(No Model.)

O. N. GULDLIN.

WATER GAS APPARATUS.

No. 529,262. Patented Nov. 13, 1894.

Fig. 1.

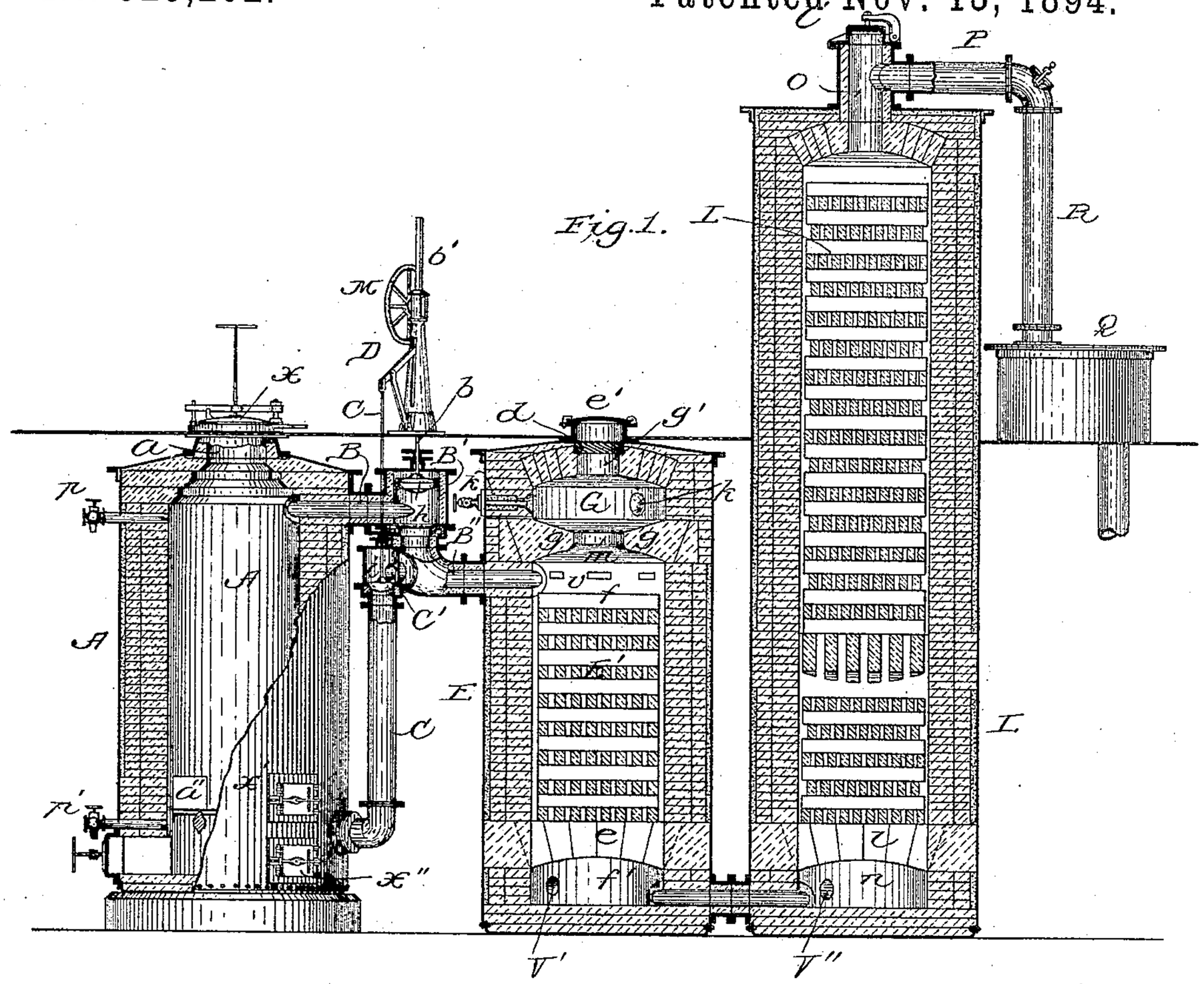


Fig. 2.

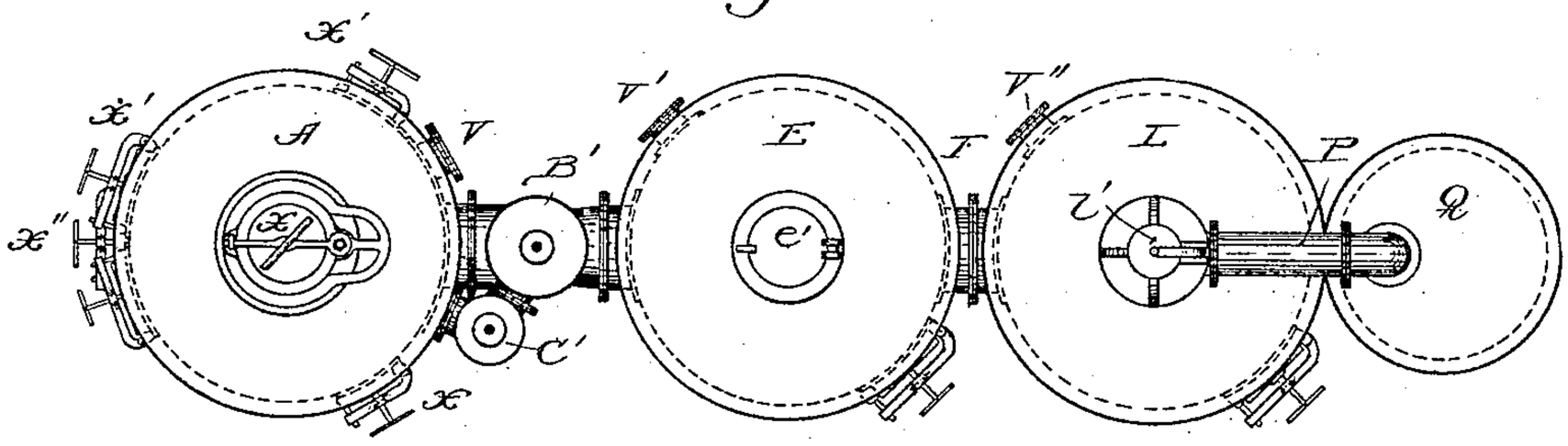
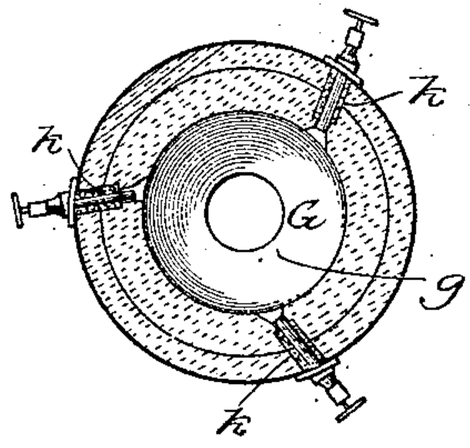


Fig. 3.



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WATER-GAS APPARATUS.

SPECIFICATION forming part of Letters Patent No. 529,262, dated November 13, 1894.

Application filed August 14, 1894. Serial No. 520,295. (No model.)

To all whom it may concern:

Be it known that I, OLAF N. GULDLIN, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Water-Gas Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus for manufacturing illuminating water-gas, constructed in three separate chambers or shells; and more particularly the invention relates to improvements in the carbureting and fixing chamber, located between the generator and the usual superheater or fixing chamber. The two chambers of the superheater (sometimes termed the double superheater) are preferably set upon the same level with the generator, and in this form, are frequently the most effective and satisfactory in operation.

The object of my invention is to provide for vaporizing and gasifying the hydrocarbon oil, at a comparatively low temperature, and then mixing such vapor or gas with water-gas, in such a way that the current of water-gas will completely envelop and protect the oil gas, preventing the oil globules or atoms from being split up or overcracked, from heavy to light hydro carbon, so that a better illuminating gas will be formed, and the formation of lamp black and hard carbon avoided.

Another object of my invention is to provide for protecting the oil supply pipes or injectors from being injured by excessive heat, and also to protect the brick checker work from accumulations of hard carbon, ashes, &c., which are apt to accumulate and clog up the passages between the brick.

Heretofore the carbureting chamber and the fixing chamber have been constructed in separate shells in connection with a water-gas generator, but the method therein used for supplying oil to the carbureting chamber and vaporizing or gasifying it for mixture with the water-gas, was defective, being wasteful of the oil and destructive of the brick checker work, for the reason that the top of the carbureting chamber was heated to an excessively high temperature by combustion of the hot producer-gas at that point; also the oil was sprayed, by means of a vertically and centrally arranged injector, directly down against the checker brick, resulting in rapidly destroying the brick, and also producing lamp black and hard carbon, which, together with ashes, blown from the generator, caused the spaces between the bricks to be obstructed and rendered useless. In carrying out my invention, I overcome these difficulties and produce greatly improved results, as will be pointed out below in connection with the drawings.

The details of construction of my improvements are illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical section of a three-chambered gas generating apparatus, with parts in elevation, and showing my improvements. Fig. 2 represents a top plan view of the same. Fig. 3 represents a horizontal section through the oil vaporizing and heating chamber on the plane of the oil injectors.

The improved pipe and valve connections and valve operating mechanism, between the top and bottom of the generator and the top of the carbureting and fixing chamber, shown in the accompanying drawings, are covered by my patent, No. 510,506, dated December 12, 1893.

The gas generating furnace, A, is of the usual construction, and is provided at the top with a fuel opening, a, closed by a lid, x, and at the bottom by the usual ash and clinker openings, a' and a'', closed by doors, x' and x''. It is also provided at top and bottom with steam supply pipes p and p', and with the air pipe V (Fig. 2) connecting with the ash-pit. The gas escape pipes B and C, connecting respectively at top and bottom of the generator, are provided with valve boxes B′ and C′, which connect by a pipe B″, with the combustion chamber, f, in the carbureting and fixing chamber E. A cylindrical valve chamber B′, is connected between the eduction pipe B and the delivery pipe B″, and is preferably provided with an annular hollow valve seat for the conical or hemispherical valve, h. The lower gas eduction pipe, C, is provided with a cylindrical valve chamber, C′, having a suitable valve seat and a valve,

i, and said valve chamber connects by a short pipe with the delivery pipe B″. The valves, *h* and *i*, are connected respectively by rods, *b* and *c* with a suitably fulcrumed-lever D; and the rod, *b*, is formed at its upper end with a rack-bar, *b′*, with which engages a pinion connecting by a shaft with the hand wheel, M, for raising and lowering the valves *h* and *i*,—the construction being such that when one valve is lowered upon its seat, the other valve will be raised off from its seat, so as to always insure a free passage for gas through one of the eduction pipes to the carbureting and fixing chamber.

My carbureting and fixing chamber, E, is constructed with an open brick work arch, *e*, near its bottom, forming the bottom chamber, *f′*, and serving to support the brick checker work, E′ above it; and chamber E is provided near the top with a brick arch or partition, *g*, forming an inclined annular hearth or floor for the upper vaporizing and heating chamber G, and containing a central opening, *m*. The partition or floor, *g*, is preferably composed of large brick extending inward from the circumferential walls, so as to form the comparatively large central openings, *m*. The upper surfaces of the bricks forming partition *g*, are inclined downward from the sides of the chamber toward the central opening for conducting any oil which may be admitted in chamber B down to the central opening and thence on to the checker brick, E′, below. A combustion chamber, *f*, is formed between the checker brick E′, and the partition, *g*, and is provided in its side walls with air ports, *v*, and the gas inlet pipe B″. Chamber G, is provided at the top with a central vertical opening or passage, *g′*, which, in practice, is closed by a tile *d* and a tight fitting lid, *e′*.

The oil supply pipes or injectors, *k*, are placed horizontally in the walls of chamber G, and, as shown in Fig. 2, are arranged tangentially, or at an angle to the circumferential wall, so as to give to the jet of oil a whirling motion in chamber G. With this construction, the oil spray will circulate around in the chamber and become heated and vaporized or gasified, after which it will flow down through the central opening, *m*, into chamber, *f*, and there be enveloped and absorbed by the water-gas flowing in through pipe B″.

In the old form of carbureting chamber, now generally in use, the oil injector is set vertically at the center in the top or crown of the superheater or fixing chamber and just at the top of the combustion chamber, so that it was rapidly burned out and destroyed by the heat of the burning producer-gas, the flames of which impinged directly upon it. In my improved construction, the oil injectors being set horizontally in the circumferential wall of the vaporizing chamber, are protected from injurious heat, and are further protected by the annular floor or partition, *g*. The top central opening, *g′*, closed by tile *d*, gives access to the oil vaporizing and heating chamber without disturbing the oil injectors, so that the chamber can be readily examined, cleaned and repaired, which is of great advantage in practical operation.

The bottom chamber, *f′*, of carburetor E, is connected by pipe F, with the bottom chamber, *n*, of the usual superheater or fixing chamber L. The superheater, L is provided with the usual open brick arch, *l*, near the bottom, supporting the checker brick above in a well known manner, and it is provided at the top with a short smoke stack, *o*, having a tight fitting lid, *l′*. The gas take-off pipe, P, connects with stack, *o*, and extends down into the water-seal chamber, Q. An air supply pipe V′ connects through the ports *v* with the combustion chamber *f*, at the top of chamber E, and a second air supply pipe V″ connects with chamber *n* at the base of fixing chamber L.

The operation is as follows: A fire is kindled on the grate, and it is fed with hard coal or coke until a deep body thereof is heated to incandescence. So soon as combustible producer-gas is given off from the bed of fuel, such gas is passed through pipes B and B″, into chamber, *f*, where it is burned by jets of air admitted through ports, *v*, and the products are passed down through the checker brick E′, and thence through pipe F, into the bottom chamber *n*, of the superheater or fixing chamber L, and finally escapes through stack, *o*, lid, *l′*, of which is open. Additional air may be admitted into the gaseous products through pipe V″ in chamber *n*. The oil vaporizing and heating chamber G is heated by radiant heat from the combustion chamber *f*. below, and is heated to a sufficient degree to properly vaporize and partially gasify the hydrocarbon oil without destructively decomposing it or cracking the globules of heavy oil into lighter hydrocarbon. The body of fuel having been heated to incandescence and the two chambers containing checker-brick, having been heated to the desired temperature, the air blasts are shut off, lid, *l′*, at the top of superheater L is closed, and water-gas is now generated by admitting steam, either at top or bottom of the generator, and the resulting water-gas is passed off through one of the eduction pipes B or C and the delivery pipe B″, into chamber *f*, of the carburetor and fixing chamber E. At the same time oil is forced, under pressure, through the injectors, *k*, and discharged in a fine mist in the vaporizing and heating chamber G in which vaporization and partial gasification are effected. In my process of making gas, the hydrocarbon oil is heated in a suitable steam heating device before being supplied to the injectors *k*, so that it is readily vaporized and partially gasified in chamber G. The oil vapor or gas passes, in a comparatively slow current, down through the large central openings, *m*, and is immediately enveloped in, and absorbed by the entering water-gas which prevents it from being

cracked or destructively decomposed. The oil gas and water-gas are thus intimately mixed and combined to form a high candle power illuminating gas without waste of oil, resulting in great economy and a superior gas. About one minute before steam is shut off from the generator, or before the run is finished, the valve in the oil supply pipe is closed. Then the water-gas rises through the central opening, *m*, into the vaporizing chamber G, and absorbs and carries out the remaining oil vapors, so that all the oil vapor is utilized.

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

1. The combination with a water-gas generator, of a carbureting and fixing chamber, having a separate oil vaporizing chamber at the top, free from checker brick and provided with a lateral oil atomizing or spraying device and a solid annular floor or hearth having a central opening, communicating with the fixing chamber below, a combustion chamber below said vaporizing chamber and above the fixing chamber, a pipe for gas leading from the generator, and a separate air inlet pipe,—both connecting with said combustion chamber, whereby the atomizing device will be protected from excessive heat and whereby the oil vapor or gas passing down through said central opening will be enveloped by the current of inflowing water-gas and intimately mixed therewith, thereby preventing the hydrocarbon vapors from being destructively decomposed by excessive heat of the brick work, substantially as described.

2. In a water gas apparatus, the carbureting and fixing chamber constructed with a separate oil vaporizing and heating chamber having an inclined floor or hearth and an opening into the fixing chamber below, and one or more oil supply pipes or injectors in the circumferential wall, in combination with a gas inlet pipe connecting with the fixing chamber below said vaporizing chamber, substantially as described.

3. The combination with a water gas generator, of a carbureting and fixing chamber containing a separate oil vaporizing chamber at the top, free from checker brick, and provided with a lateral atomizer or supply pipe and a solid annular hearth having a central opening communicating with the fixing chamber below, a combustion chamber below said vaporizing chamber and above the fixing chamber, a pipe for gas leading from the generator, and a separate air inlet pipe,—both connecting with said combustion chamber, a separate superheater, as L, and a pipe connecting the base of the carbureting and fixing chamber, with the base of said superheater, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

OLAF N. GULDLIN.

Witnesses:
J. C. VAN HORN,
E. B. CLARK.