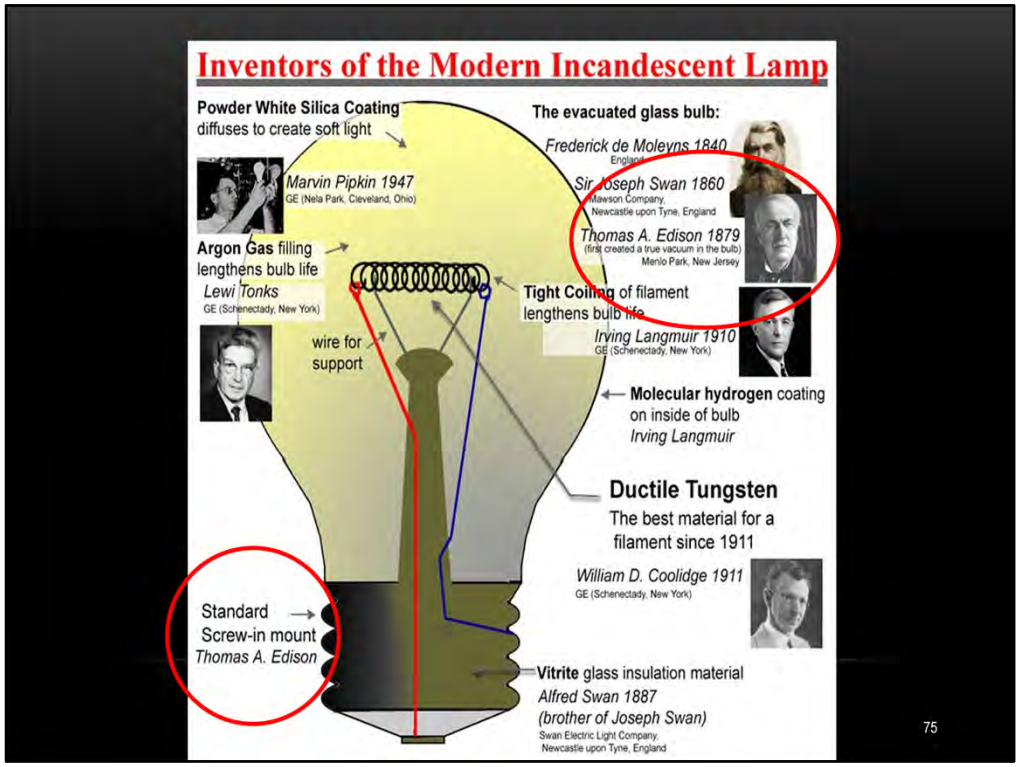
And, I'll bet most of you have one of these in a drawer at home.



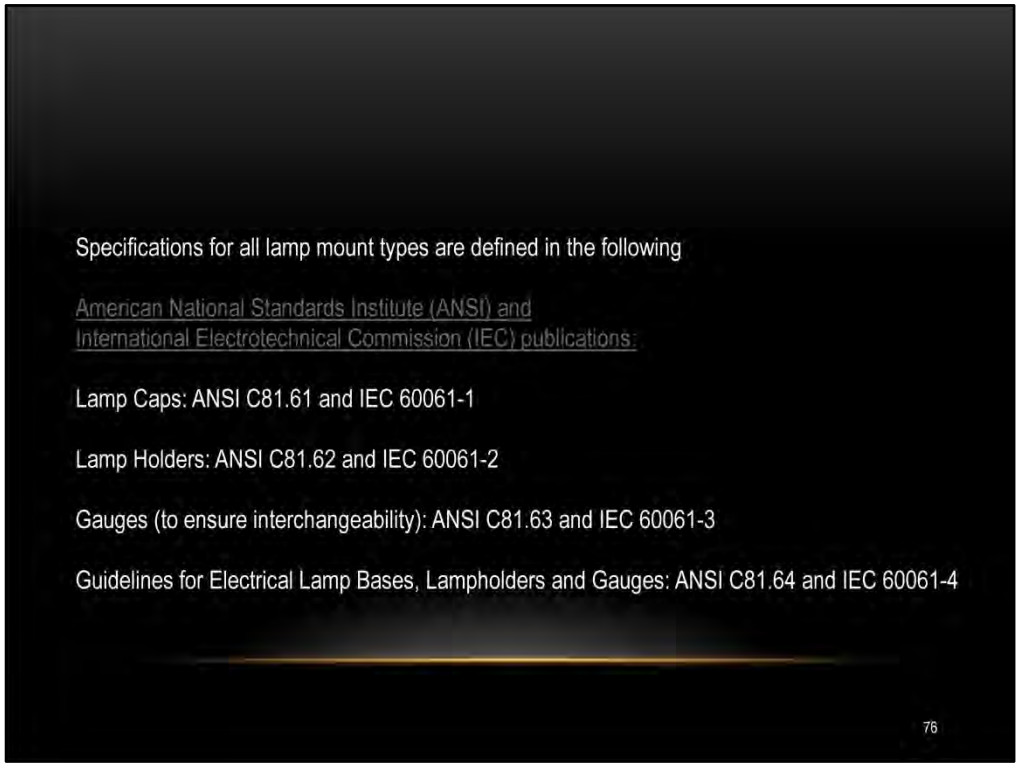
Christmas lights came on the scene very early – much safer that candles.



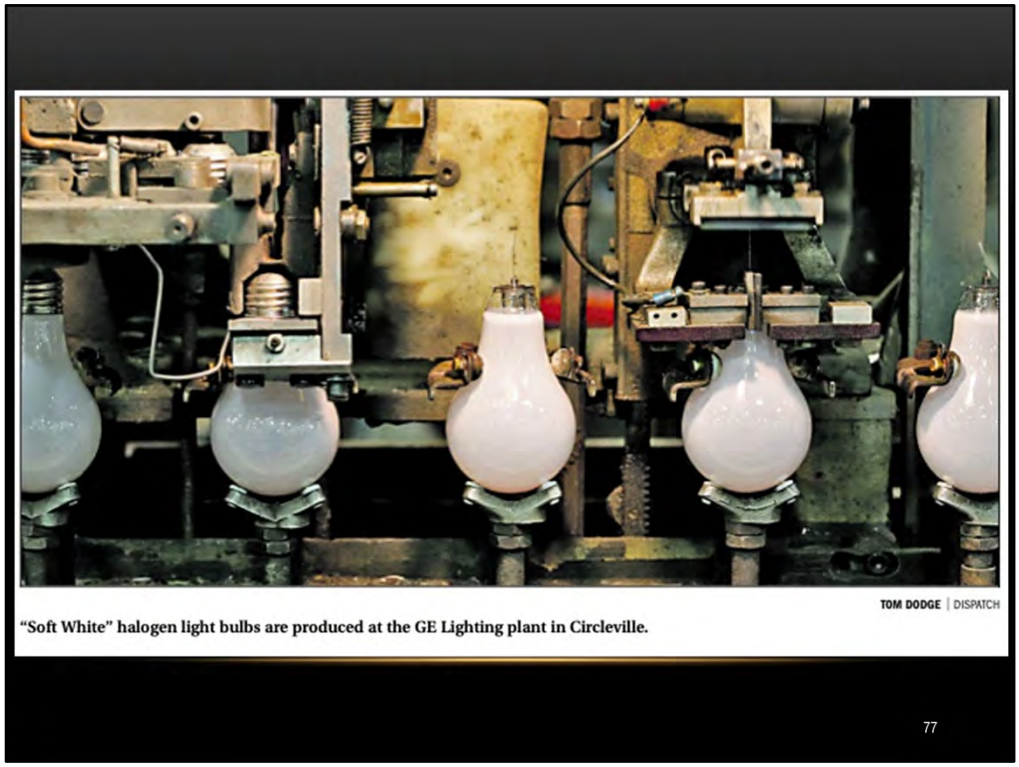
And I even found some pretty extreme examples of screw base connections during my research.



Until fairly recently, research and refinements to the incandescent light bulb have continued. Better filaments, coatings to reduce glare, eliminating the “tip” left from earlier vacuum processes, argon gas to extend the life, etc. – all have contributed to a better light bulb. However, Thomas Edison’s true vacuum bulb and his screw-in mount remain the fundamental elements of this very common product.



Today, of course, the medium screw base is specified and standardized by American and European standards agencies. Interestingly, they are slightly different, but American and European bulbs are generally interchangeable, due to Edison's adaptation of the loose thread of the kerosene can, rather than using a more precise screw thread. Until fairly recently, a G.E. plant in Providence, Rhode Island produced most American screw bases.



TOM DODGE | DISPATCH

"Soft White" halogen light bulbs are produced at the GE Lighting plant in Circleville.

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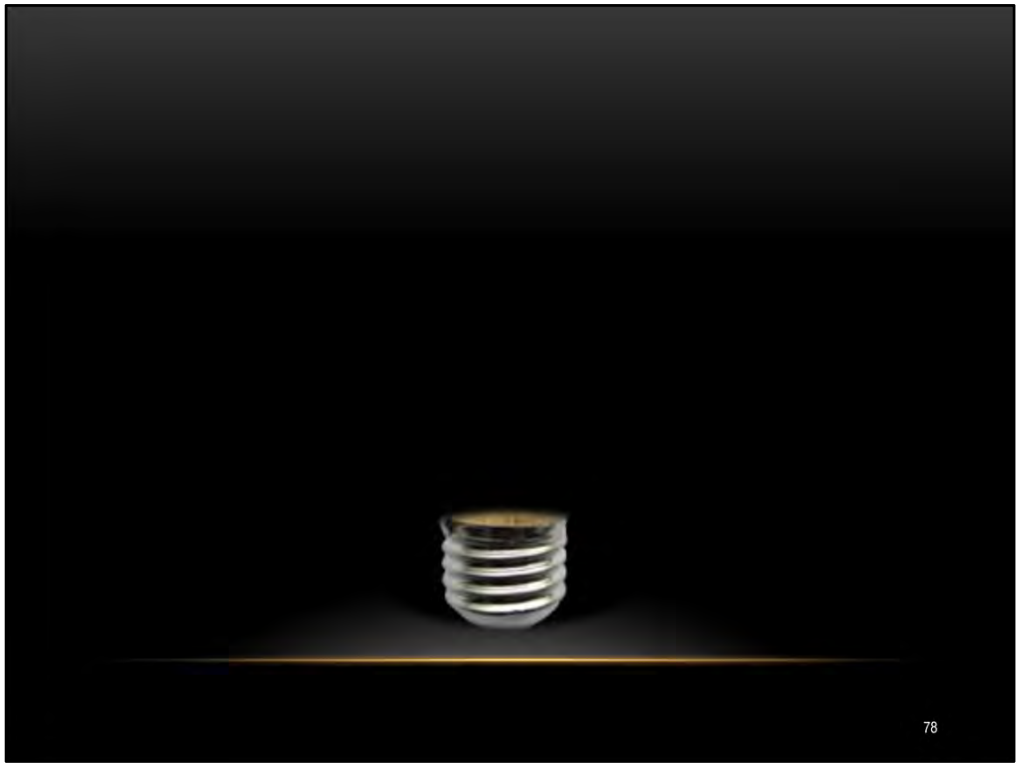
Bulbs were produced in many locations, including this assembly line in Circleville, Ohio; however, G.E. stopped making traditional incandescent bulbs in this country in 2010, in favor of more efficient light sources.



So, what was the consequence of Edison's invention of the humble little medium screw base for his light bulb?

Maybe it is overkill, but I think it is fair to say that this simple invention was a significant contribution to a practical, affordable, universal, commercial lighting system, and that that system has profoundly changed our civilization. Once artificial lights could be installed inside buildings and controlled individually by switches, we began to have complete control over our homes, factories, offices and city streets. We were no longer under the control of sunlight. Our buildings could be designed larger – every room no longer required a window – industrial plants could run around the clock – we were no longer tied to biological time. Electric lights, elevators and pumps, along with more advanced structural systems, allowed us to build taller and taller buildings. Once adequate electrical

supplies became generally available, more and more uses were developed. Domestically, this meant irons and toasters and vacuum cleaners and hair dryers. Later radio and refrigerators were added to the mix.

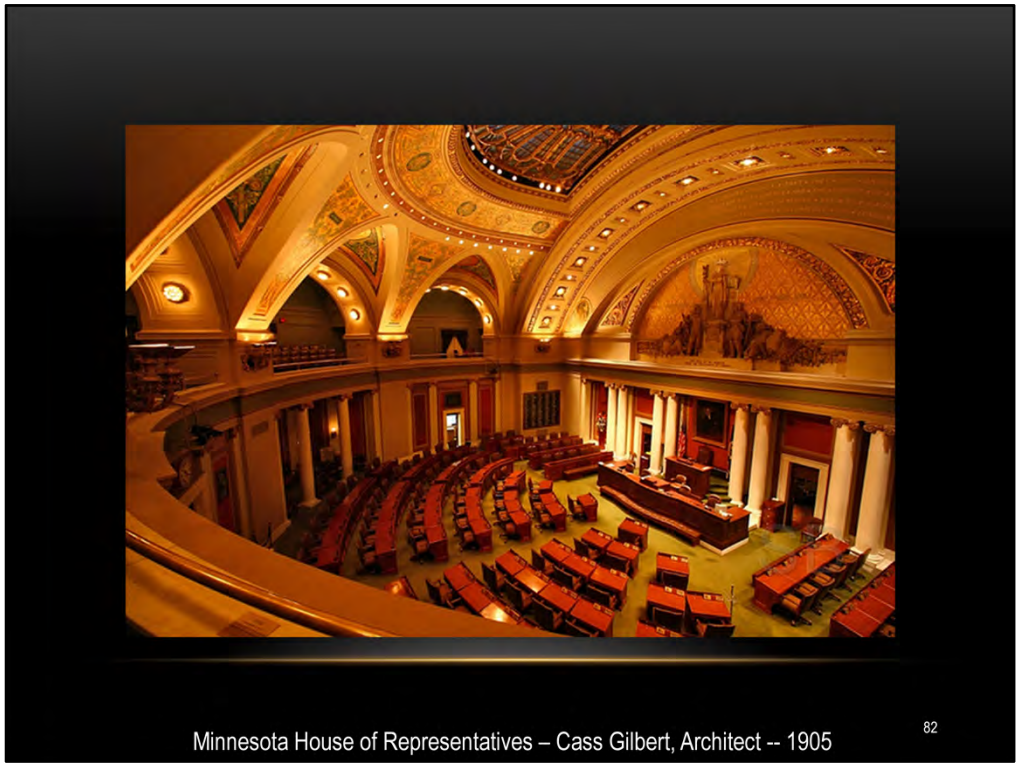
With more efficient and longer lasting light sources readily available today, we are probably at the sunset of Thomas Edison's incandescent light bulb.

But what about the medium screw base?

Here are some of the various light bulbs on the consumer market today,

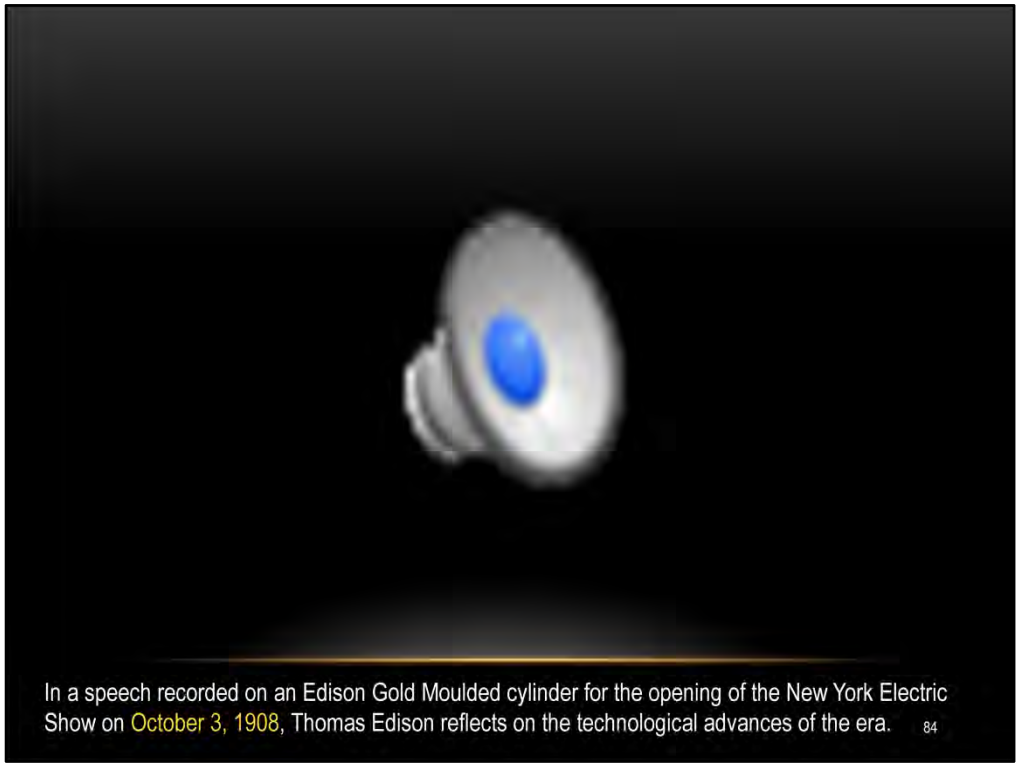
and here are some more. Almost all are attached to the electrical system with the screw base invented by Thomas Edison in 1890.

When Terry and I visited NELA Park – GE's lighting research and development laboratory in Cleveland – this year, we learned that almost all lighting research and development is being concentrated on Light Emitting Diodes – LEDs. This relatively new lighting source, that can be dimmed, that can be colored at will, and which burns brightly for a very long time while consuming very little energy, is, no doubt, the wave of the future of the lighting industry.



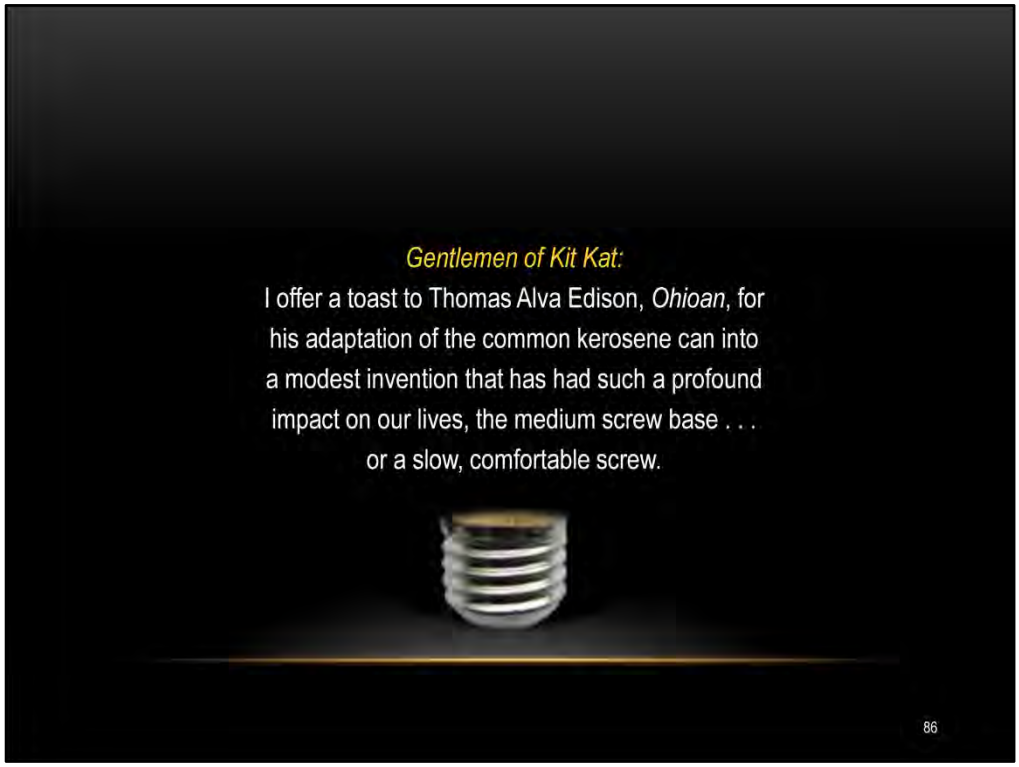
Along with our friends at Hammel, Green and Abrahamson Architects, we are currently creating a 21st century lighting plan as part of the restoration of the 1905 Cass Gilbert-designed Minnesota State Capitol – a virtual celebration of the incandescent light – using the new LED light sources with –

you guessed it – Edison's medium screw base. As incandescent light bulbs are gradually replaced by these more efficient light sources, we see consumer bulbs continue to be developed with the Edison screw base. Why? Because it is convenient and we are used to it.



I'd like to end with these remarks made by Thomas Edison in 1908 and recorded on the phonograph he invented.

Before you is a special cocktail prepared for us by the Club. Please grab it and join me:



I offer a toast to Thomas Alva Edison – Ohioan – for his adaptation of the common kerosene can into a modest invention that has had such a profound impact on our lives, the medium screw base . . . or a slow comfortable screw.


A SLOW COMFORTABLE SCREW
A Kit Kat Essay
Bob Loversidge
February 17, 2015

Thank you.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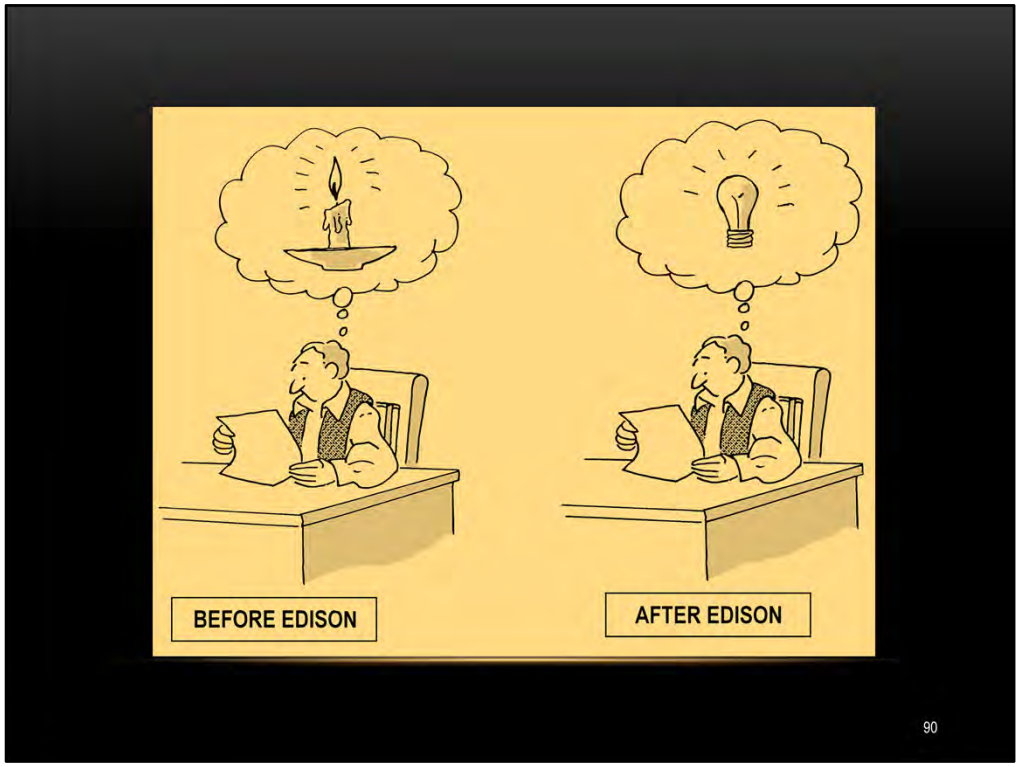
BEFORE EDISON
AFTER EDISON
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In a speech recorded on an Edison Gold Moulded cylinder for the opening of the New York Electric Show on October 3, 1908, Thomas Edison reflects on the technological advances of the era.

"Ladies and Gentleman, those of us who began our lab labors at the operators key 50 years ago have been presented to see and assist in the whole modern industrial development of electricity. Since the remarkable experiments of Morse in 1844 and the unsuccessful efforts of Field in 1858 there have come with incredible rapidity one electrical art after another, so that in practically every respect civilization has been revolutionized. It is still too early to stand outside these events and pronounce final judgment on their lasting value. But we may surely entertain the belief that the last half of the 19th century was as distinct in its electrical inventions and the results as the first half was in relation to speed. When I look around at the resources of the electrical field today, I feel that I would be glad to begin again my work as an electrician and inventor. And we veterans can only urge upon our successors, the younger followers of Franklin and of Kelvin, to realize the measure of their opportunities and arise to the heights of their responsibilities in this day of electricity."