W. SMITH.

Apparatus for the Manufacture of Gas.

No. 218,585. **Patented Aug. 12, 1879.**

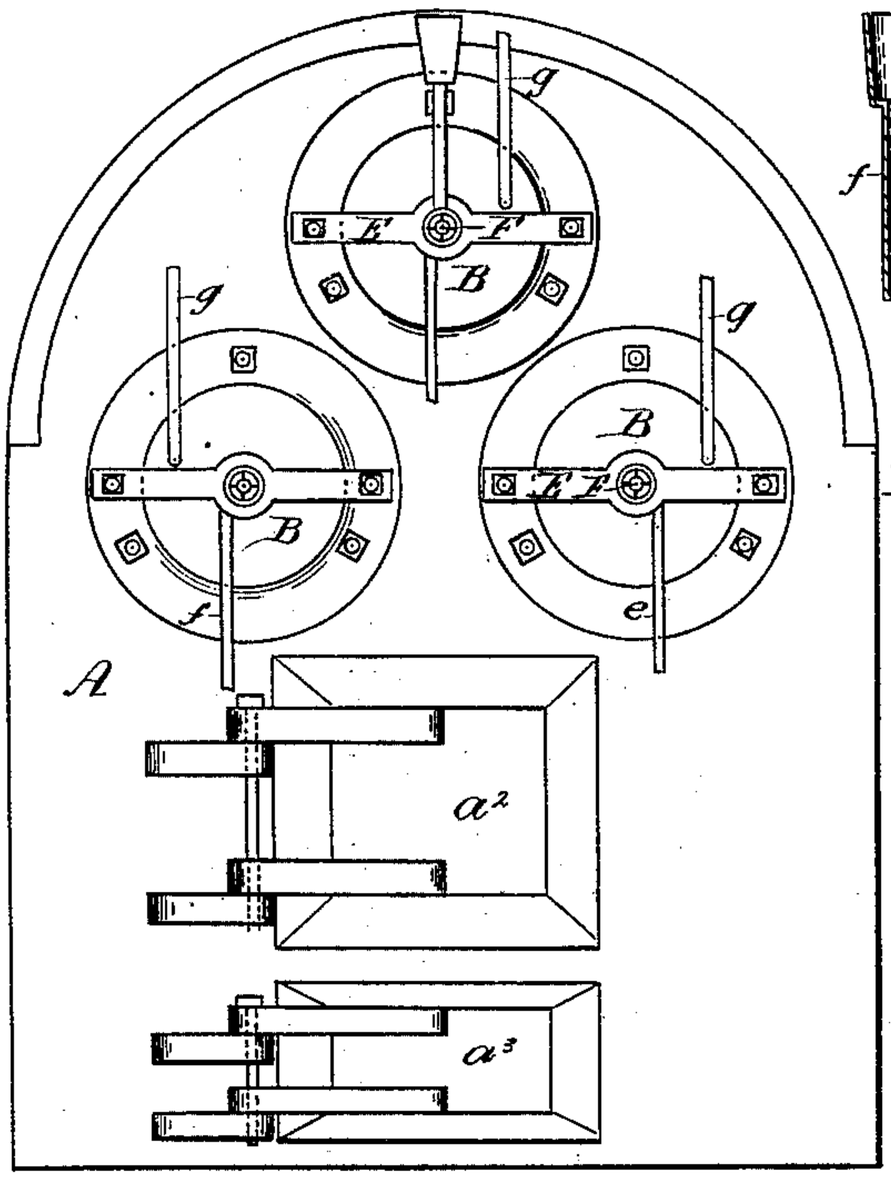

Fig. 1.

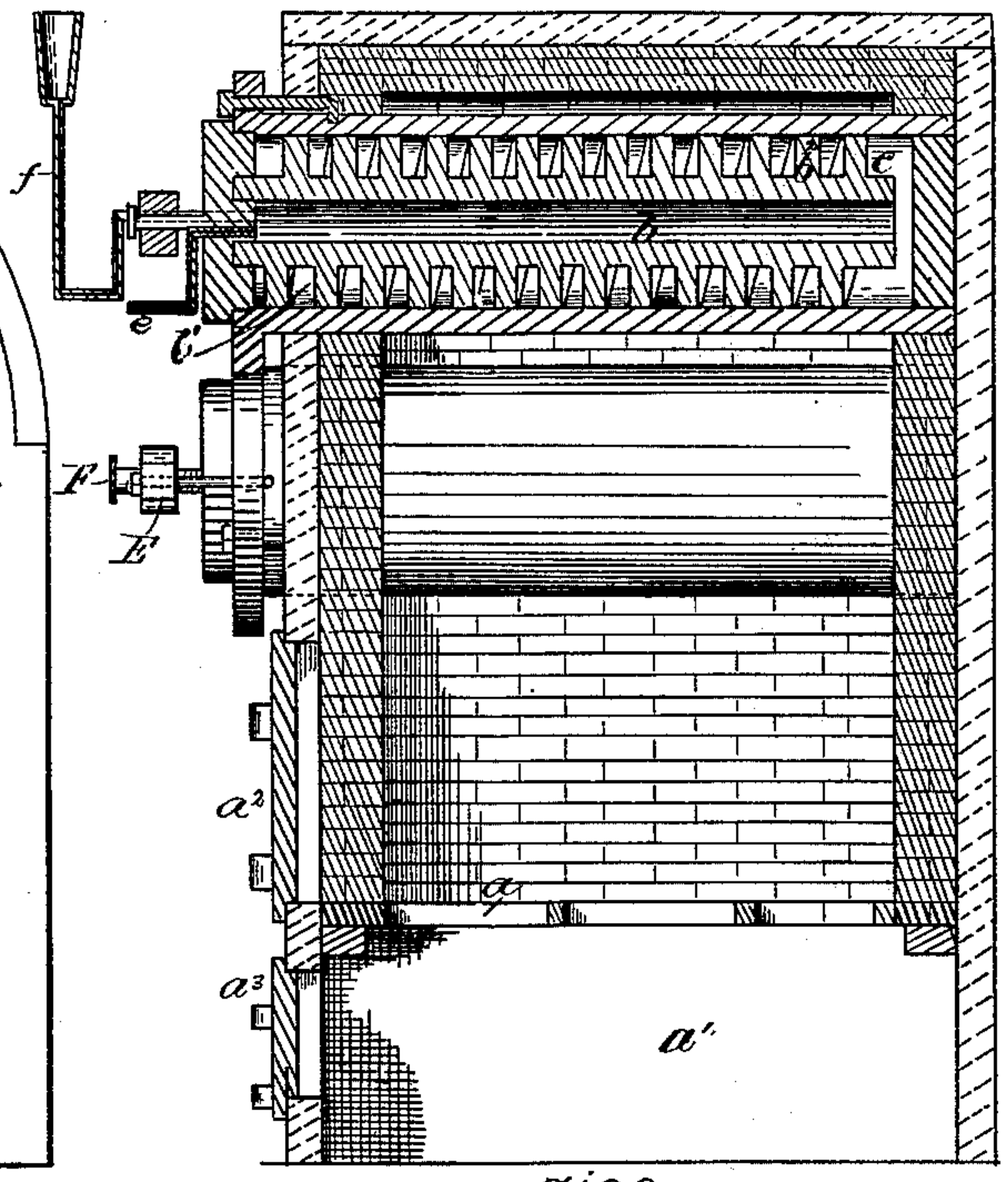

Fig. 2.

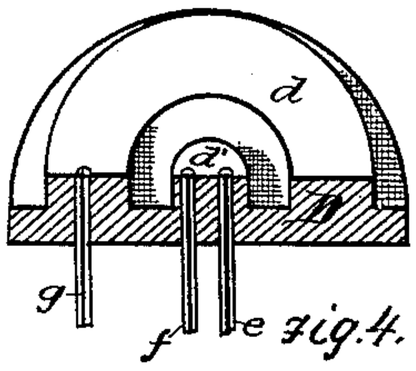

Fig. 4.

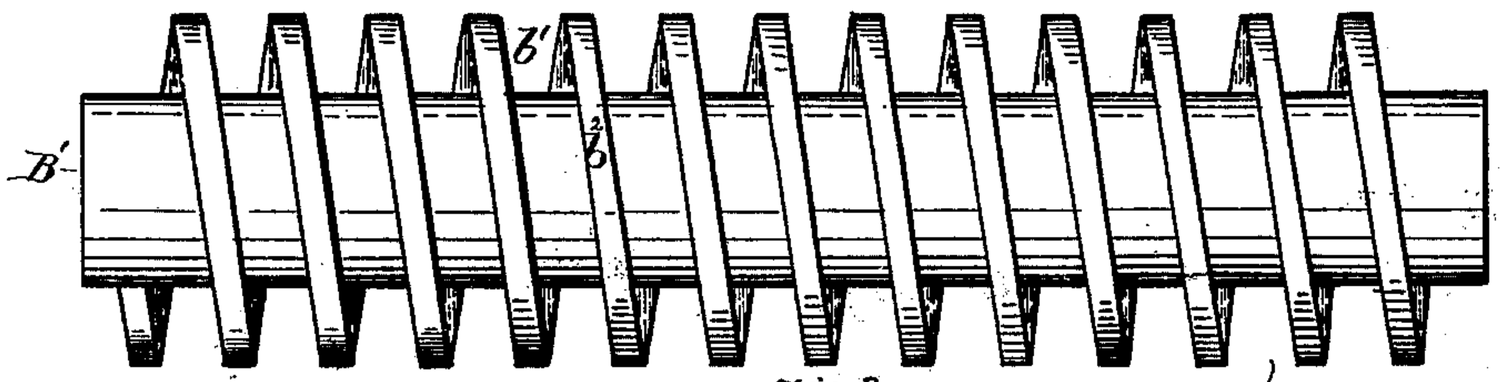

Fig. 3.

Witnesses

Alex. Scott

Chas. A. Emery

Inventor,

William Smith

by Bakewell & Kerr

Atty's

UNITED STATES PATENT OFFICE.

WILLIAM SMITH, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR THE MANUFACTURE OF GAS.

Specification forming part of Letters Patent No. **218,585**, dated August 12, 1879; application filed June 4, 1879.

To all whom it may concern:

Be it known that I, WILLIAM SMITH, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for the Manufacture of Gas; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of devices embodying my invention. Fig. 2 is a vertical central section of the same. Fig. 3 is a detached view of the retort center-piece. Fig. 4 is a detached view of the retort-cap.

Like letters refer to like parts wherever they occur.

My invention relates to the construction and arrangement of apparatus for the manufacture of gas; and consists, mainly, in the combination, with a retort having a detachable section with central passage, of a cupped or flanged cap, which confines the deposits of tarry residuum or carbonaceous matters to the central flue or passage of the detachable section, so that the same can readily be removed; and, secondarily, in details of construction and arrangements hereinafter more specifically set forth.

In the manufacture of gas as at present conducted there are produced several qualities—viz., what is termed "water-gas," resulting from the decomposition of water, either by subjecting steam to hot iron, or by subjecting the steam to hot coke or charcoal, the nature of the gas varying accordingly; "oil-gas," formed by vaporizing and subjecting the hydrocarbon oils to a high heat in suitable retorts; and a third gas, formed by subjecting steam and oil combined to high heats. Of these several gases the first is more generally used for heating purposes alone, while the second and third are used both for lighting and heating purposes.

Variable mixtures of the several gases are frequently required in the arts, especially in metallurgic furnaces, but heretofore have not been available, for the reason that separate furnaces and retorts were necessarily erected for the manufacture of each gas.

The object of the present invention is, first, to obtain such a construction of the retorts that they will be equally adapted for the manufacture of either or all of the gases specified, will be simple, easily cleaned, and effective in operation; and, secondly, to so arrange the series in a single furnace that each retort may be operated independently of the other, and the several gases produced at the same time.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates a suitable furnace, having a grate-surface, *a*, sufficient to properly heat three or more retorts, B. a^1 indicates the ash-pit, and a^2 a^3 the furnace and ash-pit doors. Within the furnace A are set three or more retorts, B, of any suitable cross-section, but preferably cylindrical, as shown. Arranged within each of said retorts B is a detachable section, B′, the cross-section of which corresponds to that of the retort, said sections consisting of a longitudinal central flue or passage, *b*, and a tortuous or spiral exterior flue or passage, b^1, formed by the spiral flange or rib b^2. The section B′ is somewhat shorter than the retort B, so as to leave a space or chamber, *c*, at the rear of the retort, by means of which the flues or passages *b* b^1 communicate. This section B′ may be formed in a single piece, or it may be composed of several mate pieces, as preferred.

D indicates a cap or cover for closing the end of the retort. This cover is formed with one annular or other shaped projection or flange, *d*, according to the cross-sectional shape of the retort, adapted to enter the space between the retort and the central flue or passage of section B′, so as to effectually seal or close the end of the retort, and also with a second projection or flange, *d′*, which enters the end of flue or passage *b*, thus closing the central flue, *b*, and preventing the escape of any tarry or carbonaceous residuum from the central flue of the detachable section. *e* indicates a steam-pipe, and *f* an oil-pipe, piercing the cover D at such points as will cause them to deliver into the central flue, *b*, while *g* is a pipe leading from the retort to the main, or directly to a gasometer, as the case may be.

In such of the retorts B as are to be used exclusively for the manufacture of water-gas

the oil-pipe *f* may be omitted, and in such as are to be used exclusively with oil the steam-pipe *e* may be omitted; but in the retort or retorts where both steam and oil are used the pipes *e f* are both inserted, and to obtain the best results should be arranged as shown—that is to say, with the steam-pipe opening into the retort below the oil-pipe, so that the steam may catch up, vaporize, and disperse the oil.

The cover or cap D will be provided with the usual or any approved form of cross-bar E and screw F, or equivalent means of securing it in position, and may be luted in the ordinary manner of securing furnace-doors, &c.

Each retort of the series will be provided with its own main and gasometer.

The retorts B and the sections B′ may be of fire-clay or metal, as desired; but for practical purposes I prefer to form the sections B′ of cast-iron. However, fire-clay sections B′ will answer very well for the retorts used for oil-gas; but cast-iron should invariably be used for water-gas.

The devices above described are used as follows: In manufacturing water-gas, the flue *b* of the retort is filled with iron turnings or like metallic substances, steam is admitted by pipe *e* to central flue or passage *b*, where it is highly heated and escapes into chamber *c*, thence into tortuous or spiral passages b^1, where it is brought in direct contact with the highly-heated walls of the retort and is decomposed, setting free hydrogen, or, if coke, charcoal, or other carbon has been used in the retort, forming a mixture of hydrogen, carbonic oxide, and carbonic-acid gases.

When an oil-gas is to be produced the oil is delivered by pipe *f* to the central flue, *b*, where it is vaporized. The vapor passes through chamber *c*, and the tortuous passage b^1 is brought uniformly in contact with the heated walls of the retort, and is converted into a fixed gas.

When both oil and steam are to be used in the manufacture of gas, the oil is admitted by pipe *f* and the steam by pipe *e*. The steam, vaporizing the hydrocarbon and mingling therewith, takes the same course through central passage, *b*, and outer passage, b^1, before specified, and is converted into a fixed gas.

Each of the three grades or qualities of gas thus produced is stored in a separate gasometer, whence they may be drawn through properly-arranged pipes, and used separately or mixed to produce a gas of any desired quality.

The advantages of my invention are the simplicity of the devices, the increased distance through which the gases are caused to travel in contact with the heated retort, the adaptation of the devices to the manufacture of either water-gas, oil-gas, or mixed gas, and the readiness with which the retorts can be cleaned.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a gas-retort, of a detachable section having a central flue or passage and a surrounding flue or passage, and a cap or cover having flanges upon its face which fit into the central flue and retort, substantially as and for the purpose specified.

2. The combination, with a gas-retort, of the section B′, having central flue, *b*, and flue or passage b^1, a cap or cover, D, having flanges *d d′*, and the oil and steam pipes *e f*, substantially as and for the purpose specified.

3. The combination, with a gas-retort, of the section B′, having a central flue or passage and a surrounding flue or passage, a cap or cover which closes the end of the central flue of section B′, an oil or steam delivery pipe which delivers into the central flue or passage of section B′, and a gas-exit pipe which leads from the surrounding flue or passage of section B′, substantially as and for the purpose specified.

In testimony whereof I, the said WILLIAM SMITH, have hereunto set my hand.

WILLIAM SMITH.

Witnesses:

F. W. RITTER, Jr.,

A. C. JOHNSTON.