

(No Model.)

A. L. ALLEN & G. W. HARRIS.

METHOD OF AND APPARATUS FOR MANUFACTURING GAS.

No. 309,916.

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Fig-1.

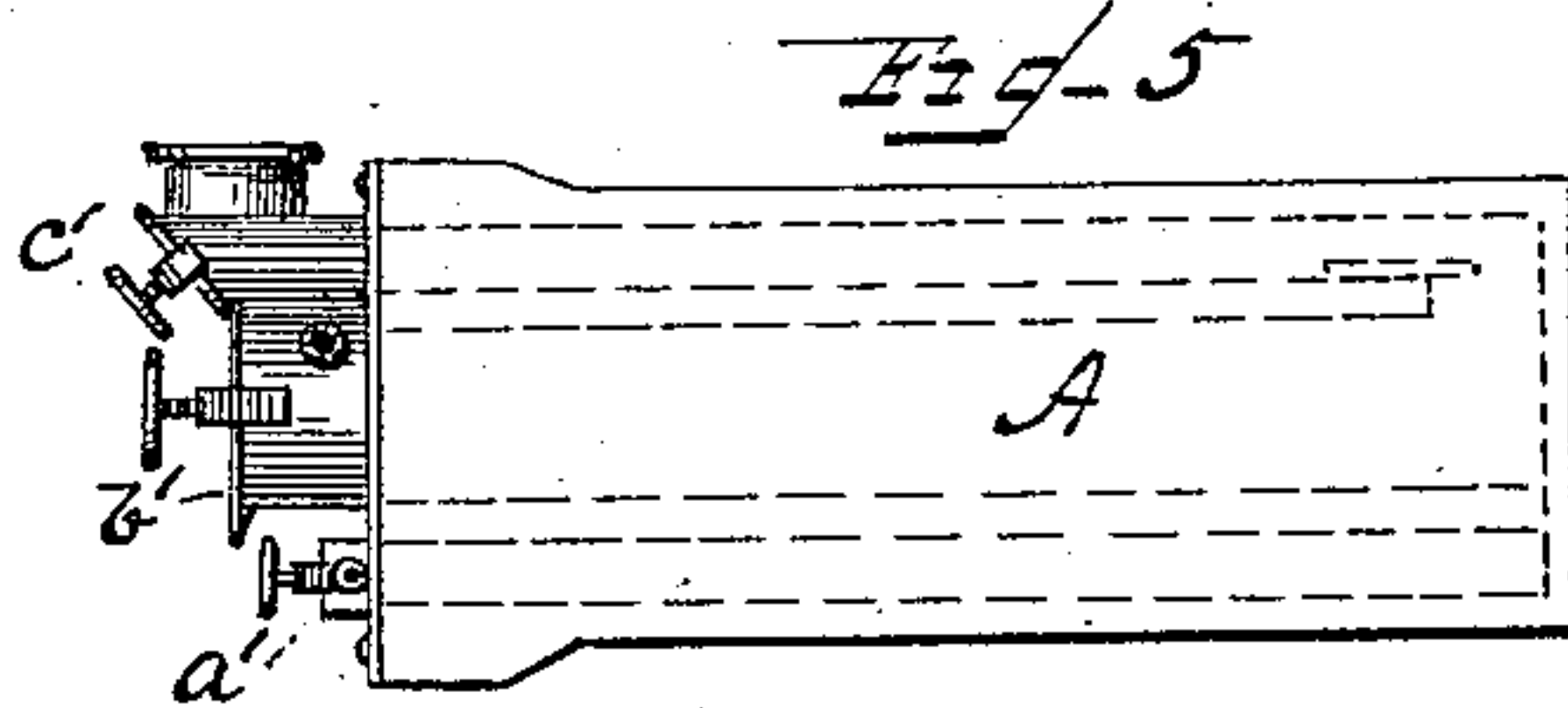
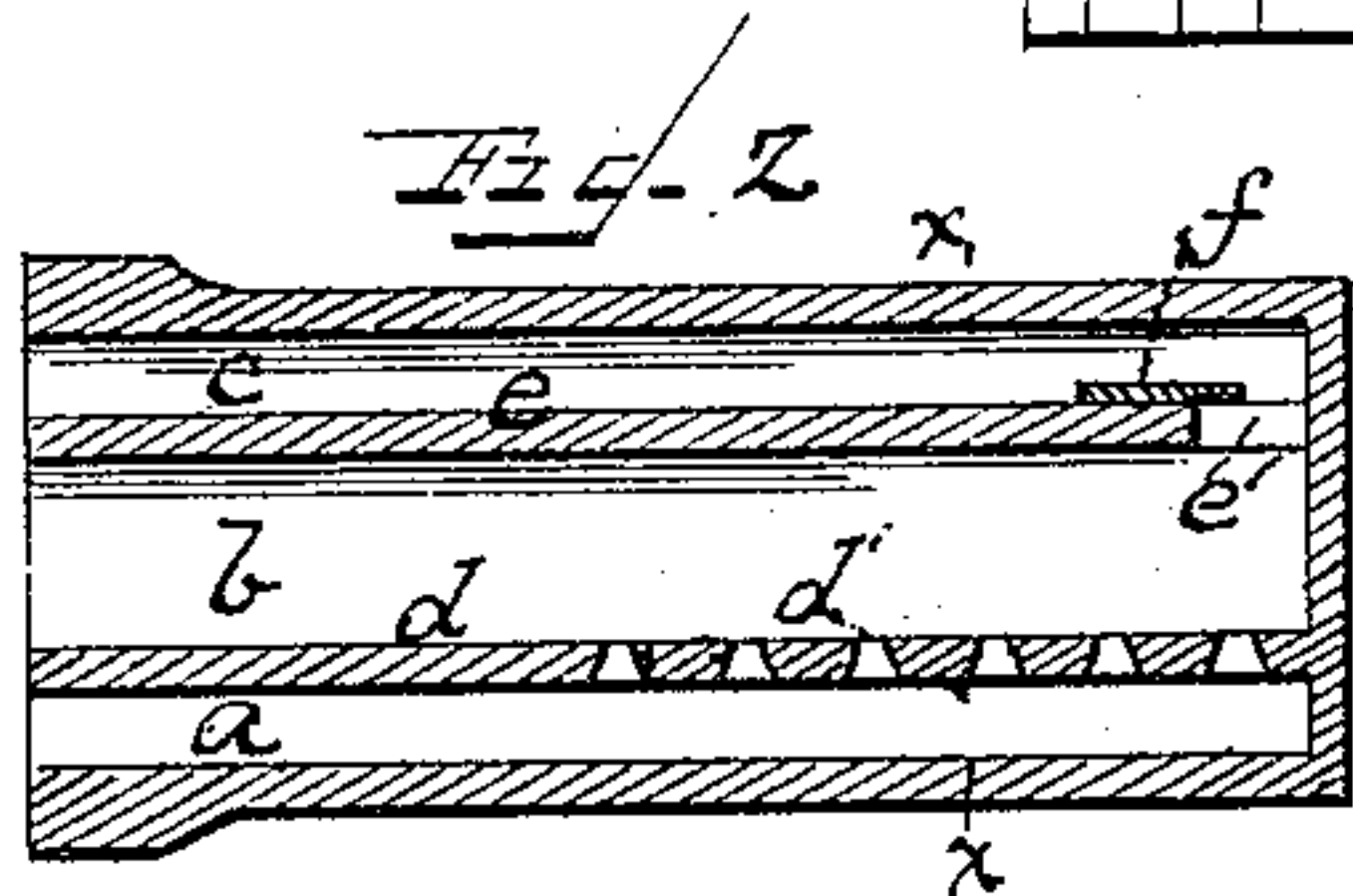
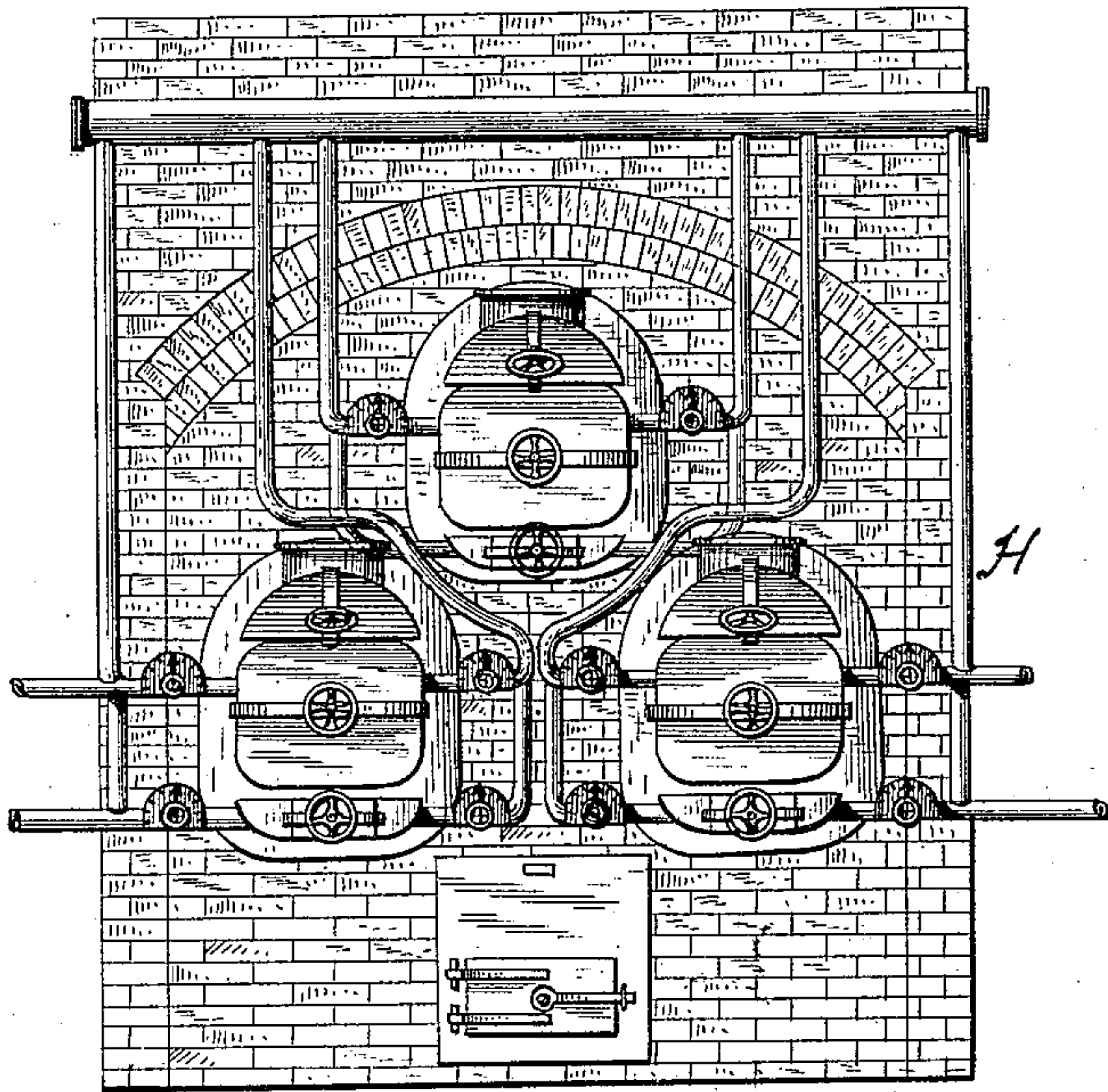


Fig-3

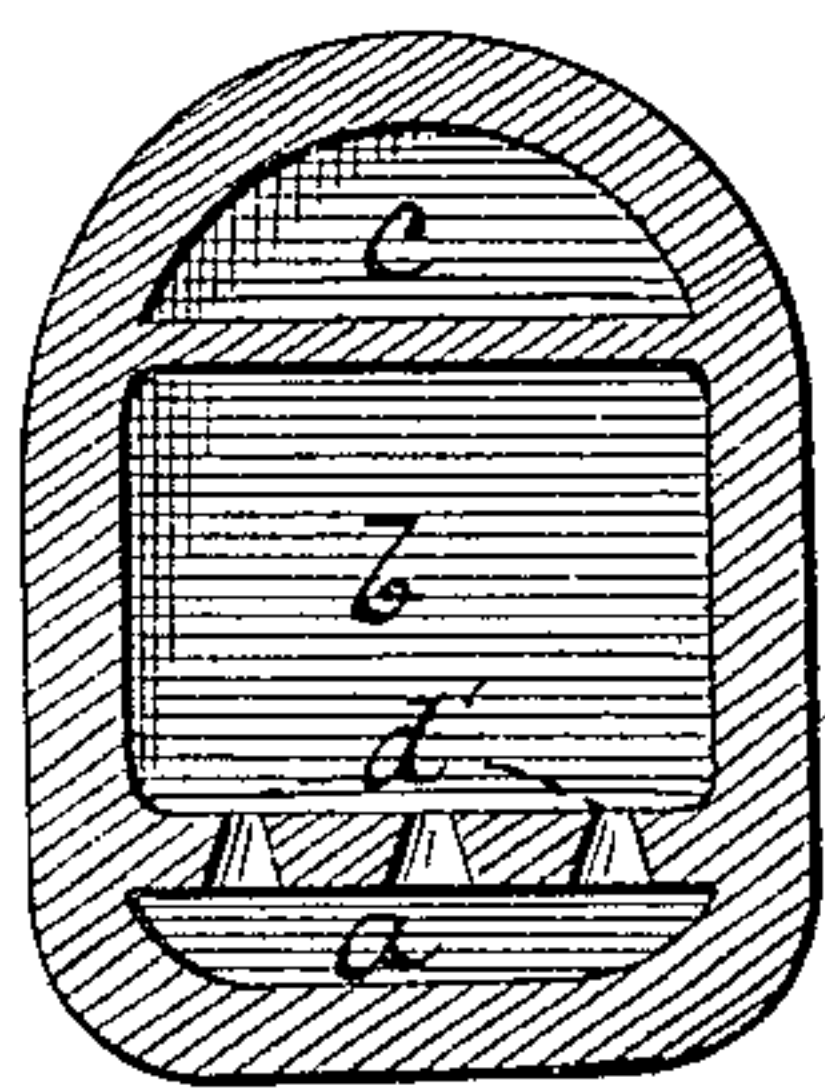
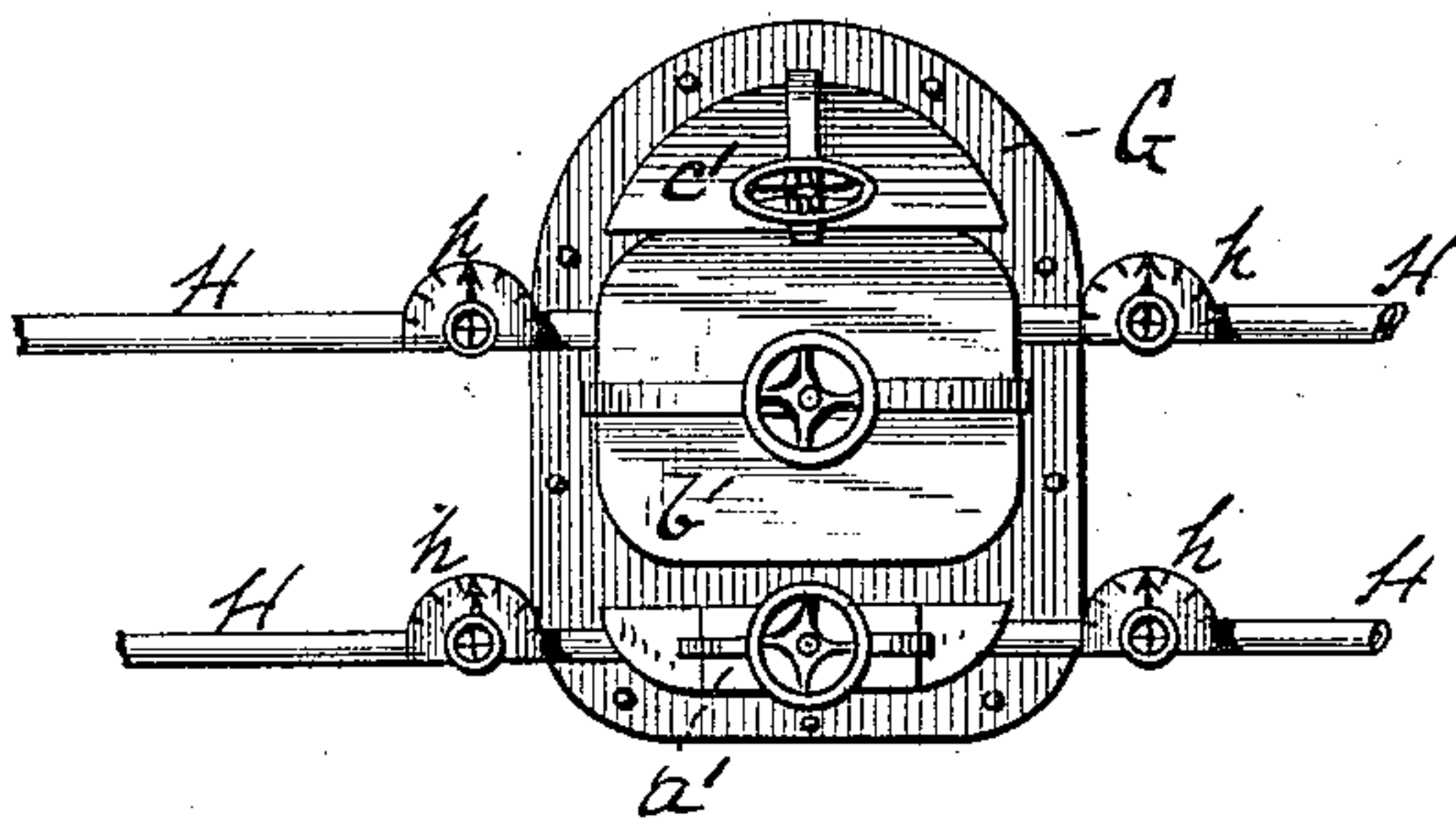


Fig-4



WITNESSES

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 309,916, dated December 30, 1884.

Application filed July 21, 1884. (No model.)

To all whom it may concern:

Be it known that we, AUGUSTUS L. ALLEN, residing at Poughkeepsie, in the county of Dutchess, and GEORGE W. HARRIS, residing at Rondout, in the county of Ulster, both in the State of New York, have invented certain new and useful Improvements in Methods of and Apparatus for Manufacturing Gas; and we hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of the same, wherein—

Figure 1 is a front elevation of a bench of three retorts embodying our improvements. Fig. 2 is a longitudinal central section of one of the retorts, showing the construction thereof. Fig. 3 is a transverse section on the line $x x$, Fig. 2. Fig. 4 is a front elevation, showing the mouth-piece, and Fig. 5 is a side elevation, also showing the mouth-piece.

Like letters refer to like parts wherever they occur.

Our present invention relates to the manufacture of gas by what is known as the "Allen-Harris or American Hydro-Carbon Process," which, generally stated, consists in the decomposition of steam in the presence of incandescent carbon—as, for instance, anthracite coal—whereby water-gas or hydrogen and carbonic oxide are obtained in large volumes, which is subsequently carbureted by means of liquid hydrocarbons or the highly-bituminous coals in the presence of high heats to obtain an illuminating-gas of high candle-power.

The object of the present invention is to insure the immediate and perfect saturation of the rapidly-volatilizing hydrocarbons by the water-gas in the carbureting stage of the process, so as to prevent carbon being deposited in the retort, or being carried off in the form of soot and tar, for want of the full supply of a permanent gas to absorb the volatile hydrocarbon vapors, and to avoid the loss consequent thereon.

We will first describe the apparatus devised by us, so as to enable others skilled in the art to construct suitable apparatus for the purpose, and then indicate the manner of operat-

ing the apparatus, so that others may apply the method either with the same or equivalent means.

As the decomposition of the steam and the manufacture of the hydrogen and carbonic oxide, usually called "water-gas," forms no part of the present invention, it may be accomplished in manner and by means pointed out in prior patents granted to us, or by any approved method and means.

Our apparatus, which is intended for the carbureting stage of the process of manufacture, consists of a retort, A, which may be set in benches of three, five, or more, according to the desired size of the works, in the usual or any approved manner, as indicated by Fig. 1 of the drawings. The retorts A are usually of fire-clay, of any desired shape or size, and each retort is divided into three chambers, a , b , and c , by two diaphragms, d and e . The lower diaphragm, d , extends the whole length of the retort, and is perforated at intervals along the rear two thirds (more or less) of its length by parallel rows of slots d' , which are of general rectangular form, so as to be readily cleaned by the cleaner when moved backward and forward in the retort. Round holes do not serve the purpose well, as they become filled, clog up, and obstruct the free passage of the gas from the chamber a to chamber b . These slots d' are preferably longer below than above, so as to permit of ash which enters the slot falling readily into chamber a , whence it can be removed. This form also facilitates the passage of the gas upward. The upper diaphragm, e , is imperforate, and extends to within a short distance of the rear end of the retort, leaving a throat or port, e' , through which the gas escapes from the rear of chamber b into the rear end of chamber c .

Arranged on the upper diaphragm, e , is a sliding tile, f , which is employed to control the size of the port or passage e' , or to close the same entirely, if desired. This tile may be moved by a suitable rod, either independent thereof or attached thereto, as preferred. The front of the retort is provided with a single mouth-piece, G, having three independent openings corresponding to the several cham-

bers, and closed by caps or doors *a' b' c'*, of appropriate form, which may be secured by the usual yokes and screws, or in other suitable manner. In the upper end of the mouth-piece
 5 G is the usual bell for the reception of a stand-pipe, of which each retort has its own.

H indicates the pipes for conducting the water-gas to the carbureting-retorts. Each branch H may be provided with an index-valve, *h*, so that the volume of gas passing
 10 can be gaged to meet the requirements of the case. Of these pipes one or more deliver into the front end of chamber *a* and one or more into the front end of chamber *b*. The object
 15 of this arrangement is first to insure that the water-gas admitted to chamber *a* has a preliminary heating before it rises into chamber *b*, and this is accomplished by only perforating the rear two-thirds, and, secondly, to in-
 20 sure that the volatilized hydrocarbon in the front part of chamber *b* shall receive a full supply of water-gas before its form is changed by the action of the high heat to which it is exposed.

25 We will now, for purpose of illustration, and in order to facilitate the construction of like devices by others, indicate some proportions of the parts which we deem advantageous, but disclaim any intention of limitation
 30 thereto. For instance, the lower diaphragm, *d*, may be placed four (4) inches (more or less) from the bottom of the retort, so that the chamber *a* can be readily cleaned by the introduction of a suitable tool. The apertures or
 35 slots *d'* may be three-eighths ($\frac{3}{8}$) of an inch wide, one (1) inch long on the upper side, and somewhat larger on the under side. The second diaphragm, *e*, may be placed fourteen (14)
 40 inches (more or less) in the clear above the diaphragm *d*, and seven (7) inches (more or less) below the top of the retort, so as to form a large middle chamber, *b*, for the reception of bituminous coal or other carbonaceous material employed, and an upper or perfecting
 45 chamber, *c*, of sufficient size to accommodate the increased volume of gas. The port or passage *e'* may be the width of the retort, and twelve (12) inches across.

The apparatus being of substantially the
 50 character hereinbefore specified, and set in the bench in the usual manner, is first properly heated and the middle or carbureting chamber, *b*, is charged with bituminous coal or other carbonaceous substance, (the apparatus being more particularly intended for rich
 55 cannel-coal,) the lids *a' b' c'* are closed, and the index-valves *g* are opened to admit the desired volume of water-gas to the front of chambers *a b*. That which enters the front
 60 of chamber *a* passes back, becoming highly heated, and flows in streams through the slots *d'* into and through the body of the incandescent carbon in the rear two-thirds of chamber *b*, while that which is admitted into the front
 65 of chamber *b* saturates the volatile carbons given off in the front third of chamber *b*, and

passing back unites in the rear of the chamber with the body of the gas, &c., passing by the throat or port *e'* into the rear or perfecting chamber, *c*, through which it travels to the
 70 front of the chamber and enters the stand-pipe.

By means of the index-valve the volume of water-gas may be regulated to just the amount required to saturate the volatile hydrocar-
 75 bons given off by the quality of carbonaceous matter in chamber *b*, and by means of slide or damper *f* the port or throat *e'* may be widened or narrowed to retard or facilitate the flow of gas into the perfecting-chamber *c*, and
 80 to maintain any desired pressure in chamber *b*. By removing any one of the lids *a' b' c'* entrance can be obtained to the corresponding chamber to alter the position of the valve
 85 *f*, to draw and renew the charge of carbonaceous matter in chamber *b*, or to clear ash and debris from chamber *a* without disturbing the other chambers.

We are aware that in the manufacture of illuminating-gas water-gas, hydrogen, carbonic oxide, or marsh-gas has been introduced
 90 beneath and passed upwardly through a highly-heated or distilling mass of coal, so as to become charged by the hydrocarbon vapors given off from the coal, and do not herein claim
 95 such subject-matter; but we are not aware that in addition thereto a stream of water-gas has been passed over such a charge of coal at the same time that a second portion of non-illuminating gas was passed through the dis-
 100 tilling mass, so that the gas passing over should relieve the gas passing through of its excess of hydrocarbon vapors, and thus prevent the formation of fixed carbon and consequent loss; and therefore,
 105

Having thus set forth the nature, advantages, and operation of our invention, what we claim, and desire to secure by Letters Patent, is—

1. A fire-clay retort having an ash-chamber
 110 below, an intermediate carbon-chamber separated from the ash-chamber by a diaphragm which is perforated at intervals along its rear half or two-thirds, and an upper perfecting-chamber which is separated from the inter-
 115 mediate carbon-chamber by a diaphragm having a valved port at its rear end, substantially as and for the purposes specified.

2. A fire-clay retort having a diaphragm integral therewith, said diaphragm having
 120 rows of perforations at intervals along its rear two-thirds, substantially as and for the purpose specified.

3. A retort having a diaphragm perforated by rows of parallel elongated slots which are
 125 larger on the under surface than on the upper surface of the diaphragm, substantially as and for the purposes specified.

4. A retort having a perforated ash-chamber, a carbon-chamber, and a superimposed
 130 perfecting-chamber, said carbon and perfecting chambers separated by a diaphragm hav-

ing a valved port at the rear of the retort, substantially as and for the purposes specified.

5 5. The combination, with a retort having two diaphragms which divide it into three communicating chambers, of two or more induction-pipes or sets of pipes, part of which deliver into the front of the lower chamber, and part of which deliver into the front of the middle chamber, substantially as and for the
10 purposes specified.

6. The method herein described of carburizing water-gas, which consists in passing one portion thereof in divided streams through a mass of incandescent carbon, while another

portion thereof is simultaneously passed over 15 the mass, whereby all the free volatilized matter is saturated with the water-gas before its form is changed by the action of the intense heat, substantially as and for the purposes specified. 20

In testimony whereof we affix our signatures, in presence of two witnesses, this 18th day of July, 1884.

AUGUSTUS L. ALLEN.
GEORGE W. HARRIS.

Witnesses:

C. H. VAN GAASBEEK,
H. W. TIBBALS.