# 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.

Fig. 1.

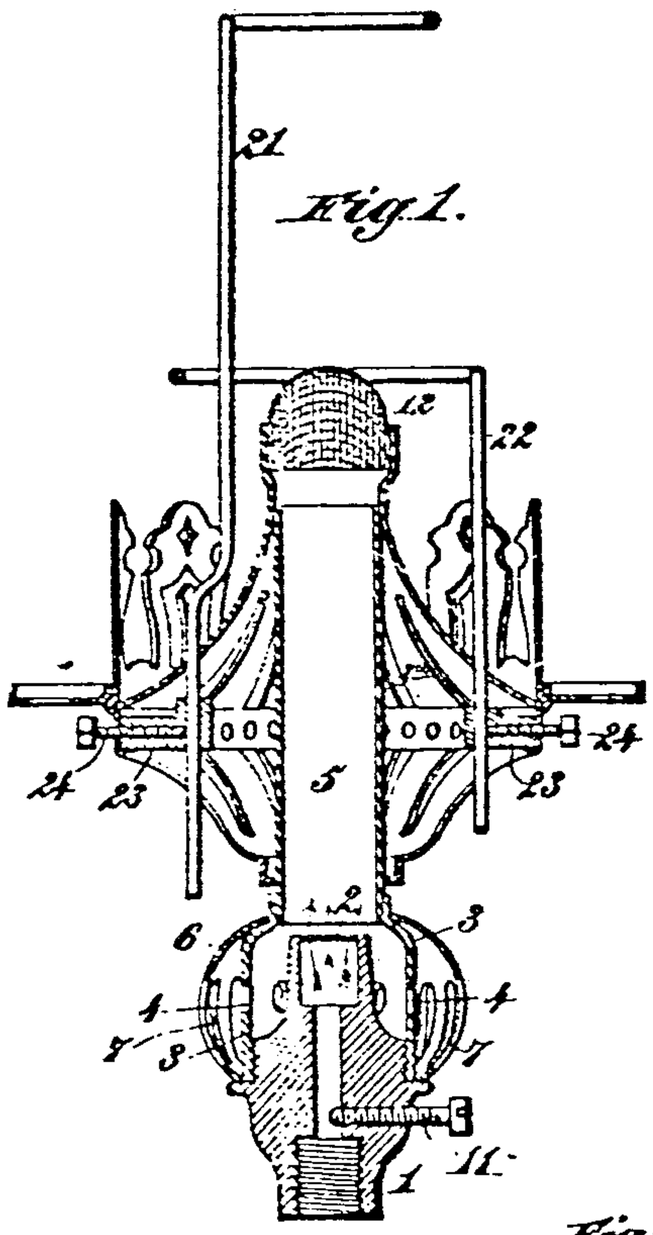



Fig. 2.

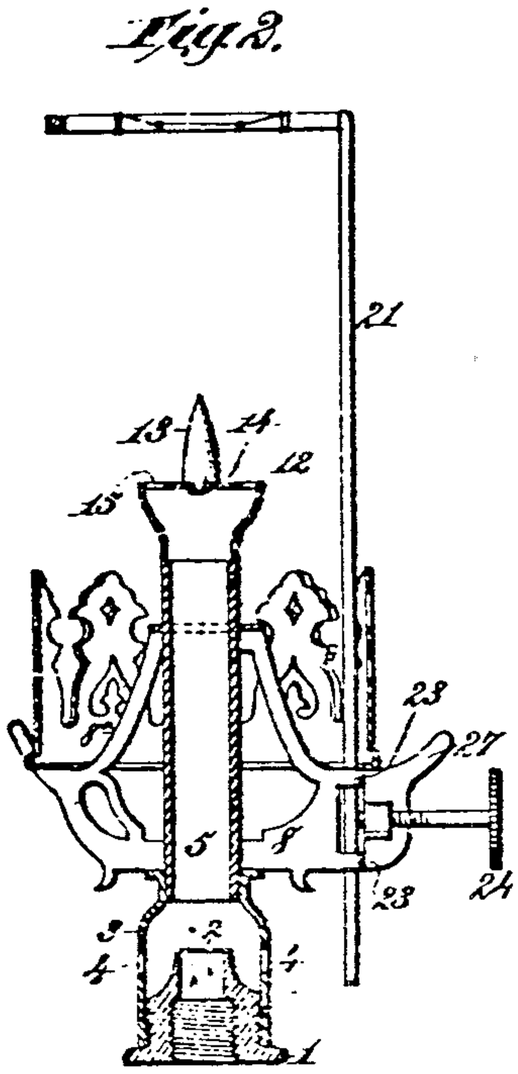



Fig. 3.

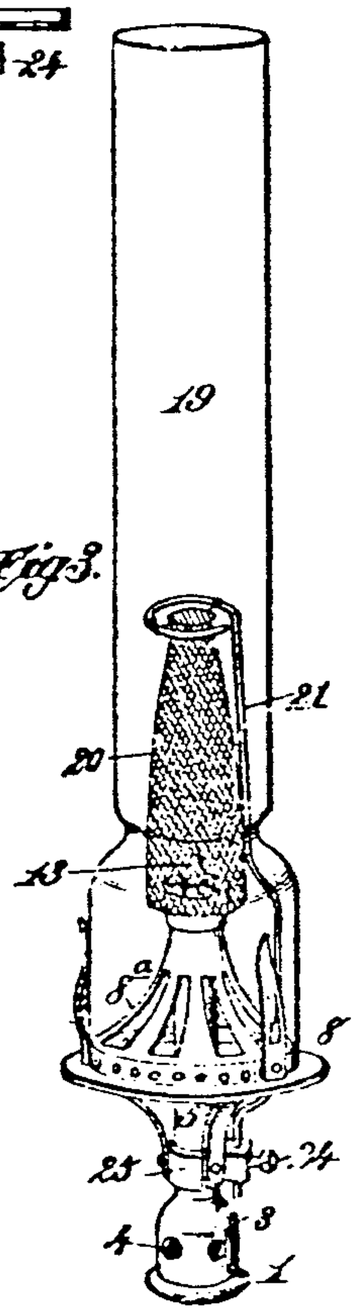



Fig. 4.

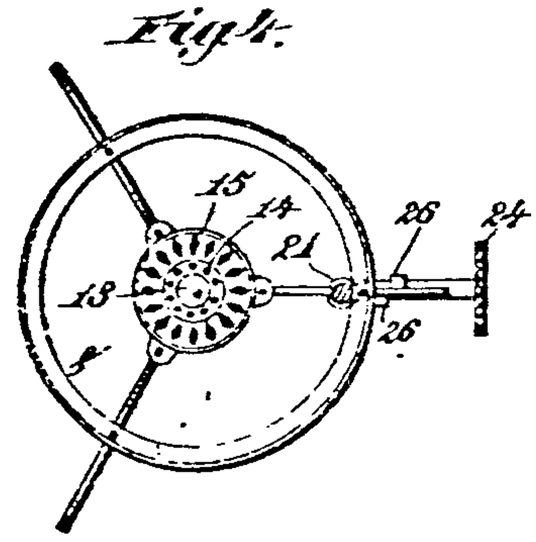
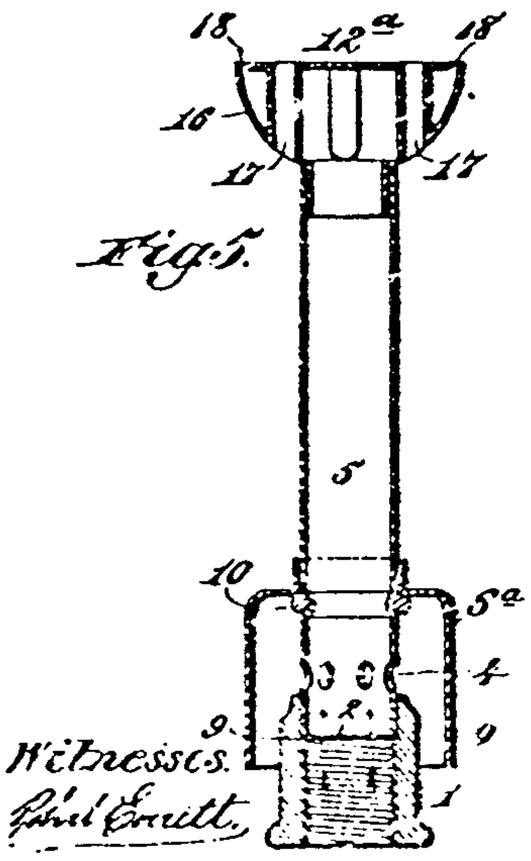



Fig. 5.




Witnesses:
Fred Gault.
Percy G. Mills

Inventor:
Carl Auer von Welsbach.
By
James L. Norris.
Atty.

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.

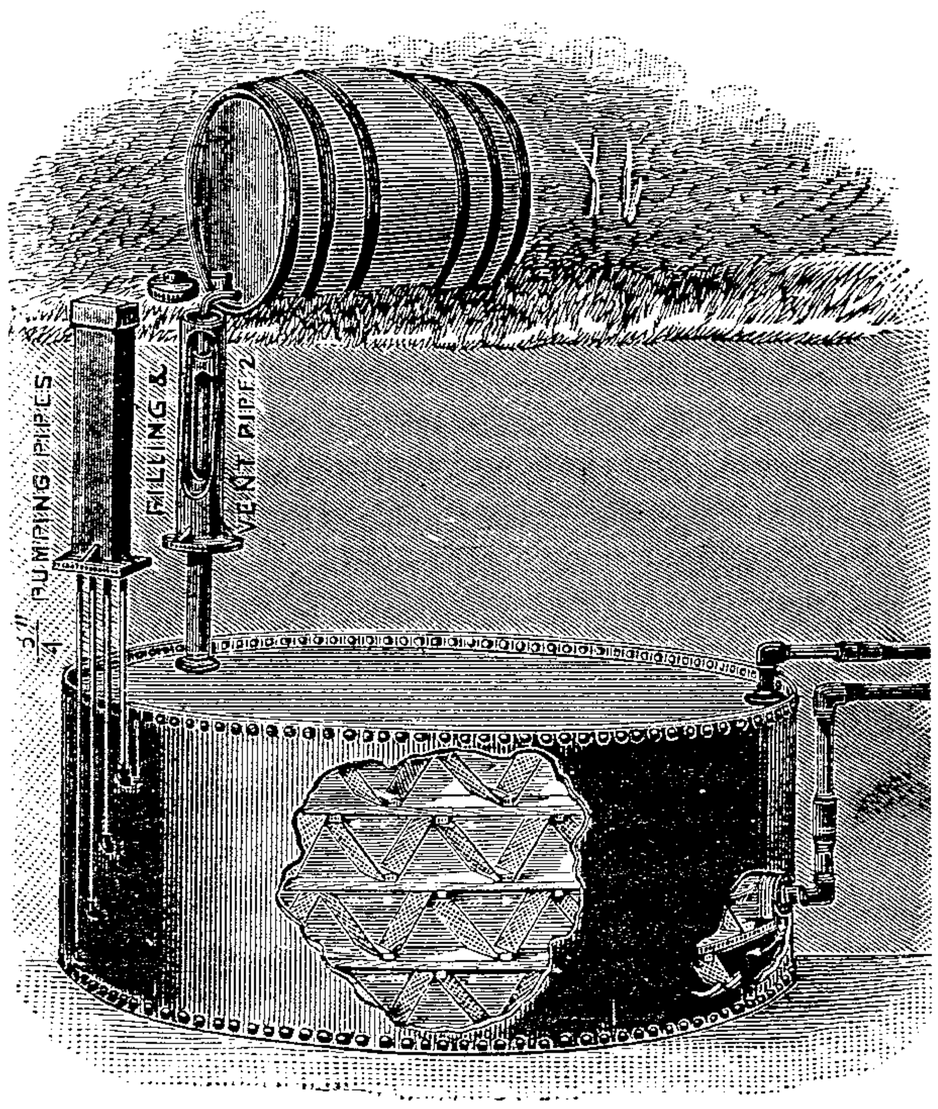
A classic example of the time was the Lucigen lamp[1] of two English inventors, Hannay and Lyle. It was based on the atomizing of combustible liquids by means of a current of compressed air. Heavy oil was forced through a burner where it was heated, thus producing a vapor. The result was broad, luminous 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.

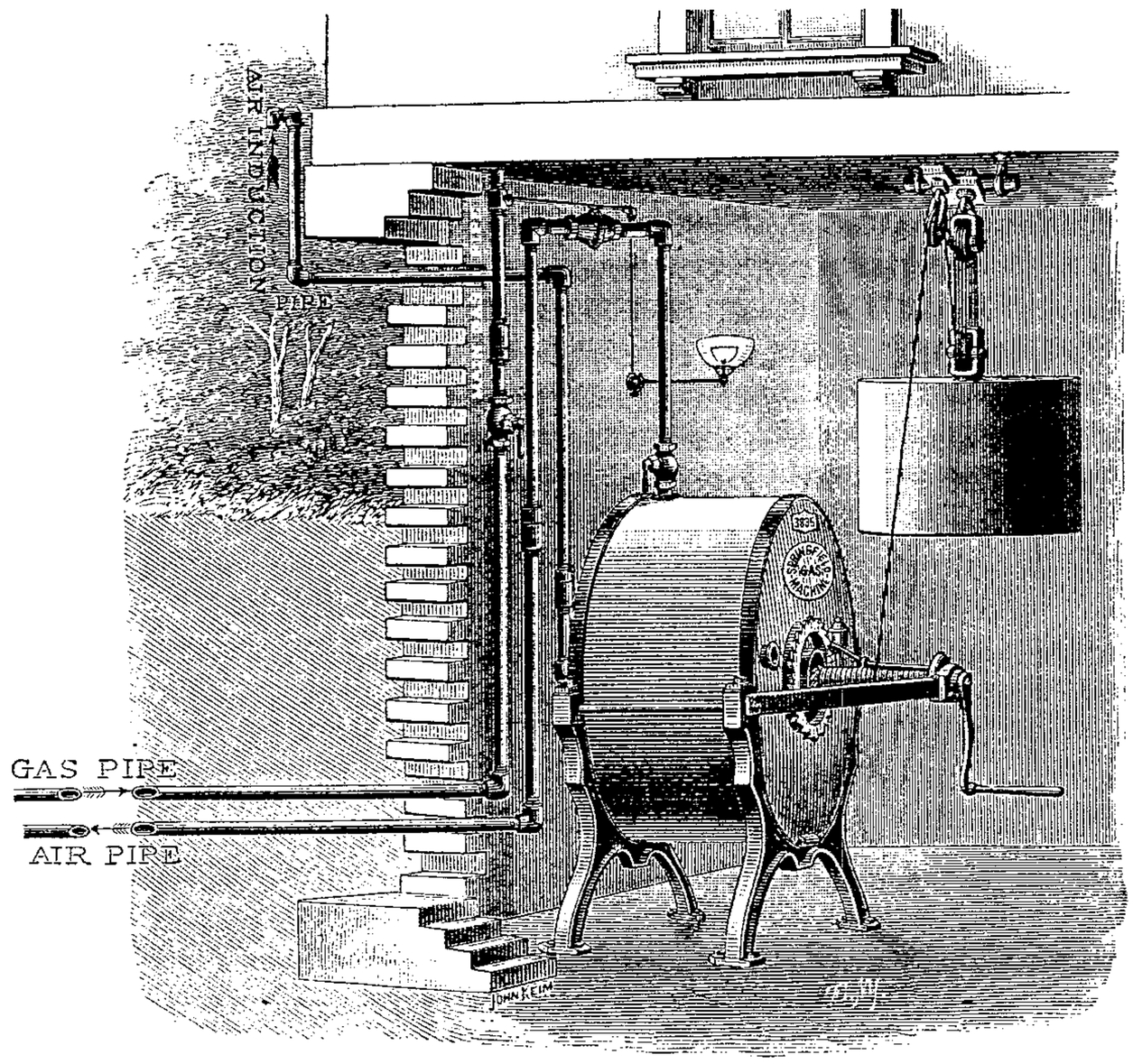
The impact of the Welsbach invention and the lighter weight burning oils, especially gasoline, undoubtedly influenced the development in the 1890s of gravity-type mantle lamps.

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.**