Gas from Gasoline

H. W. Ebendorf

Foreword

When the history of our time is written, the last 100 years surely will be recorded as a period of tremendous change. Earlier discoveries fueled the automobile age of the present century. Man learned how to fly. Electricity and electronics brought forth an infinite stream of inventions. These and other major discoveries have left little room for the more mundane accomplishments of inventors and innovators. Still, in their way and in their time many of these transitory achievements brought comfort, convenience and even cheer to those who experienced them.

Gas from Gasoline is an attempt to recognize the part played by those who found ways to utilize volatile but controllable hydrocarbons for light. The record is incomplete. Only glimpses are captured from old patents, the sales literature and advertisements of companies long gone from the business scene, the pages of *Scientific American* magazine and the assistance of those who collect lighting facts and artifacts for the satisfaction they derive from sharing their discoveries.

This then is offered as a beginning to further study of gas-from-gasoline lighting. Comments, criticism and suggestions are welcome.

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Gas from Gasoline

—a footnote to the history of lighting in the United States and Canada

by H. W. Ebendorf

"The peculiar feature of the gas lamp of Dr. Auer von Welsbach consists in the incandescence of certain metallic salts placed in the middle of the flame of a Bunsen burner."[1]

It was in this manner that *Scientific American* introduced its readers to an invention destined to have far-reaching and enduring effects on the history of illumination.

The principle of the incandescent mantle was not new. Readers were reminded the Welsbach mantle was the same as that in the Clamond lamp in which the incandescent substance was a little thimble of magnesia threads.

Dr. Auer had gone a step farther. He had taken an ordinary Bunsen burner and had suspended above it a hood of cotton or woolen material. The hood, which later would be identified as the Welsbach mantle, was about 6 or 7 centimeters in height and fastened at the bottom by a platinum thread. As soon as the burner was lighted the hood or mantle, which previously had been washed in a preparation of mineral salts, came aglow with a whitish blue light said to be remarkable for its steadiness and intensity.

Two months later *Scientific American*[2] would report that the Welsbach system of gas lighting had been demonstrated successfully at the Marlborough Picture Gallery in London. The Welsbach mantle lamps were screwed onto the gallery's ordinary gas fittings where, it was said, "they emitted a white and brilliant light resembling somewhat that of an incandescent electric lamp."

Dr. Auer had begun work in the field of incandescent gas lighting in 1880 at the Bunsen laboratory in Heidelberg. He obtained a patent on his mantle in 1885 but several years would elapse before he would settle upon a solution of 99 percent thorium oxide and 1 percent cerium oxide as the combination which would give the best light.

If the Welsbach invention would seem to be linked irrevocably to the Gay Nineties, its importance, although overshadowed by the excitement which attended the early days of Edison's incandescent lamp, proved to be of lasting significance. The principles which guided the development of the burner and the incandescent mantle are far from being obsolete. Operable hydrocarbon mantle lamps and lanterns, whether used for pleasure, emergency or decoration, today number in the millions.

The significance of the mantle and burner combination was not overlooked. In the years between 1892 and 1900 more than 2,400 patents on lighting devices were issued by the U.S. Patent Office. While this number included patents on electric and acetylene lamps, many applied to devices which were equipped with mantles and were fueled by kerosene, gasoline and other petroleum derivatives.

There were good reasons for this flurry of inventiveness. For the most part, availability of coal gas and electricity was limited to metropolitan areas. It was evident that it would take years for these two forms of energy to reach the smaller cities, towns and suburban areas.

Despite the physical limitations inherent in turn-of-the-century electric and manufactured gas lighting, the fact that they represented progress and a higher standard of living was not lost on the general public. The search for alternatives was on in earnest.

Although kerosene was plentiful and the kerosene-burning wick lamps of the period had reached new heights of utility and style, attention was more and more turning to gasoline as an illuminating fuel.

That gas vapor could be made from gasoline and had properties similar to gas made from coal was well recognized. The same could be said for acetylene, a gas produced by adding water to calcium carbide. The question was how best to produce and utilize these alternate fuels.

One approach was the gas-from-gasoline machines of the 1880s.

The early gas machine was a formidable contrivance. A typical machine included a large fuel tank, an air compression apparatus, an evaporating chamber (usually buried in the ground) and a system of metal pipes about 1½ inches in diameter to which were attached a varying number of light fixtures. The entire system might weigh over a ton and, in some instances required construction of a separate building with a tower to accommodate the air compressor. The tower enclosed a huge weight which was cranked by hand to the top and then slowly lowered by gravity thus activating the air pump. The illuminating vapor produced by mixing air and gasoline in the evaporator produced what was called "carbureted air gas" and was fed at low pressure through the pipes which led to the lighting fixtures.

Carbureted or "air gas" was said to burn with a rich, bright flame, fully equal to coal gas, and much superior to that ordinarily supplied by city gas companies. It was claimed further that carbureted gas was "remarkably pure, with no sulphurous compounds or impurities, and with proper burners, was without smoke or odor."

As to the cost, it was claimed that with gasoline at 14 to 20 cents a gallon, six gallons of fluid would produce light and heat equal to that from a thousand feet of ordinary coal gas.

Carbureted gas in a proportion of 15 percent vapor to 85 percent air could be piped to flat flame burners of the type common to most coal gas fixtures in use in the late 1880s. In this application each burner consumed about four feet of gas per hour and gave off four candles per foot of gas. When a Welsbach burner and vertical mantle combination was used, a light of 16 foot candles for each cubic foot of gas was claimed.

Whether the cost comparison is accurate may be a matter for conjecture, but there is no denying that the introduction

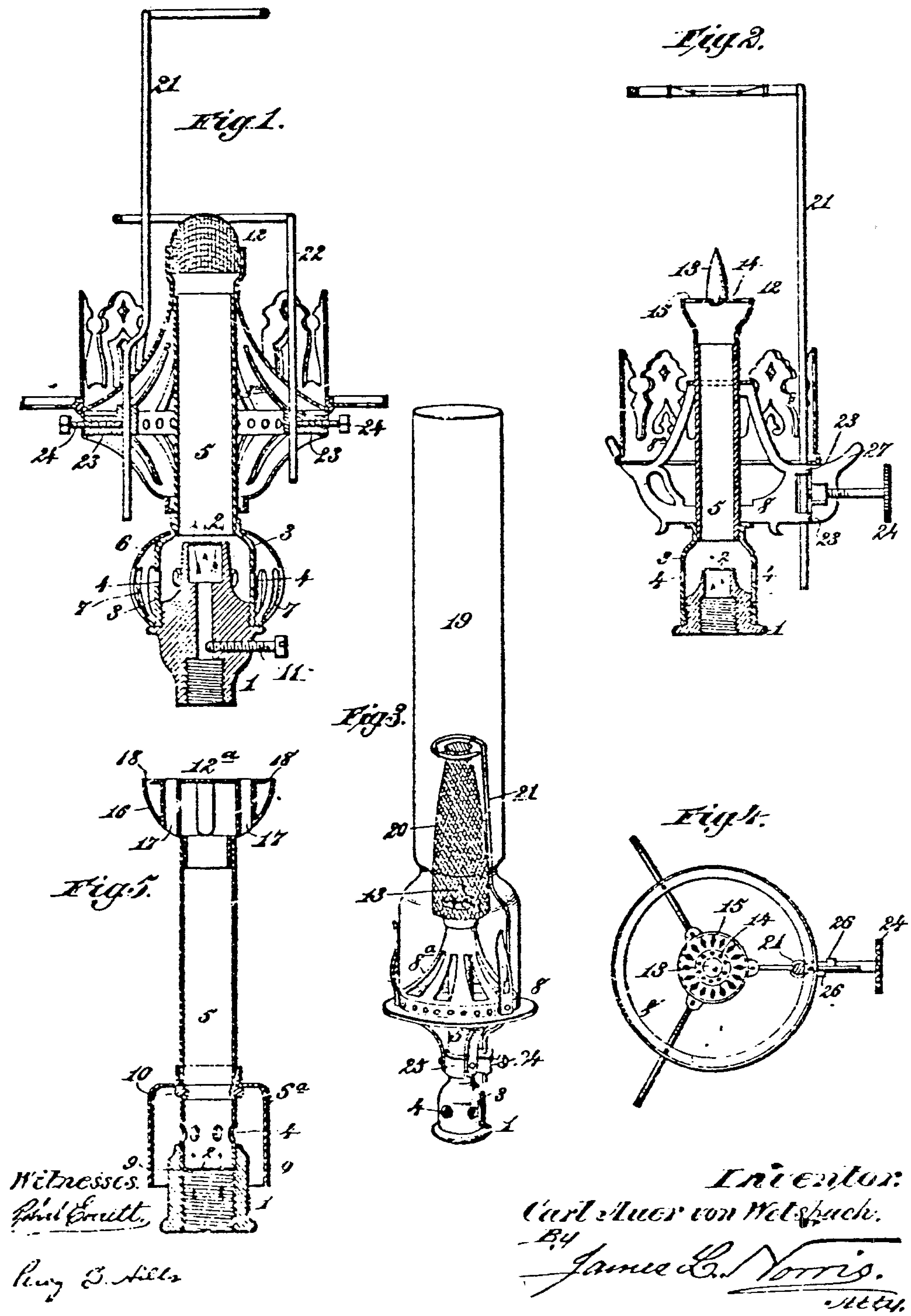
[1] "Incandescent Burner" — Dr. Auer Von Welsbach, *Scientific American*, Jan. 15, 1887.

[2] "An Improved System of Lighting" *Scientific American*, Mar. 5, 1887.

C. A. VON WELSBACH.

INCANDESCENT GAS LAMP.

No. 409.530. Patented Aug. 20, 1889.



NOTES: Figures 1 and 2 are sectional elevations. Fig. 3 (center) side elevation of lamp with chimney and mantle in position. Fig. 4, burner as shown in Figs. 1 and 2. Fig. 5 a modified burner in vertical section. Welsbach lamp was patented in Great Britain July 28, 1886, Patent No. 9,755.

of the mantle greatly reduced fuel consumption while improving the amount of light given off.

Among the companies specializing in the sale and installation of the ponderous gas machines of the late 1880s were Gilbert & Barker, Springfield, Massachusetts; Denny Bros. Imperial Gas Machine Co., New York City, the Bolte-Weyer Company of Chicago; C.M. Kemp Manufacturing Co., Baltimore, Maryland; and Ransom Gas Machine Co. of New Jersey.

Installations, which are believed to have numbered in the thousands, were generally custom designed for commercial establishments, public buildings, resort hotels and for the country estates of the wealthy.

A booklet entitled "How Best to Light Our Country Homes and Resorts" published by Gilbert & Barker, contains nearly 70 pages of testimonial letters from satisfied users of the manufacturer's Springfield Gas Machines, some of which were said to have been in use as far back as 1886.

The demise of the carbureted gas machines has been attributed to the spread of electric service and, to a lesser degree, the more wide-spread availability of manufactured and natural gas. Yet another factor may have been problems encountered through improper installation of the conduits and connections. Some supply lines were actually fabricated of sheet metal, a practice which may have given rise to the description "gutter pipe system."

Acetylene lighting systems which became fairly popular early in the twentieth century also came in for criticism due to improper installation and operation.

Concurrent with the development of the early gas machines, inventors on both sides of the Atlantic were experimenting with many diverse oils including crude and refined petroleum, various solvents, vegetable oils, even waste lubricating oils.

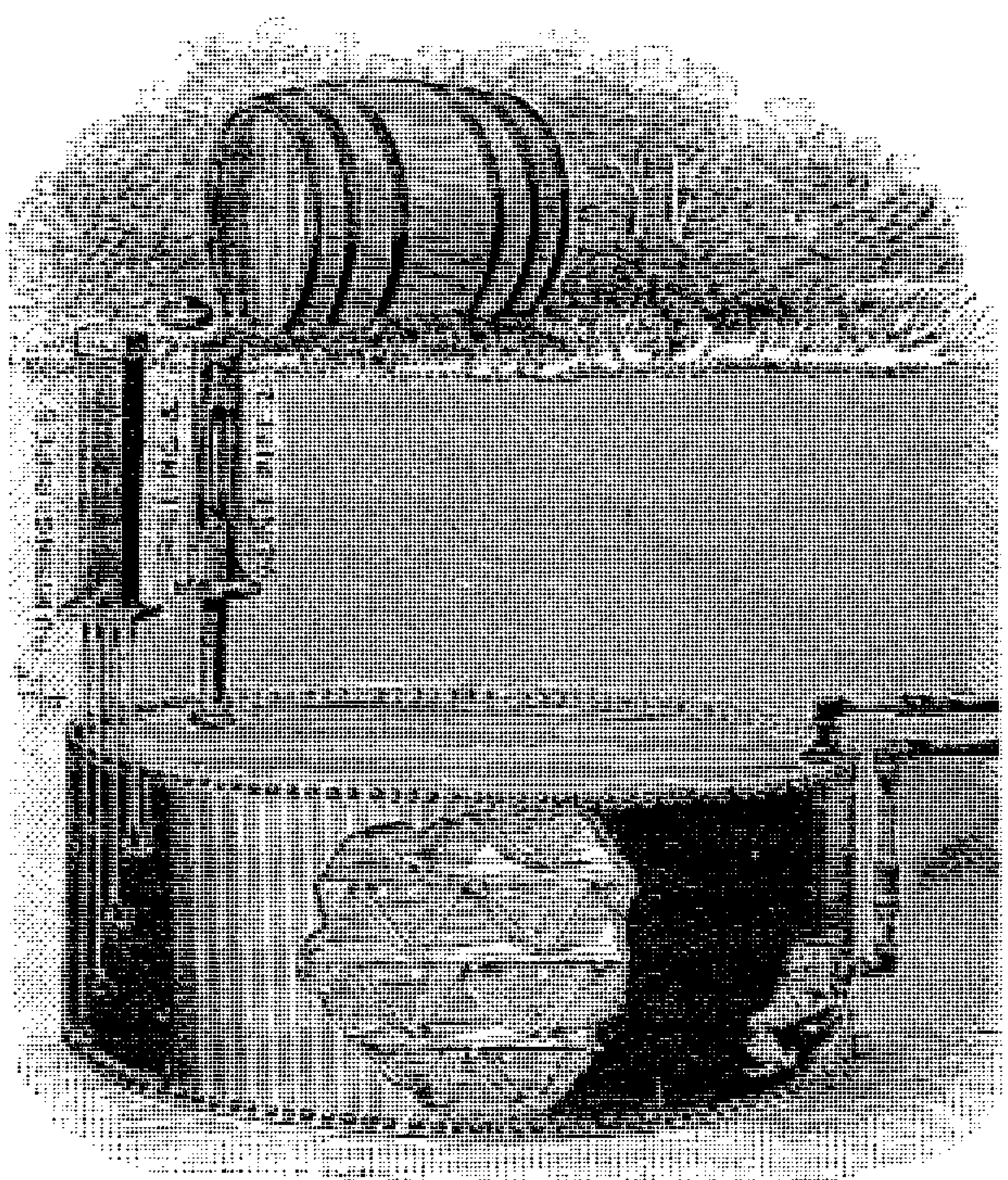
A classic example of the time was the Lucigen lamp[1] of two English inventors, Hannay and Lyle. It was based on the atomizing of combustible liquids by means of a current of compressed air. Heavy oil was forced through a burner where it was heated, thus producing a vapor. The result was broad, luminous flame which, it was said, might aptly be called "a plume of fire." The Lucigen was used primarily to illuminate outdoor areas and for this purpose was mounted on a steel pole or tripod 20 feet or more above the ground.

About the same time there was patented, first in France and then in the United States, the Seigle-Goujon lamp.[2] Although somewhat smaller than the Lucigen, the Seigle-Goujon lamps also relied upon a luminous flame rather than a mantle.

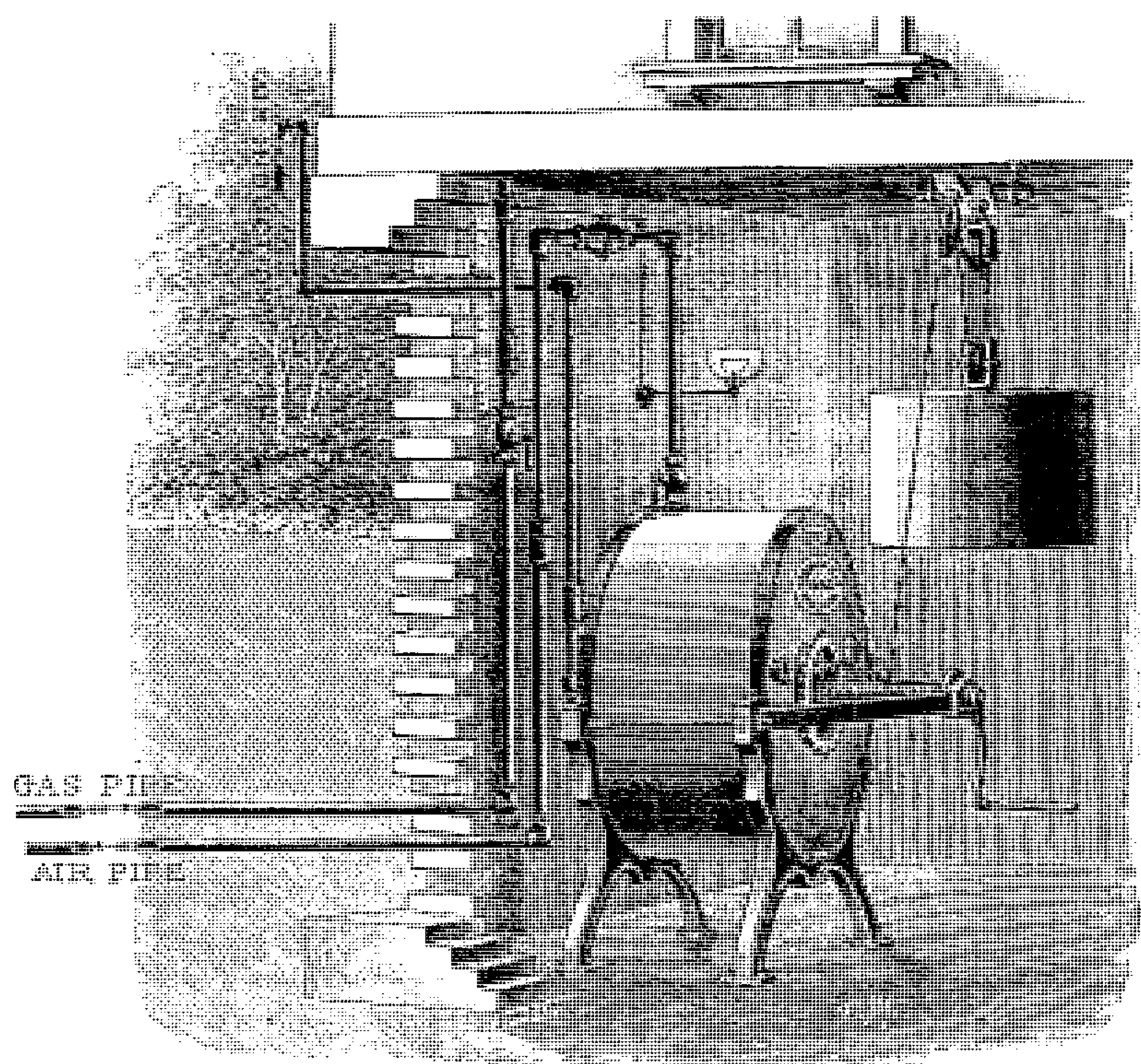
The impact of the Welsbach invention and the lighter weight burning oils, especially gasoline, undoubtedly influenced the development in the 1890s of gravity-type mantle lamps.

Some gravity lamps were made to be hung from the ceiling; others were of the table lamp variety with the student lamp being a particular favorite. Still others were pole-mounted and were for lighting streets and barn lots. Most burned gasoline but some were fueled with kerosene and a few were advertised as dual-fuel lamps. Common to all was a vaporizing device or generator, a burner, an incandescent mantle, a chimney, globe or shade, and a fuel reservoir mounted above the burner. There was no pressurization, and while these gravity fed lamps gave off a

[1]"The Lucigen" — *Scientific American*, p. 147, Sept. 8, 1888.
[2]"Vapor Burner" — Seigle-Goujon, U.S. Patent No. 439,307, Oct. 28, 1880.

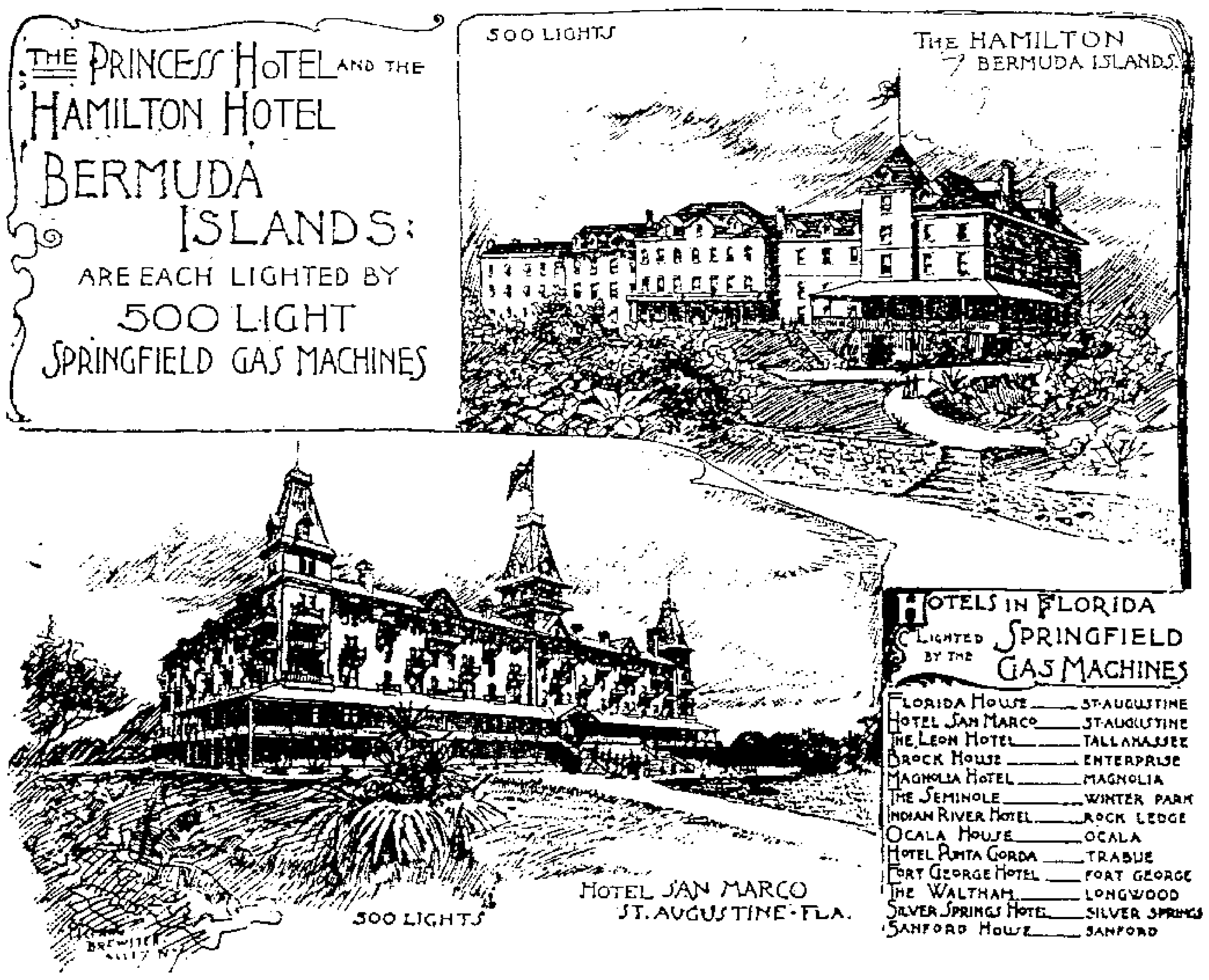


GAS GENERATOR—PLATE NO. I.

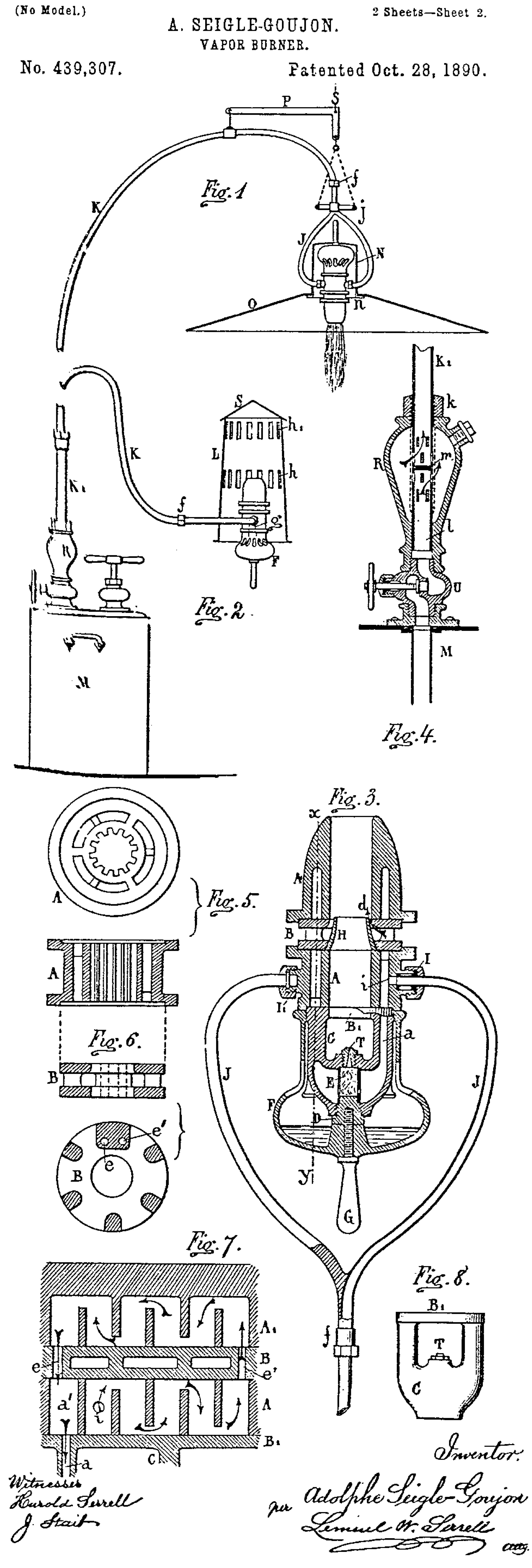


AIR PUMP—PLATE NO. I.

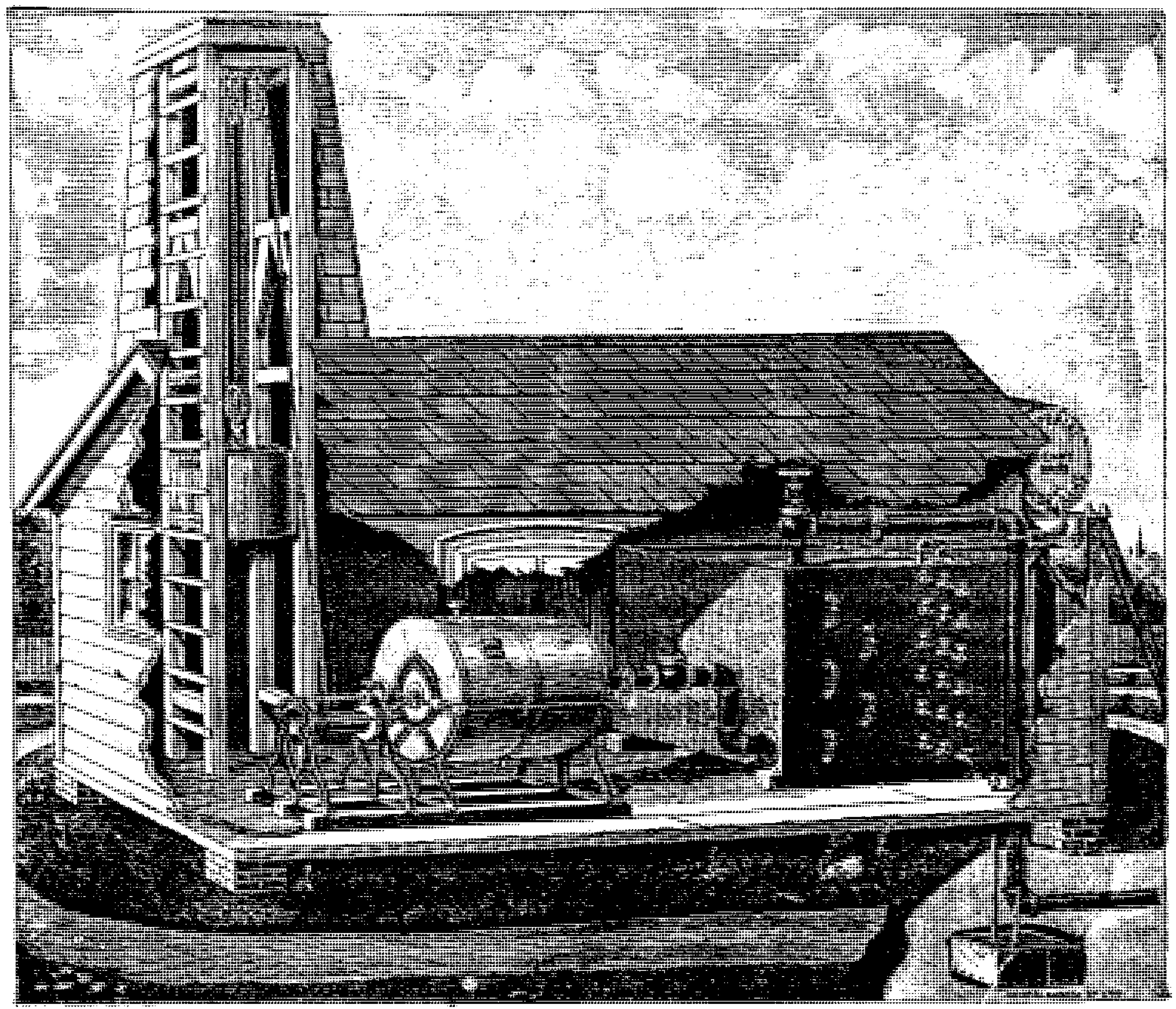
The Springfield Gas Machine of the Gilbert & Barker Co. made its own gas vapor from gasoline fed into an underground evaporator shown at left. As a current of air from pump at right was passed over and through the evaporator pans gas vapor or "carbureted air gas" was produced. Distributing pipes in the walls and floors of the building carried the gas to lighting fixtures and burners for cooking and heating. Gas from a 1-inch pipe might supply as many as 25 burners.



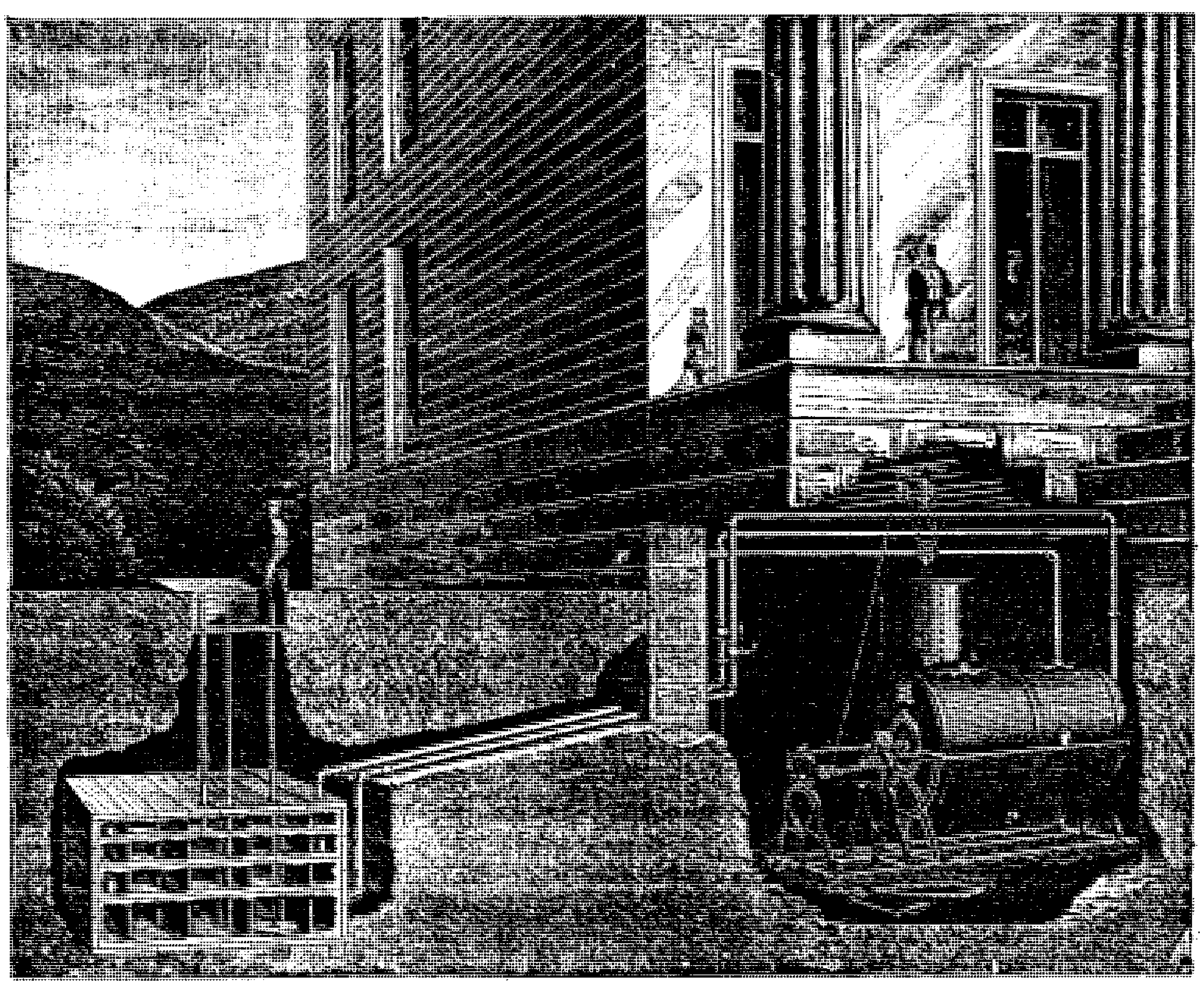
The manufacturer of Springfield Gas Machines claimed several thousand machines in use including a 300-light machine in the royal palace in Honolulu, and several large hotels in the White Mountains, Florida and the Bermuda Islands.



Like the Lucigen lamp of Hannay and Lyle the Seigle-Goujon burner derived its light from an intense flame. Compressed air and a vaporizer with serpentine passages (Fig. 7) gave maximum vaporization. Figure 1 depicts the burner as it was used in an overhead lighting fixture. Figure 2 is a burner for heating. Neither the Lucigen or Seigle-Goujon lamps employed an incandescent mantle.



Gas machines for churches, hotels, mills and other commercial structures sometimes were designed to be housed in a separate building. Generator with overflow pan, lower right, was divided into a series of reservoirs or pans containing gasoline. As air passed from pan to pan it was impregnated with vapors which exited at low pressure from the top of the reservoir through a large supply pipe.

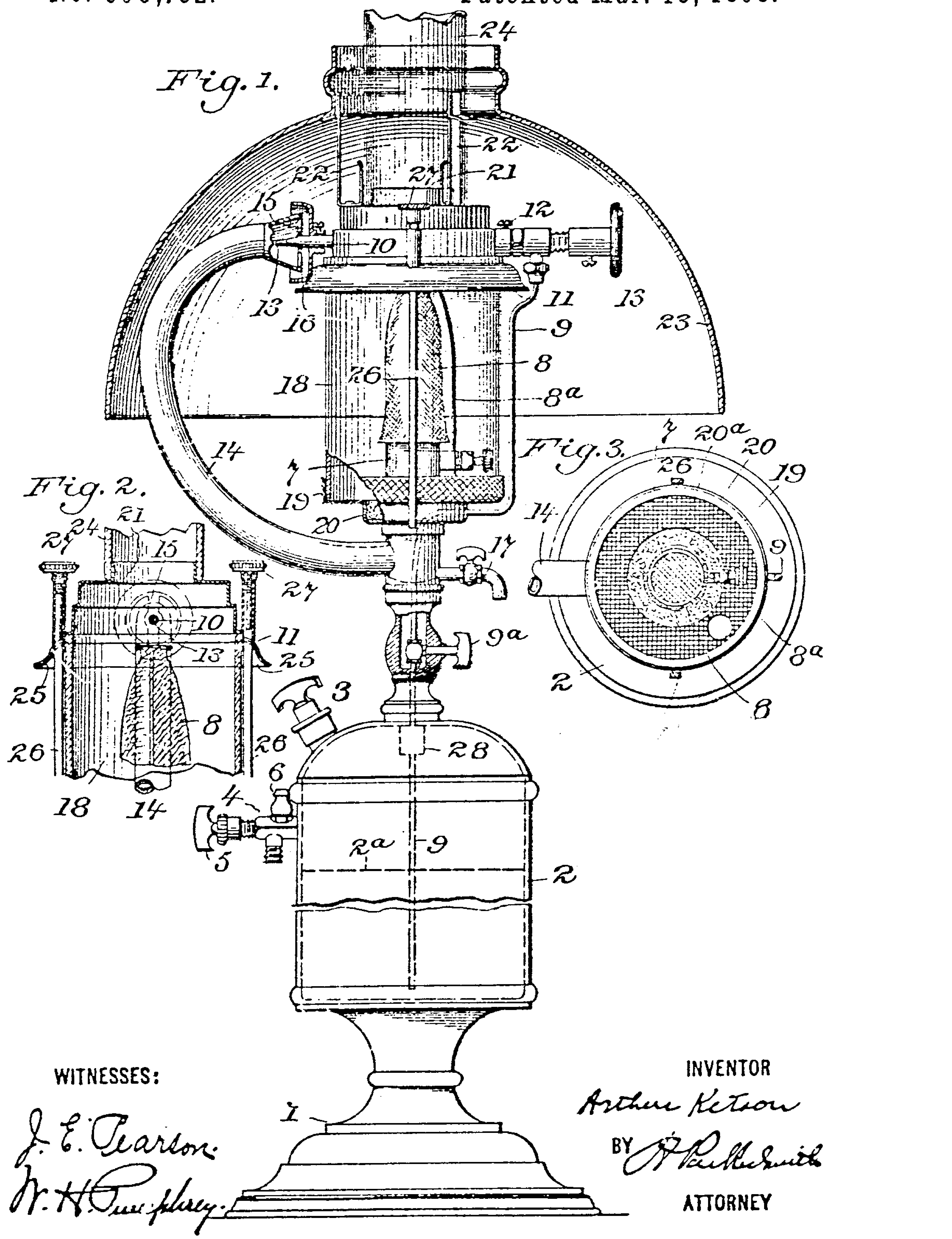


An artist's conception of gas machine installation in a public building places the air pump with its weight and pulley in the basement and the generator underground. Air entered at the bottom of the generator and exited at the top. The evaporator pans were interconnected and the air picked up gasoline vapor as it passed from pan to pan. It was claimed that a 1½-inch pipe 150 feet in length could supply gas vapor to as many as 75 burners.

A. KITSON.

VAPOR BURNING APPARATUS.

No. 600,792. Patented Mar. 15, 1898.



WITNESSES:

INVENTOR

Arthur Kitson

BY

ATTORNEY

NOTES: Fig. 1 side elevation. Fig. 2 cross section of reflector with vaporizing tube. Fig. 3 detail of alcohol cup and skeleton extensions for supporting the globe. Patent assigned to Kitson Hydrocarbon Heating and Incandescent Lighting Co. of West Virginia. Fount was charged with compressed air through connection 5.

good strong light, particles of carbon and other impurities in the liquid fuel tended to collect in the generator. This meant frequent cleaning or replacement of the vaporizing device.

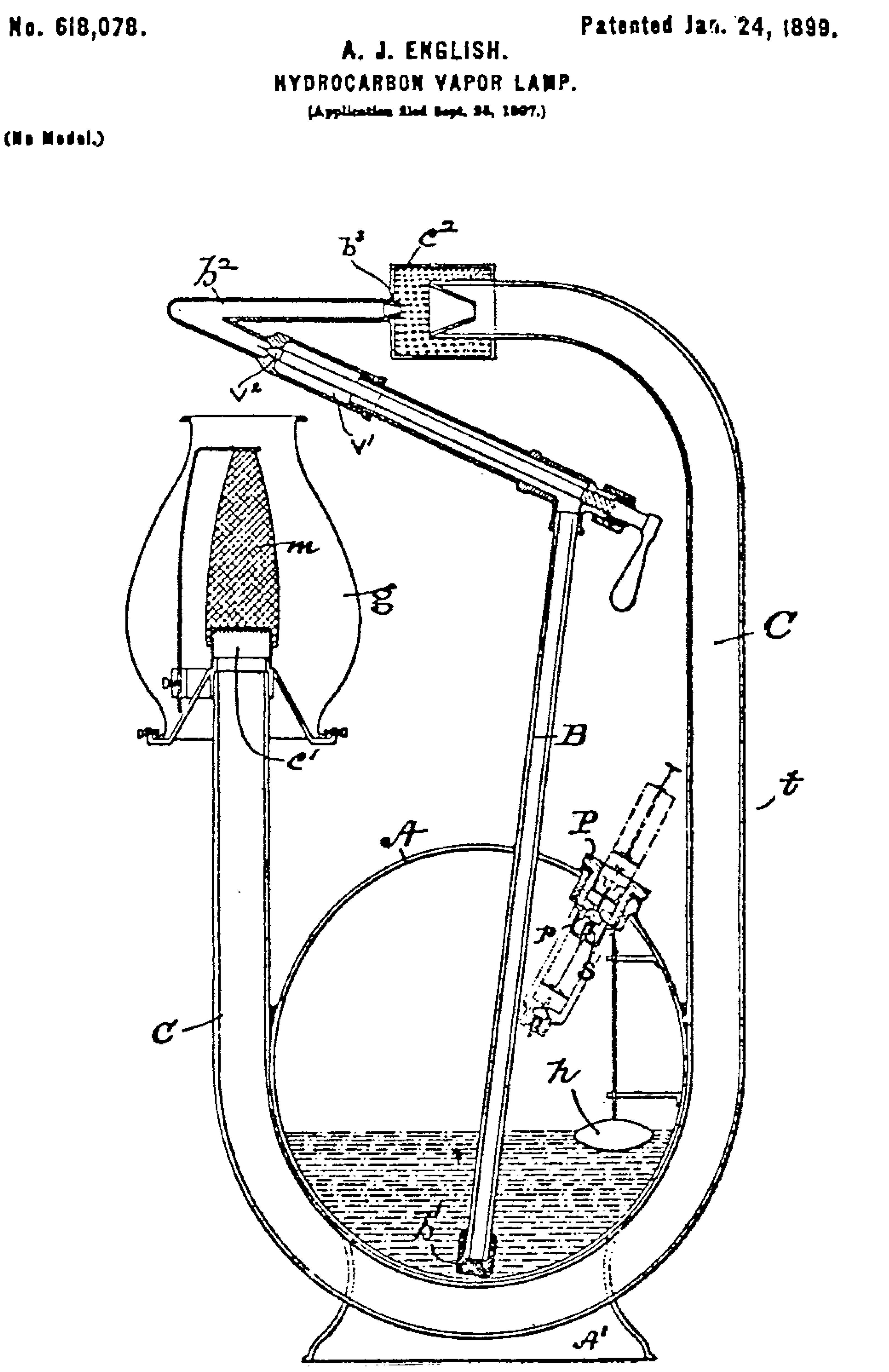
As we have seen, both the gravity-fed lamps and the early gas machines failed to provide a lasting service. But, even before these inventions were put to the test of time, significant work was being done toward development of gas lighting in which liquid fuel, under pressure, was forced into a small tube leading to a generator. Here the vaporizing process would begin from the heat of a small flame burning directly beneath the generator. The vapor thus produced would exit through a tiny orifice and thence through a larger tube to a burner surmounted by a mantle. The force feeding of fuel to the generator all but eliminated the problem of impurities clogging the supply line. What particles did reach the generator were trapped in a porous substance, usually asbestos wicking.

An example of this new breed of hydrocarbon pressure lamps was designed by Arthur Kitson, a British subject who later lived and worked in Philadelphia.

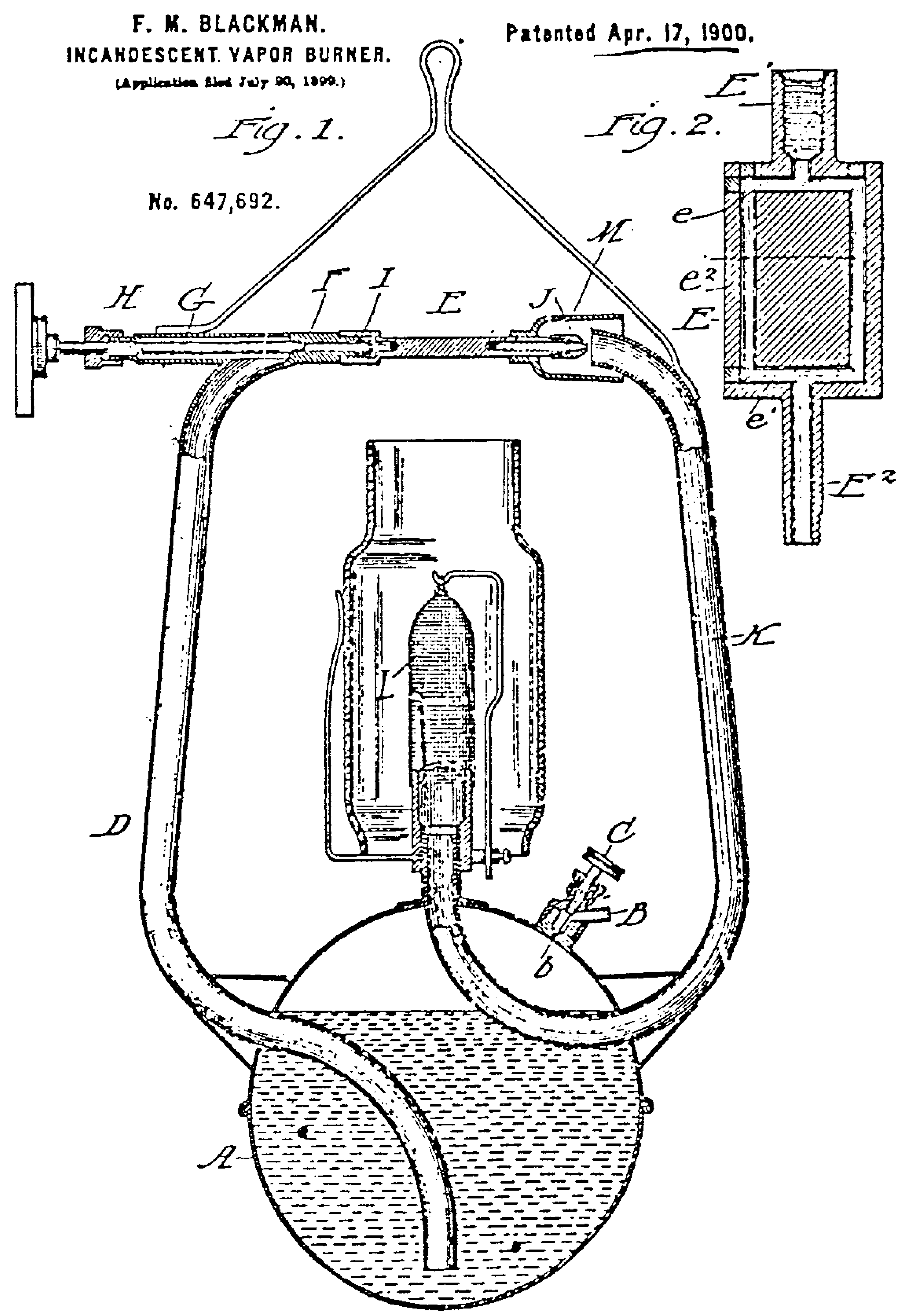
In 1898, Kitson obtained a patent[1] for a vapor-burning apparatus which appears to have challenged inventors on both sides of the Atlantic. As will be seen in the drawing which accompanied his application for a U.S. patent, the Kitson lamp included important elements of the modern-day gasoline and/or kerosene lighting appliances: a pedestal type font serving as a reservoir for fuel and compressed air; a valve to admit or cut off fuel to the vaporizing device; a vaporizor or generator equipped with a needle valve to admit fuel necessary for combustion; a curved mixing tube extending downward from the generator to the lamp's burner; an incandescent mantle encircling the burner and a clear glass chimney which served to protect the mantle and also directed sufficient heat to the generator to permit continuous operation without the necessity of further priming.

In the months that followed, other patents were granted to various inventors. It is possible that some inventors actually had their products on the market ahead of Kitson's lamp. Preliminary inquiries into these early

[1] "Vapor Burning Apparatus" — A. Kitson, U.S. Patent No. 600,792, Mar. 15, 1898.



The English lamp was designed to use coal oil or gasoline under pressure. Liquid fuel was forced into a valve chamber provided with a needle valve. When heat was applied, the vapor thus created was directed through tube C to the burner and mantle. Blackman assigned the patent to the Perfection Light Co. of Cincinnati.



Blackman's lamp introduced a "minute" inlet orifice in addition to the customary "minute" outlet orifice common to hydrocarbon pressure lamps. The objective was a generator or vaporizer which would prevent pulsations of the flame.

lamps would seem to indicate that several hydrocarbon pressure lamps were developed between 1895 and 1901. If this assumption is correct the activity may be attributed to the state of the mantle making art which seems not to have been perfected until the mid-1890s.

Among the early lamps was one described in patent No. 618,078[1] granted January 24, 1899 to A.J. English. Interesting features of the English design were the unusual arrangement of the lamp's essential components and an air pump which, in the words of the inventor, "may be embodied in the reservoir as part of the (lamp) structure if desired."

Close behind the English patent was No. 630,966[2] granted to V.H. Slinack of Philadelphia and assigned to the Pennsylvania Globe Gas Light Company. Unlike the Kitson and English table lamps, Slinack's lamp was designed to be suspended from the ceiling or overhead beam. The Slinack design incorporates features found in the Welsbach and Kitson lamps but surrounds the operating part of the lamp with a harp-like structure which adds symmetry and stability to the apparatus.

Another early inventor was Franklin M. Blackman of Aurora, Illinois. In submitting his application in July 1899[3] Blackman stated he was aware that "it was not new, broadly, to provide a lamp with a generator or vaporizer heated by the flame of the lamp and which has a minute vapor-outlet, but, he continued, "I am not aware that it has ever been proposed to provide the vaporizing chamber with a similarly minute inlet for the liquid hydrocarbon." The inventor undertook to correct what he felt were deficiencies in existing generator-burner combinations. Whether Mr. Blackman's generator was a success in a material sense we do not know.

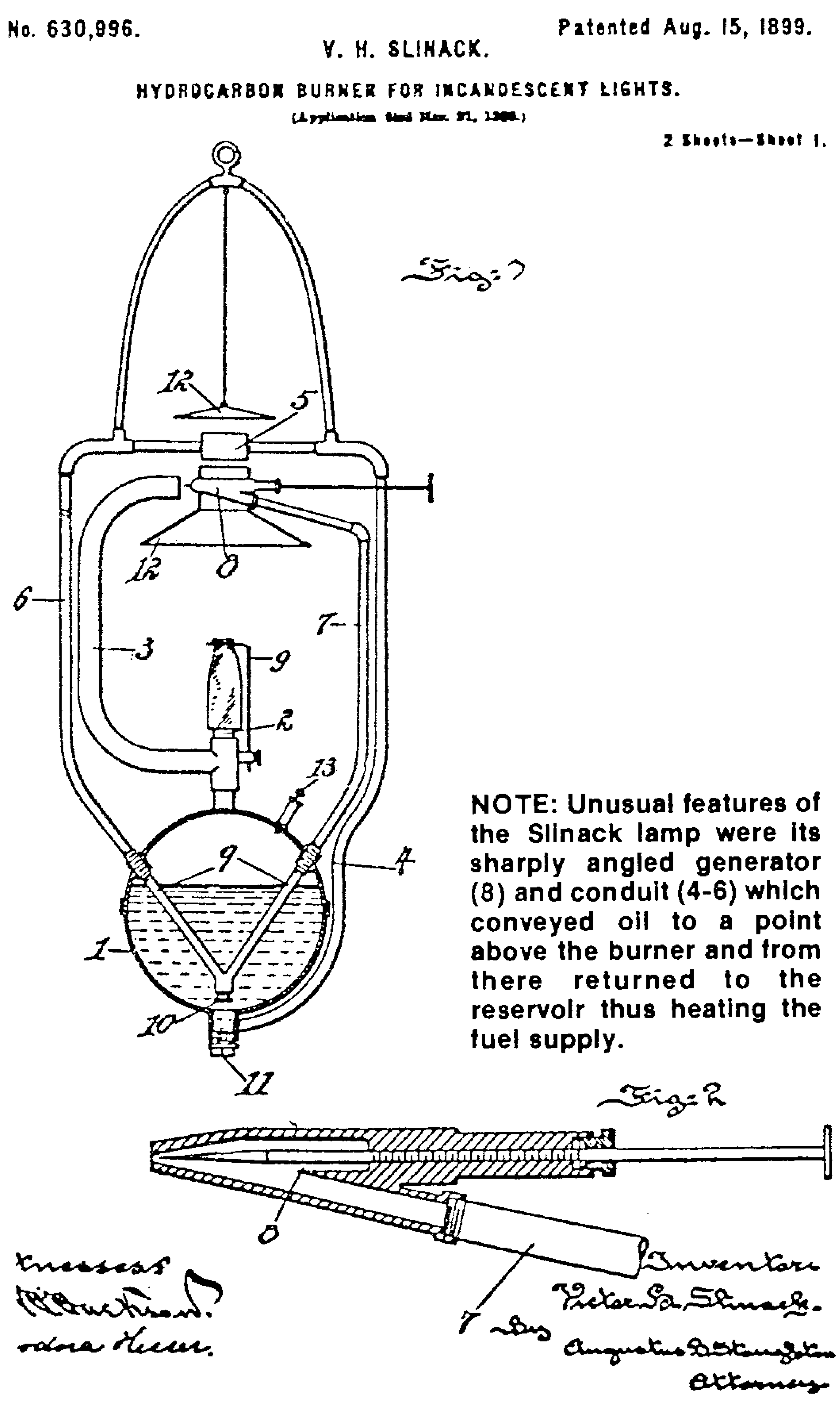
Which brings us to the vapor lamp of William H. Irby[4] of Memphis, Tennessee. Irby filed his application on April 28, 1900, and on September 18 of that year received U.S. Patent No. 657,936. It will be noted from the patent application that many of the details of earlier patents were incorporated in Irby's design. One significant difference was what *Scientific American* referred to as the lamp's

[1]Hydrocarbon Vapor Lamp — A. J. English, U.S. Patent No. 618,078, Jan. 24, 1899.

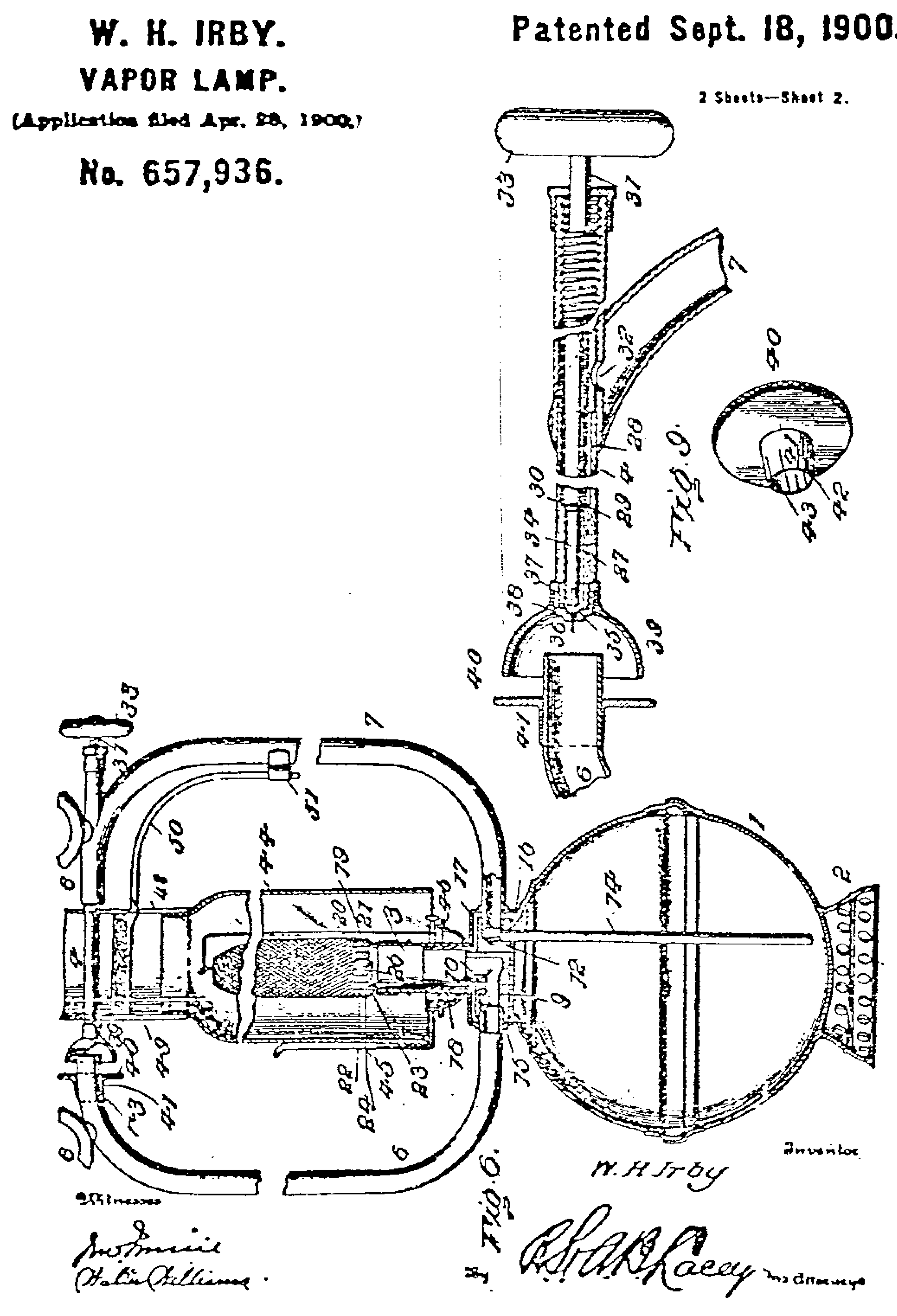
[2]Hydrocarbon Burner for Incandescent Lights — V. H. Slinack, U.S. Patent No. 630,996, Aug. 15, 1899.

[3]Incandescent Vapor Burner — F. H. Blackman, U.S. Patent No. 647,692, April 17, 1900.

[4]Vapor Lamp — W. H. Irby, U.S. Patent No. 657,936, Sept. 18, 1900.



NOTE: Unusual features of the Slinack lamp were its sharply angled generator (8) and conduit (4-6) which conveyed oil to a point above the burner and from there returned to the reservoir thus heating the fuel supply.

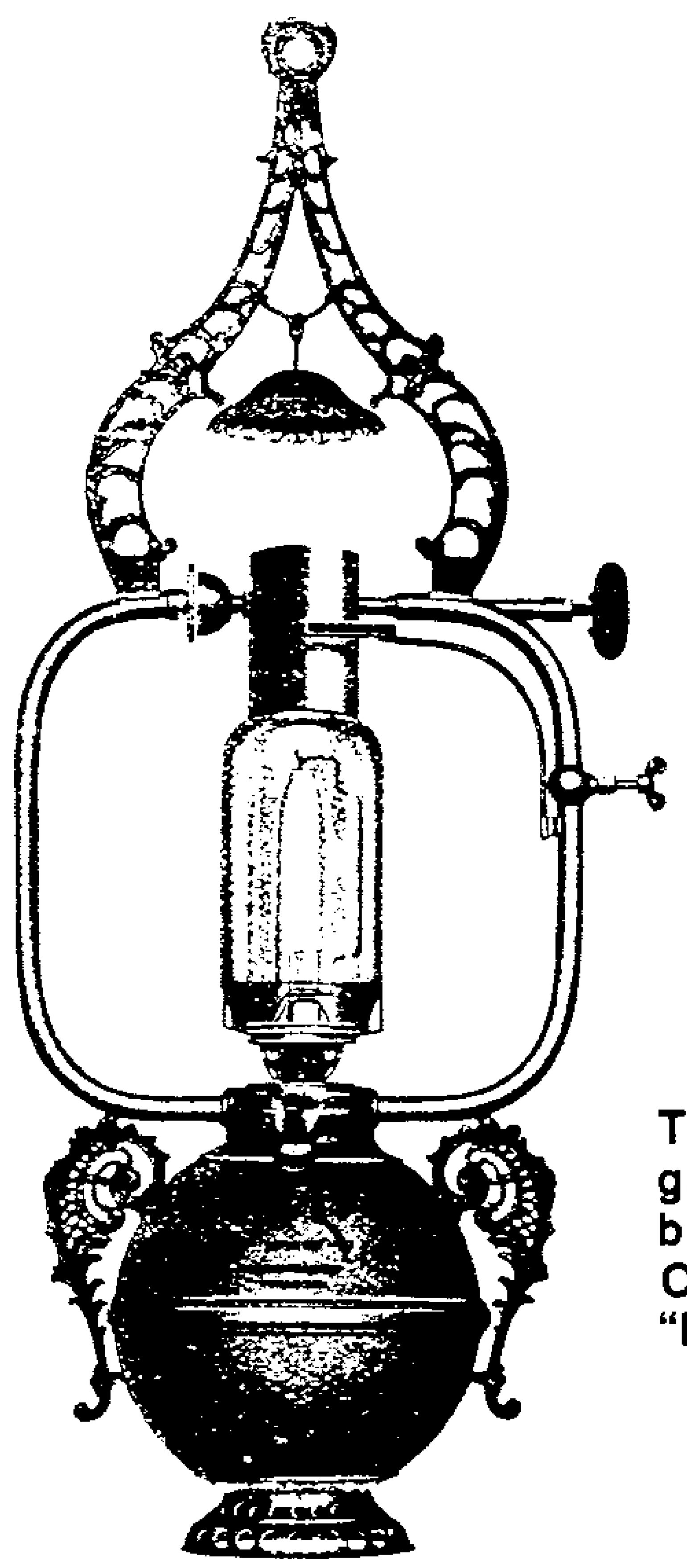


NOTE: Among the several improvements in the design of gas vapor lamps was Irby's use of oppositely disposed arms, the one on the right concealing the fuel tube and the left arm for conducting gas vapor to the burner. The first of these lamps appear to have reached the market in 1899. They were manufactured by the Edward Miller Co. until 1905 when manufacturing was done by the Hydro Carbon Co., later known as the Coleman Lamp Company.

"oppositely disposed tubular arms serving respectively to convey the hydrocarbon to the generator and the gaseous mixture to the burner."

In his application Irby said the object of his invention was "to improve the general construction of lamps through the better assembling of the parts, a more certain control of vapor and air, and the burner and accessory elements rendered more accessible for cleaning, priming, or any desired purpose."

What the Irby lamp may have lacked in originality it made up for in utility and durability. The lamp remained in production for nearly 20 years and its progeny, represented by the Coleman lamps and lanterns, are produced still at a rate of over a million units annually.



The Arc Lamp was the first gasoline pressure lamp to bear the Coleman name. Originally it was called the "Efficient Lamp."

In common with many of the other hydrocarbon mantle lamps around the turn of the century, Irby's lamp was intended primarily for commercial purposes. It operated on 40 pounds of pressure and was said to produce up to 750 candlepower of bright, white light. It weighed approximately 10 pounds. The fuel reservoir was bowl-shaped and made of heavy brass. The capacity of the bowl was one gallon — enough fuel for up to 24 hours of lighting service it was claimed. All joints in the frame were threaded and brazed. If the lamp fell or tipped over fuel to the burner was cut off and the lamp went out. An alcohol torch was required to initiate the vaporizing process.

The Irby lamps were made under contract with Edward Miller & Co. of Meriden, Conn., a leading manufacturer of burners, lamps and trimmings.

Irby and his partner, Forrest Gilliland, were engaged in the crockery business in Memphis. Irby's lamp, tradenamed "Efficient," was a sideline. Instead of selling lamps, Irby-Gilliland engaged a salesman who followed a practice which seems to have been prevalent in the early days of the lighting business. The objective was to acquire agents who would agree to buy an exclusive territory. Acquisition of a territory carried with it the right to buy lamps from Irby-Gilliland.

One who encountered the Irby-Gilliland territory salesman was William Coffin Coleman, a young man with poor eyesight and a burning desire to exchange a career as a school teacher with that of an attorney at law.

Early in 1899 Coleman was selling typewriters in Alabama in order to replenish funds with which to complete his law studies. He saw his first Irby-Gilliland lamp in a drug store window. The intensity and steadiness of its light so entranced him that he vowed to own one. When he discovered the lamp was not for sale but only for demonstration, he bypassed the territory salesman and negotiated directly with Irby-Gilliland.

Later that year Coleman purchased twelve lamps and chose Kingfisher, Oklahoma Territory as the center of his sales effort. He arrived in Kingfisher on January 1, 1900, the first day of the Twentieth Century.

One of the setbacks Coleman experienced was the near total sales resistance of the merchants of the small but prosperous frontier town. The reason, he learned, was that an itinerant salesman had sold gravity-fed lamps to just about every store on Main Street. One by one the lamps failed and there was no one to repair them.

Coleman met the challenge by offering to rent his lamps, fuel and service included, for $1 per lamp per week. No light; no pay. Within a few months Kingfisher was the best-lighted town in Oklahoma Territory and Coleman's little Hydro Carbon Light Co. was providing service to a half dozen nearby towns.

In November, 1901 Coleman moved his lamp rental service to Wichita, Kansas, a young city with an electric system that did not satisfy the demands of its customers. This situation was not unusual for the times. Merchants along the main streets no longer were content with low-level lighting and were good prospects for modern gas lighting.

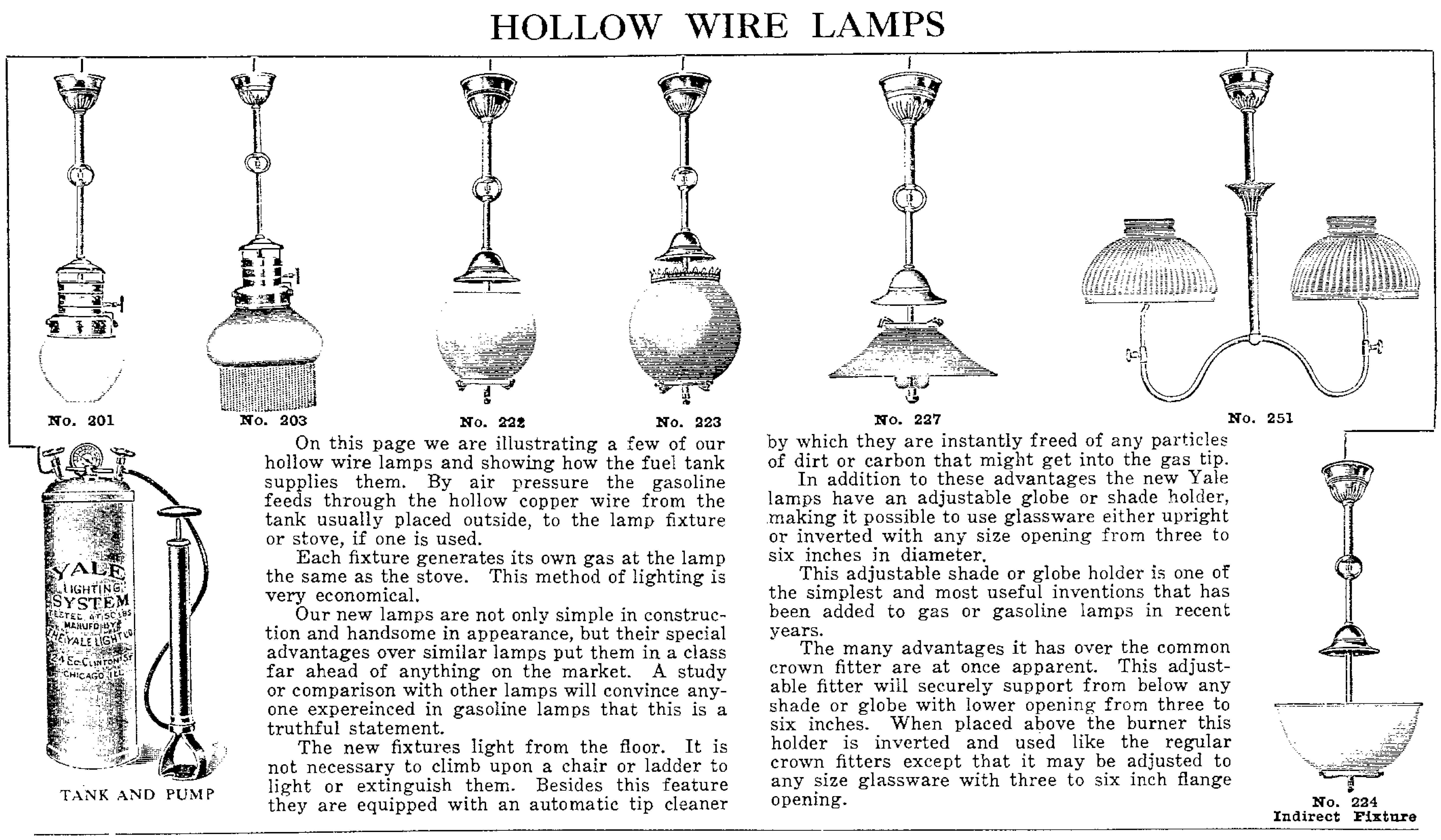
It followed that early inventors of hydrocarbon fueled mantle lamps concentrated on high pressure lamps capable of producing light of 300 to 1,000 candlepower. By design, such lighting was geared to the needs of commercial establishments, churches, meeting halls and street lighting. In fact, one criticism of householders was that the modern lamps that made their own gas from gasoline were too bright.

The attraction of high level illumination extended to Europe. By 1901 inventors there had devised gasoline and kerosene burning pressure lamps with mantles for use in lighthouses.[1] The lamps were approved by both the French and British governments.

During the very early years of the new century, interest seemed centered on what came to be known as hollow wire lighting. A hollow wire system consisted of a central tank for fuel and air, a copper tube ⅛ inch in diameter, and a series of lamp fixtures leading off the supply line. Each lamp had its own control valve, generator, burner, mantle and a shade or globe. The lamps varied in intensity depending upon the size and number of burners.

The fuel tank usually held 3 to 5 gallons of liquid fuel with space remaining for compressed air added by means of a tire pump. As many as 30 lamps might be on the system although the number employed generally is believed to have been considerably less.

[1]"Recent Improvements in the Lighting and Buoying of the Coasts of France" *Scientific American,* Supp. No. 1350, Nov. 22, 1901.


HOLLOW WIRE LAMPS

No. 201 No. 203 No. 222 No. 223 No. 227 No. 251

On this page we are illustrating a few of our hollow wire lamps and showing how the fuel tank supplies them. By air pressure the gasoline feeds through the hollow copper wire from the tank usually placed outside, to the lamp fixture or stove, if one is used.

Each fixture generates its own gas at the lamp the same as the stove. This method of lighting is very economical.

Our new lamps are not only simple in construction and handsome in appearance, but their special advantages over similar lamps put them in a class far ahead of anything on the market. A study or comparison with other lamps will convince anyone expereinced in gasoline lamps that this is a truthful statement.

The new fixtures light from the floor. It is not necessary to climb upon a chair or ladder to light or extinguish them. Besides this feature they are equipped with an automatic tip cleaner by which they are instantly freed of any particles of dirt or carbon that might get into the gas tip.

In addition to these advantages the new Yale lamps have an adjustable globe or shade holder, making it possible to use glassware either upright or inverted with any size opening from three to six inches in diameter.

This adjustable shade or globe holder is one of the simplest and most useful inventions that has been added to gas or gasoline lamps in recent years.

The many advantages it has over the common crown fitter are at once apparent. This adjustable fitter will securely support from below any shade or globe with lower opening from three to six inches. When placed above the burner this holder is inverted and used like the regular crown fitters except that it may be adjusted to any size glassware with three to six inch flange opening.

TANK AND PUMP

No. 224
Indirect Fixture

Typical of the hollow wire lighting systems in use during the early years of the century was that of the Yale Light Co. A system consisted of from 1 to 50 lights or fixtures. Each light had its own generator. A tank or reservoir for supplying gasoline for the entire system was placed outside the building. By pressurizing the tank with air, fuel flowed through a seamless brass tube about ⅛-inch in diameter to the lighting fixtures.

A variation of the hollow wire system was reminiscent of the much larger and more complex gas machines. Instead of forcing liquid fuel through a hollow wire, it fed into a central generator where it was converted to a vapor. The vapor was conducted to the lamp fixtures through 1½ inch galvanized iron pipe. In order to distinguish the system from hollow wire lighting manufacturers referred to it as a central generator or tube system.

An added benefit claimed for the hollow wire and tube systems was low cost of operation. According to sales literature of the period, the gasoline vapor lamps were far more economical than electric, manufactured gas, acetylene lamps and even the kerosene wick-type lamps. It was pointed out that when properly adjusted, the high intensity of hollow wire and tube lights consumed a mixture of 5 percent gasoline and 95 percent air. That same ratio still applies to the gasoline pressurized lanterns made today.

During the heyday of the hollow wire and tube systems, roughly the years between 1900 and the early 1920s, outdoor street lamps fueled with gasoline attained some degree of popularity. At one time Chicago was reported to have 8,000 gasoline street lamps. Other cities used them for lighting parks and thoroughfares beyond the reach of existing electric lines. A larger number, however, were destined for use in small towns and villages which had no electric service or had a light plant with insufficient generating capacity to serve the combined needs of both the public and private sectors.

The more advanced street lamps were self-contained in that the fuel reservoir was concealed in the lamp post. Gasoline and air were added at regular intervals. A clockwork device could be set to turn off the light at a specified time but lighting the lamps had to be done manually. Another version of the gasoline street lamps was to give them a carefully measured amount of fuel and when the fuel was exhausted the lamp went out.

Among the companies active during this period were the American Gas Machine Co. of Albert Lea, Minn., Acorn Brass Mfg. Co., Akron Light Co., Martin and Moorhead, Superior Mfg. Co., Standard-Gillette, Gasoline Lighting Co., Yale Light Co. and the Hydro-Carbon Light Co. of W.C. Coleman.

It is not known how many companies were engaged in manufacturing gasoline lamps and lanterns during the 1900-1925 period. One manufacturer stated that more than 50 claimed to be making gasoline lighting devices but that "to our positive knowledge not more than one-fifth of these concerns do any more actual merchandising than is involved in packaging goods or putting goods into a shipping case or putting connections on wire."[1]

Whatever the total may have been, progress was being made. One of the earlier advances was the inverted mantle. One source[2] states that it was not until 1900-1901 that the inverted mantle became a possibility. Development was credited to Bernt, Cravenka and Kent whose work on high pressure burners was reported to have covered a span of several years.

The inverted mantle seems to have come into general use between 1905 and 1910, a critical period in the development of hydrocarbon lamps and lighting systems. The mantle was widely accepted because it was relatively simple to manufacture and apply. Whereas it could be shipped flat in an ordinary box or envelope and tied to the lamp burner with an asbestos string, the standing mantle

[1]Bolte & Weyer Mfg. Co., Catalog No. 16, 1911.

[2]"Inverted Burners" *Encyclopedia Brittanica,* Vol. XVI, p. 658.

[1]Lamp— W. C. Coleman, U.S. Patent No. 976,723, Nov. 22, 1910.

had to be shaped, hardened, burnt off and encased in a protective carton before leaving the factory.

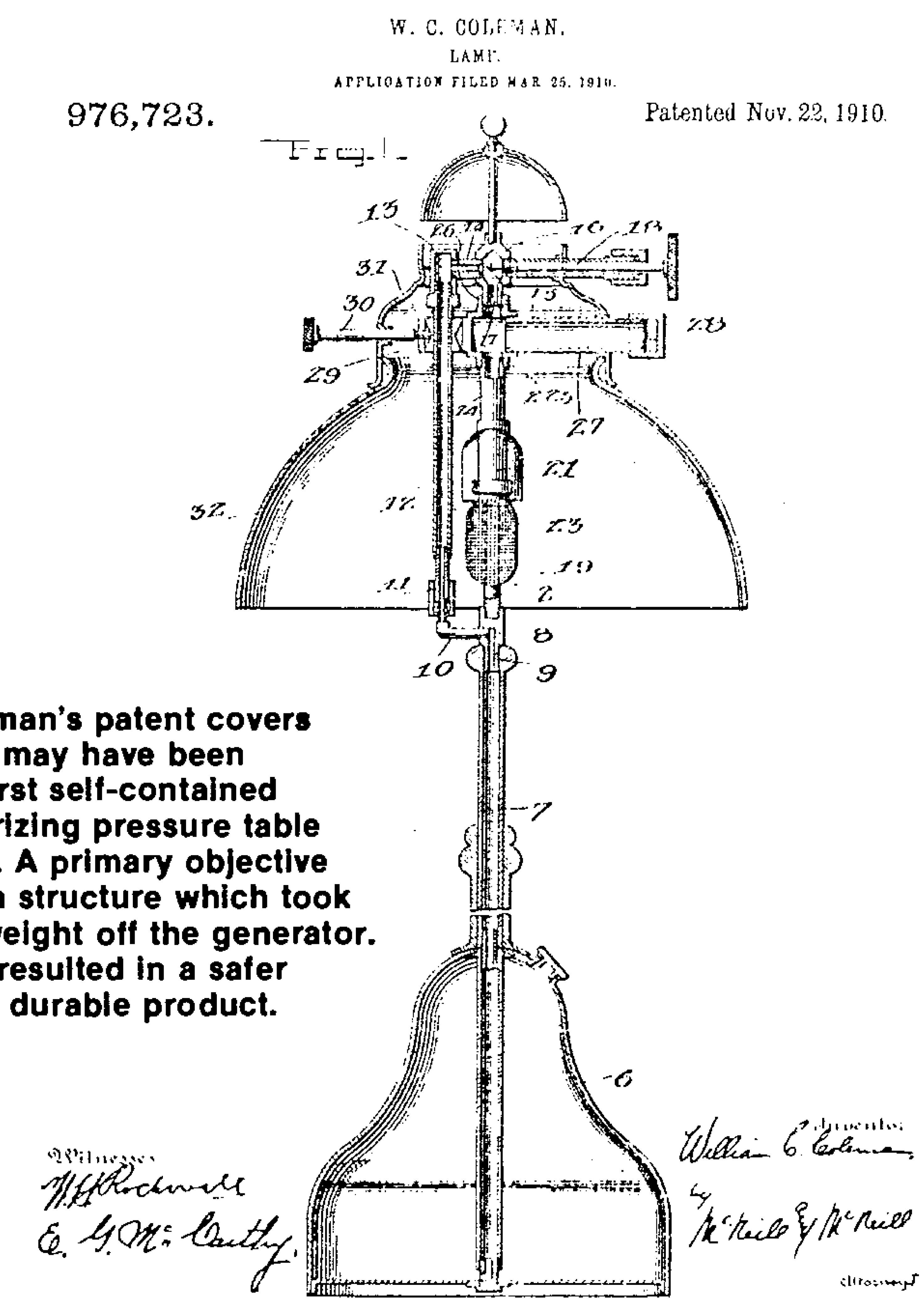
Lamp manufacturers were learning early that fuel tanks and lamp fonts had to be made strong enough to withstand pressures of as much as 100 pounds per square inch. Among the first to learn the lesson was Coleman. Being in the lamp rental business he found that much of his time was occupied in repairing and replacing leaky lamps so that he could collect his fee. He succeeded in pursuading the Edward Miller Co. to correct the deficiency, but only after he had acquired the patent rights to the Efficient lamp and renamed it the Coleman Arc Lamp. In 1905 he began making his own lamps.

Although the hollow wire and tube systems helped popularize the idea that there was more to twentieth century lighting than Edison's carbon filament bulbs and coal oil lamps, there remained a critical need for a fully portable table lamp which would produce up to 300 candlepower yet would be safe to use even if it were dropped on the floor or accidentally upset.

While in Chicago in 1907, Coleman saw a table lamp that worked on gas vapor fed to the burner by means of a rubber tube. The lamp was portable to the radius of the tube.

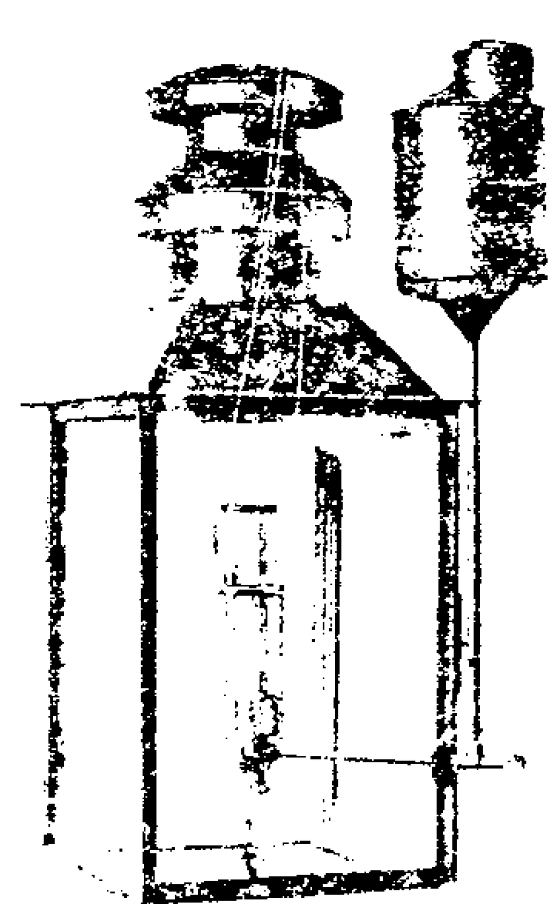
Coleman returned to his little factory in Kansas and began work on what two years later would be introduced as the Coleman Model R Reading Lamp.[1] A patent was granted the inventor in 1910.

[1]Lamp — W. C. Coleman, U.S. Patent No. 976,723, Nov. 22, 1910.

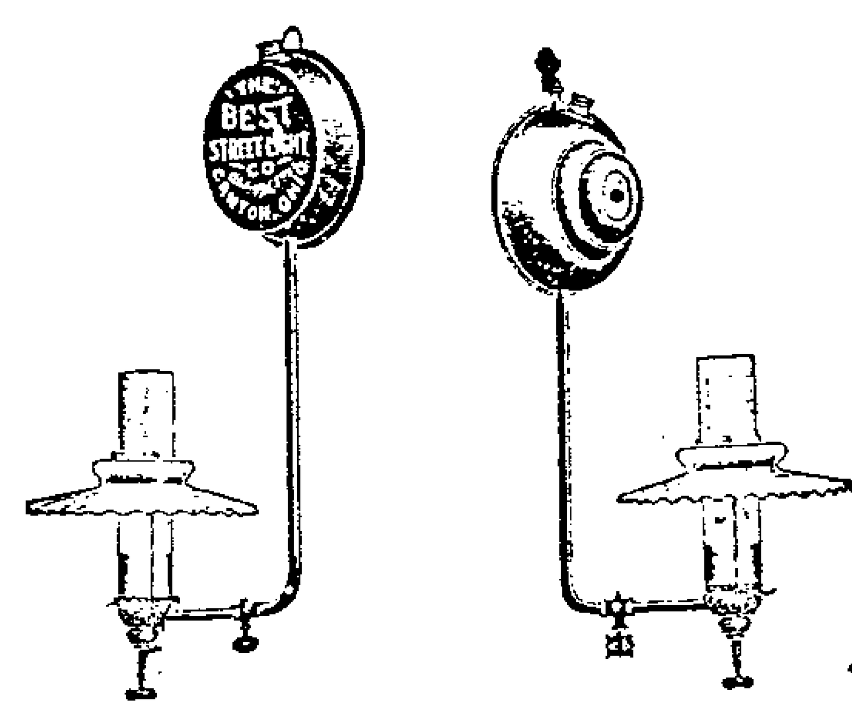


Coleman's patent covers what may have been the first self-contained vaporizing pressure table lamp. A primary objective was a structure which took the weight off the generator. This resulted in a safer more durable product.

Incandescent Lawn or Veranda Lamp
100 Candle Power

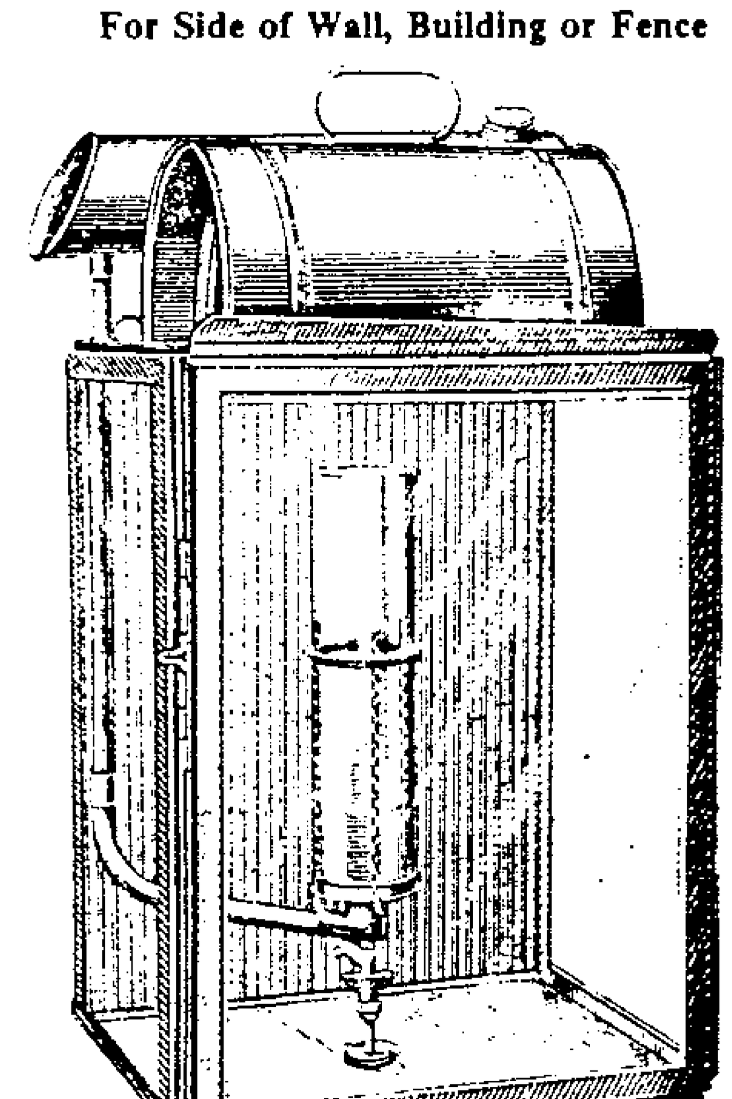


Wall Lamps

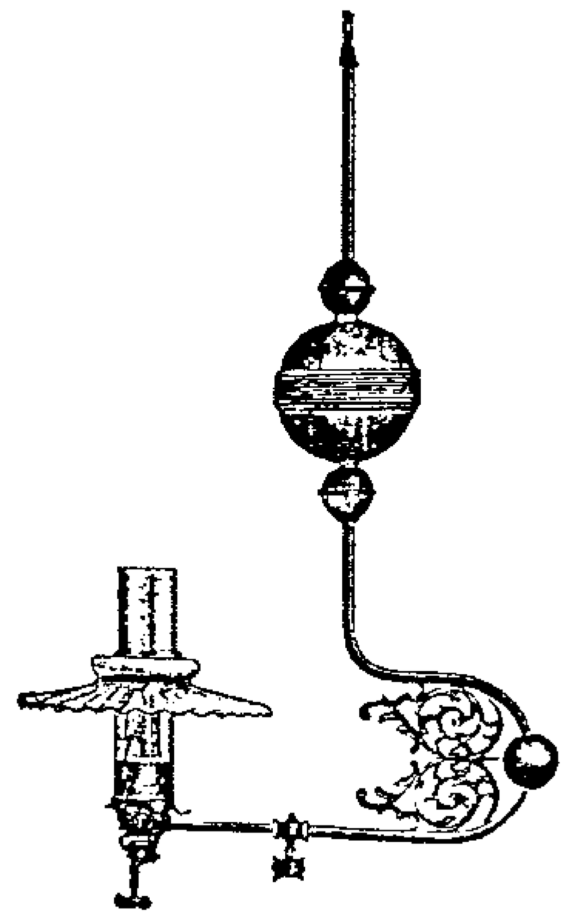


No. 1. No. 2.

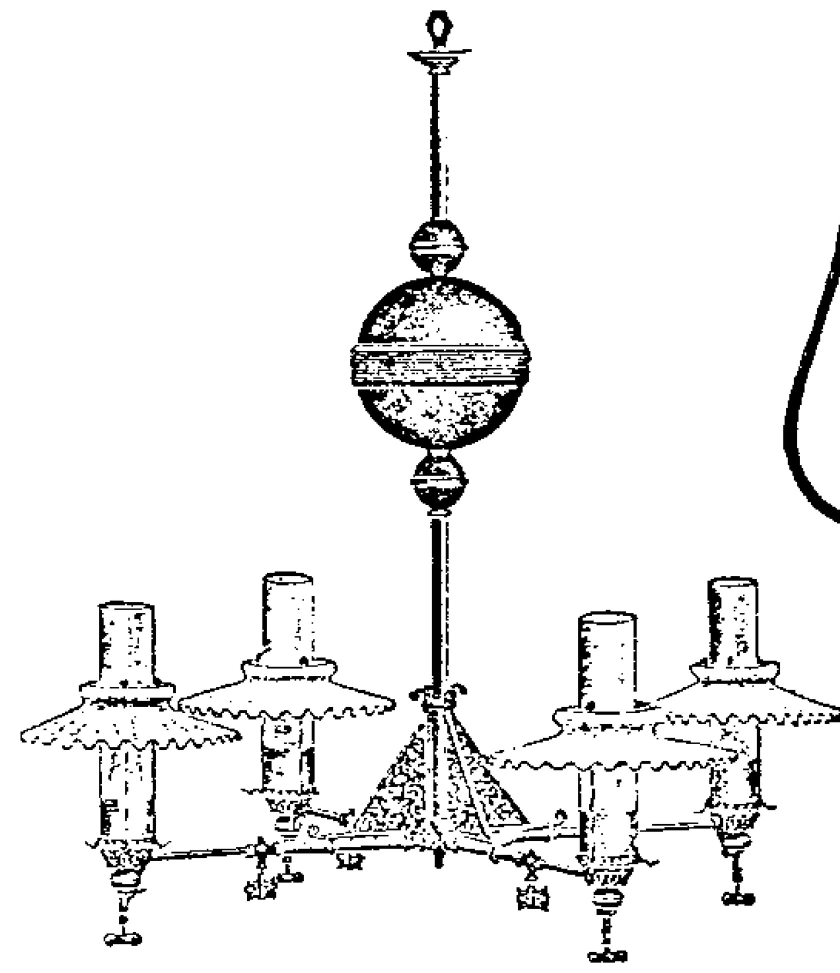
Square Side Lamp, No. 30
For Side of Wall, Building or Fence

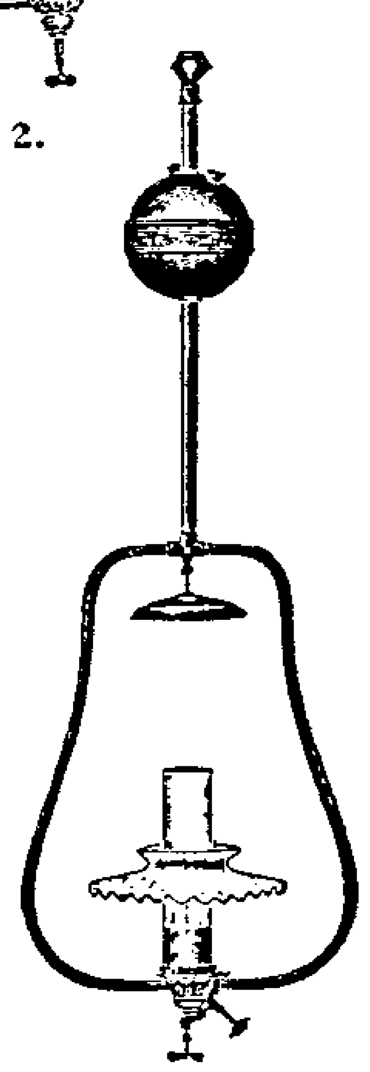


One Light Pendant
One Quart Brass Reservoir
Invisible Filling Cap and Indicator

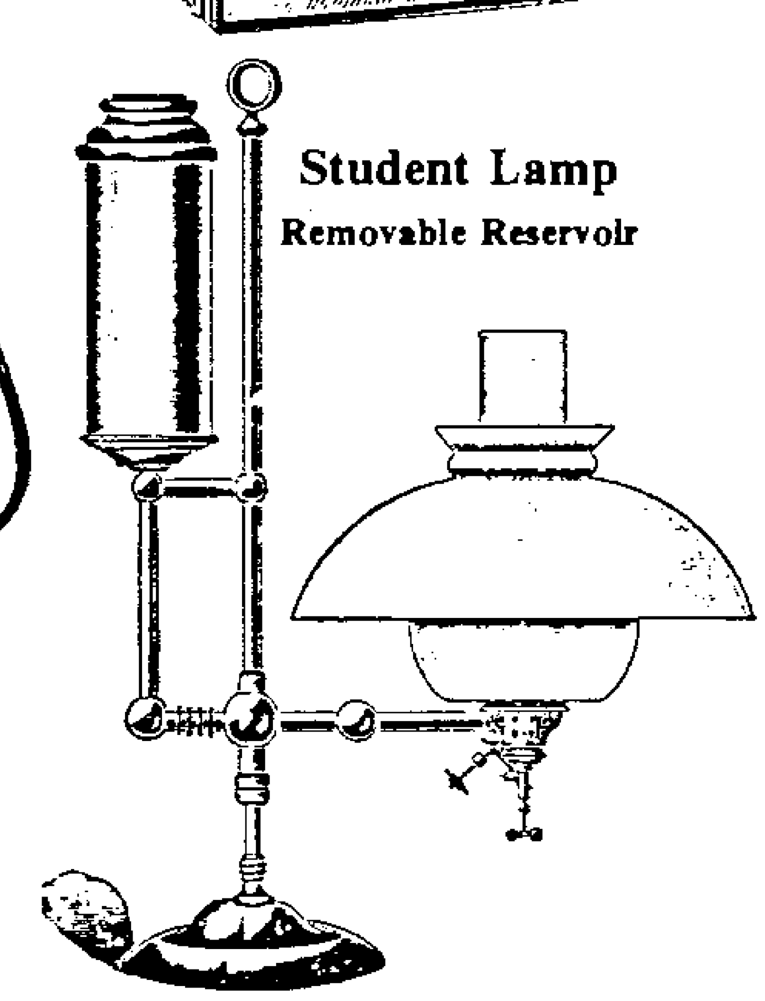


400 Candle Power





Student Lamp
Removable Reservoir



Gravity feed gasoline lamps made during the early 1900s came in many shapes and sizes. Illustrations are from a catalog of the Best Light Co., Canton, Ohio.

Whether Coleman's Model R was the first of the portable gasoline table lamps may be academic. In any event it seems to have been the model for numerous other lamps which would insure the success of the gasoline lights and eventually would lead to the highly utilitarian outdoor lantern.

Prior to 1916, most gasoline and kerosene mantle lamps required preheating in order to begin the vaporizing process. The most common preheating device was the alcohol torch. Often the torch was little more than a bit of cloth held by a twist of wire. After being dipped in a container of methyl alcohol, the torch was ignited and applied to the generator.

The building of a better generator became almost an obsession with inventors. The solution to the problem turned out to be quite simple. The generator was lengthened by adding a loop or pigtail to the generator's brass tubing. This added about 3 inches of heating surface. When two lighted matches were applied to the sides of the loop the vaporizing process was underway. The alcohol torch soon disappeared.

Some 10 years later, the generator would be improved further, but by then the Coleman Quick-Lite lamps and lanterns had gained a leadership position in gasoline vapor lighting.

The 1920s may well have been the most productive period in the gas-from-gasoline era. The portable table lamp became a familiar sight in millions of homes beyond the reach of electric lines. The lantern, which was by now virtually stormproof, was favored by many farmers and others who worked outdoors.

The burning apparatus common to the lamp and lantern also was being employed in self-heating irons, domestic water heaters, camp and utility stoves, full-size kitchen ranges, hot plates and blow torches.

The product parade continued into the war years. The allied forces ordered over one million gasoline lanterns and another one million special military burners from one company alone. And when the war ended, far from being obsolete, the lantern and its companion, the folding camp stove, found favor with new generations of campers and picnickers.

Any attempt to assess the role of pressurized gasoline and kerosene lamps is without end. Their origin can be traced to the vapor or "spirit" lamps of the early part of the 19th century. The gas machines of the '80s and '90s were a forward step particularly after they incorporated the Welsbach mantle. Then came the hollow wire and tube systems and almost concurrently the development in the early 1900s of self-contained hanging lamps, wall lamps and table lamps.

Gasoline lanterns gained favored status during the first World War by lengthening the hours farmers could work in the field.

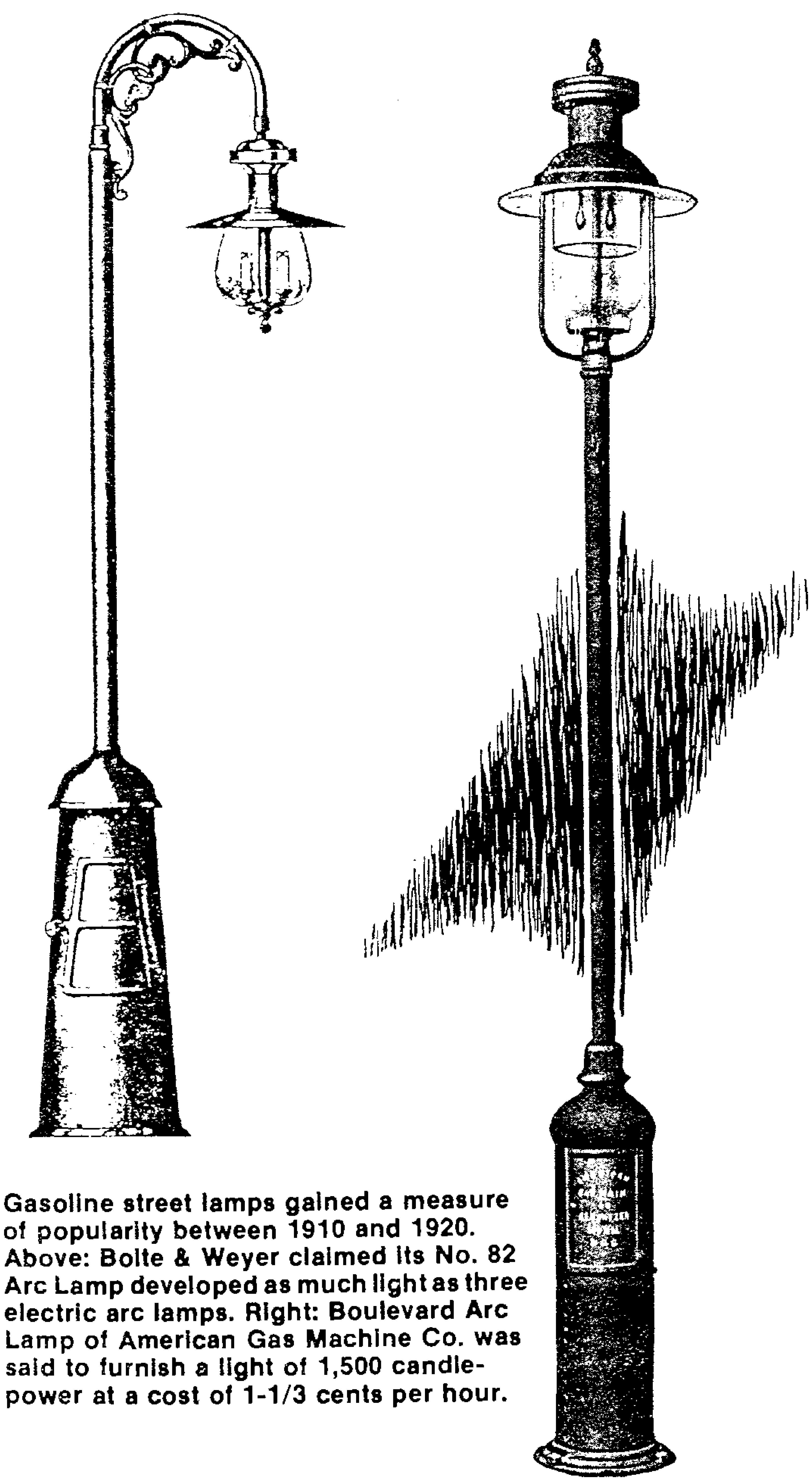
During the same period missionaries, explorers, archeologists and big game hunters would carry gas lanterns with them thus introducing millions to the marvel of their bright light.

Commercial application of gas lanterns proliferated. Night workers on shipping and loading docks, commercial fishermen, railway repair crews, forest rangers, operators of newsstands on the sidewalks of metropolitan cities, and shopkeepers in oriental bazaars all came to rely upon the brightness and dependability of the ubiquitous gasoline and kerosene pressure lamps.

It has been reported that gas lanterns have successfully guided aircraft to safe landings in the high Andes. Emergency surgery has many times been done by lantern light. In almost any natural disaster in the past 50 years, lanterns have preceded emergency electrical generators. To this day, the lantern, along with candles and flashlights, are the prudent householder's best friends in power outages.

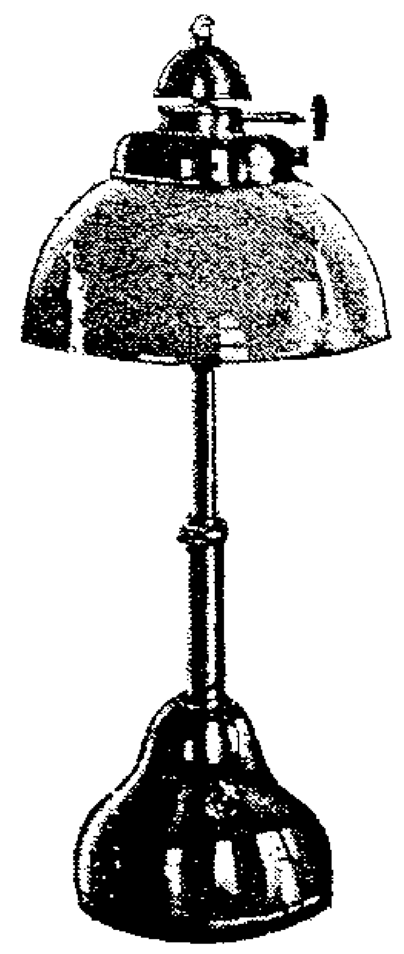
The gasoline pressure lamps and lanterns have had their successes and failures, their champions and detractors. But one thing is constant: the principles which guided their development are as unfailing today as their bright light.

— End —

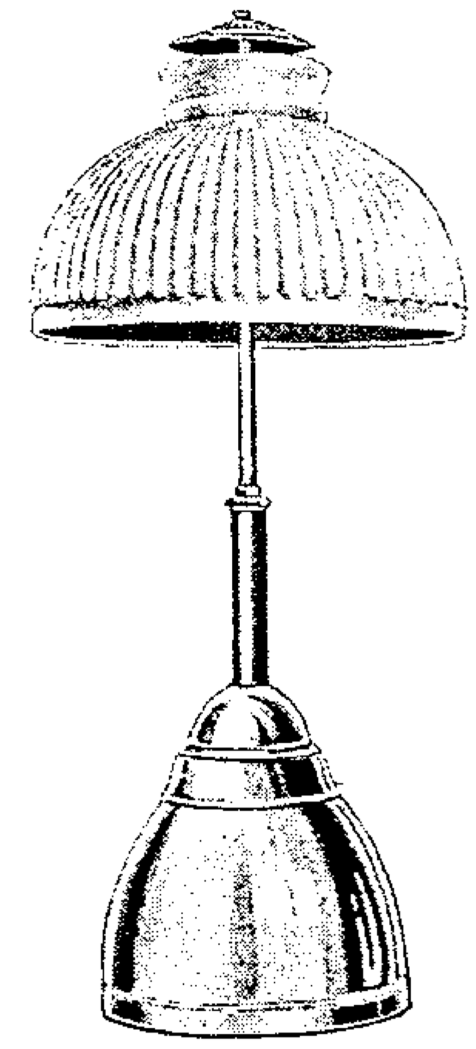


Gasoline street lamps gained a measure of popularity between 1910 and 1920. Above: Bolte & Weyer claimed its No. 82 Arc Lamp developed as much light as three electric arc lamps. Right: Boulevard Arc Lamp of American Gas Machine Co. was said to furnish a light of 1,500 candlepower at a cost of 1-1/3 cents per hour.

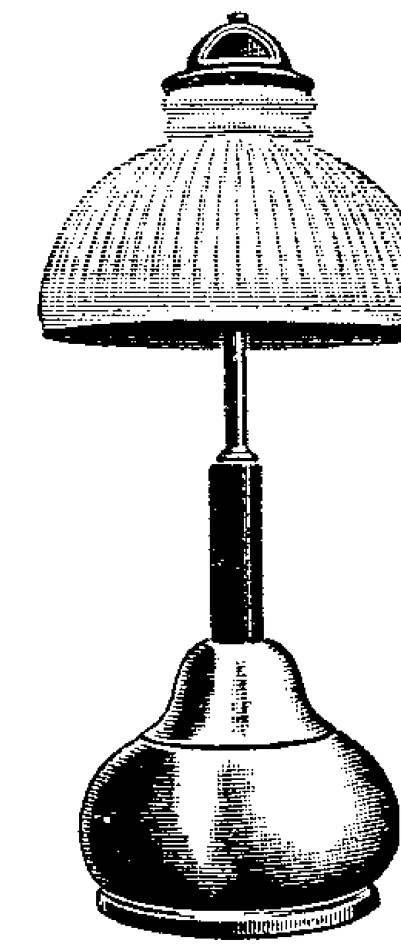
The gasoline pressure lamps on this page are representative of types made between 1909 and 1930. Although there were several manufacturers, most lamps of the period were similar in construction and operation. Variations in the shape of the font and in shades and globes were distinguishing features.



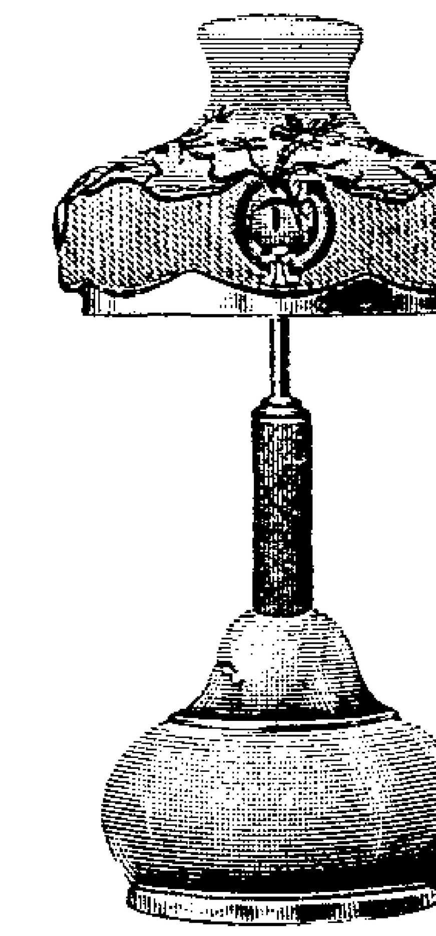
1909
Coleman
Reading Lamp



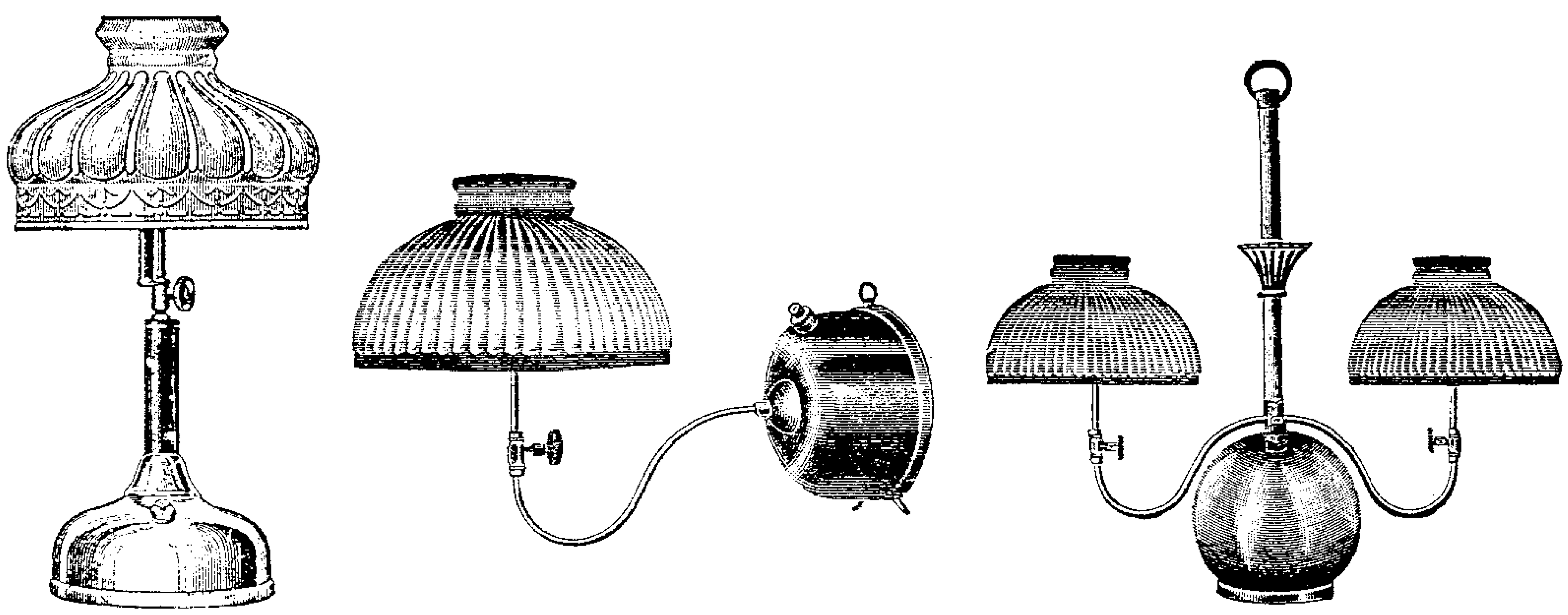
1911
Early Air-O-Lite



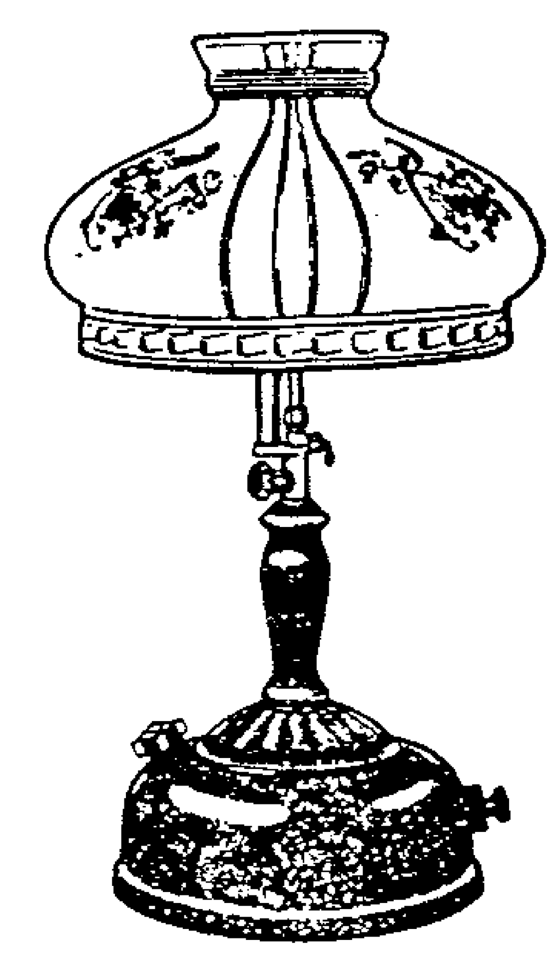
1912
Improved
Air-O-Lite



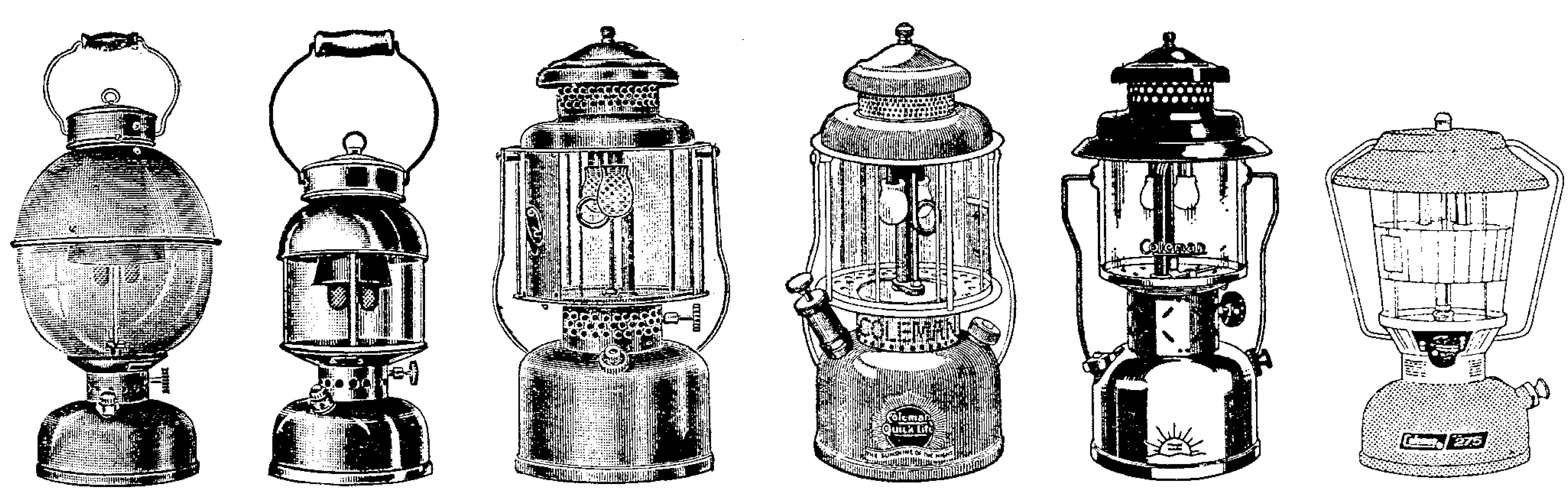
1914-1915
Air-O-Lite with
decorated shade



Match-lighting lamps, represented here by three types of Coleman Quick-Lites, obsoleted the alcohol torches. The heat from two wood matches was sufficient to initiate the generating process. Lamp at far left is typical of the gasoline table lamps made between 1916 and 1928. Also illustrated are the four-burner chandelier Quick-Lite and two-burner wall or bracket lamp. Fonts of nickel-plated brass and the black fibre hand grip of the table lamp are identifying features.



A major step in the evolution of the gasoline table lamp was the invention in the late 1920s of the rotary type generator which further simplified the lighting process and also kept the generator's orifice open. The lamp was the first in the Coleman Instant-Lite series, c1928.



Gasoline pressure lantern followed the appearance of table lamps and street lamps. The first of the Coleman lanterns (extreme left) was the Arc light made in 1914. Model A and AL torch lighting lanterns followed. The first of the match lighting lanterns, called Quick-Lites, shown third and fourth from left, were introduced during the latter years of World War I. Success of the Quick-Lite encouraged other lamp manufacturers to enter the field. Coleman Instant-Lite models, most of them with two burners, still are being made in quantity. Lantern at extreme right is a recent addition to the company's present line of gasoline and kerosene pressure lanterns. Other models currently in production include a miniturized gasoline lantern for back-packers and lanterns burning propane gas.

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