

(No Model.)

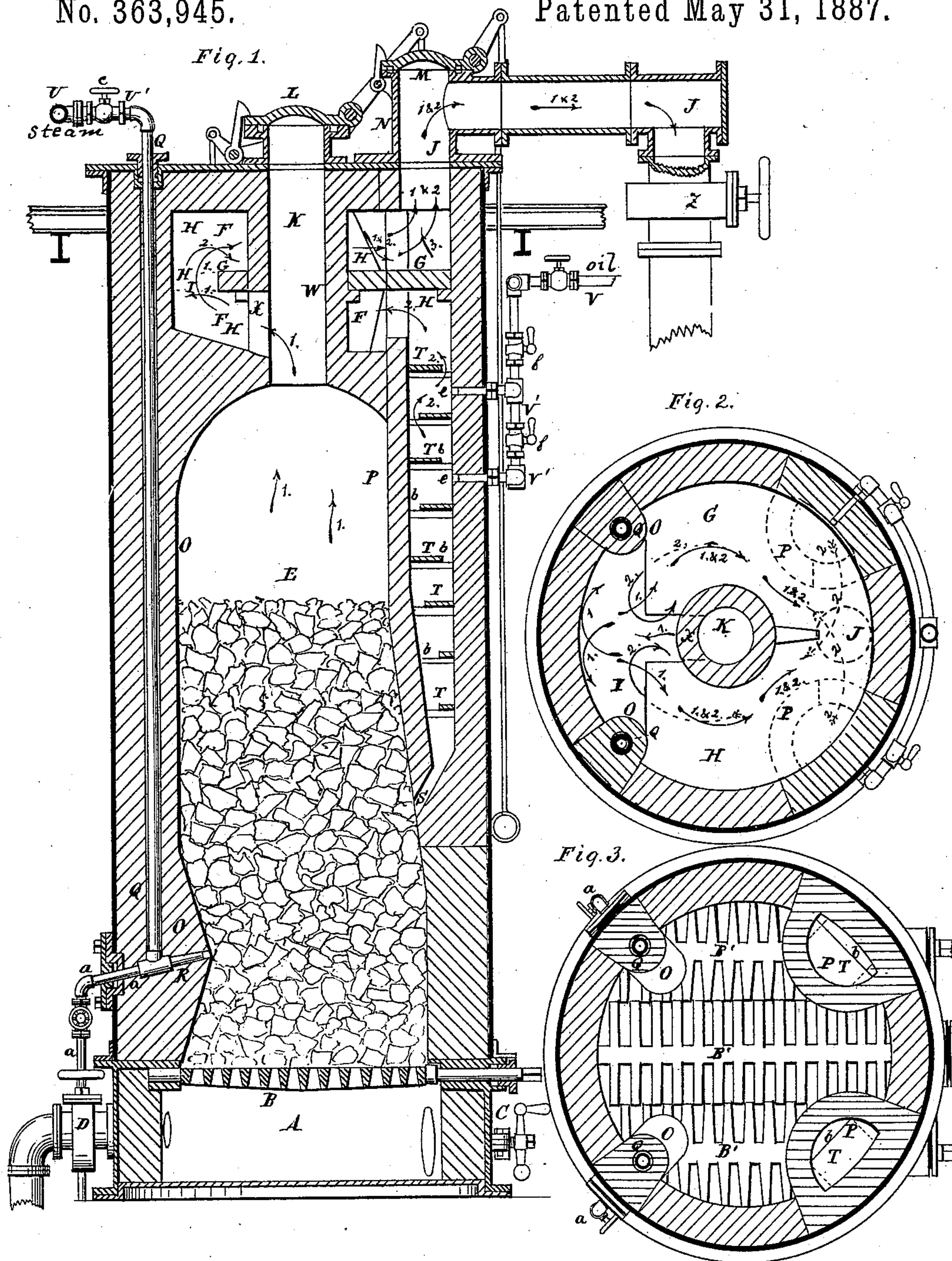
2 Sheets—Sheet 1.

R. BOEKLEN.

APPARATUS FOR GENERATING ILLUMINATING GAS.

No. 363,945.

Patented May 31, 1887.



WITNESSES:

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Fig. 4.

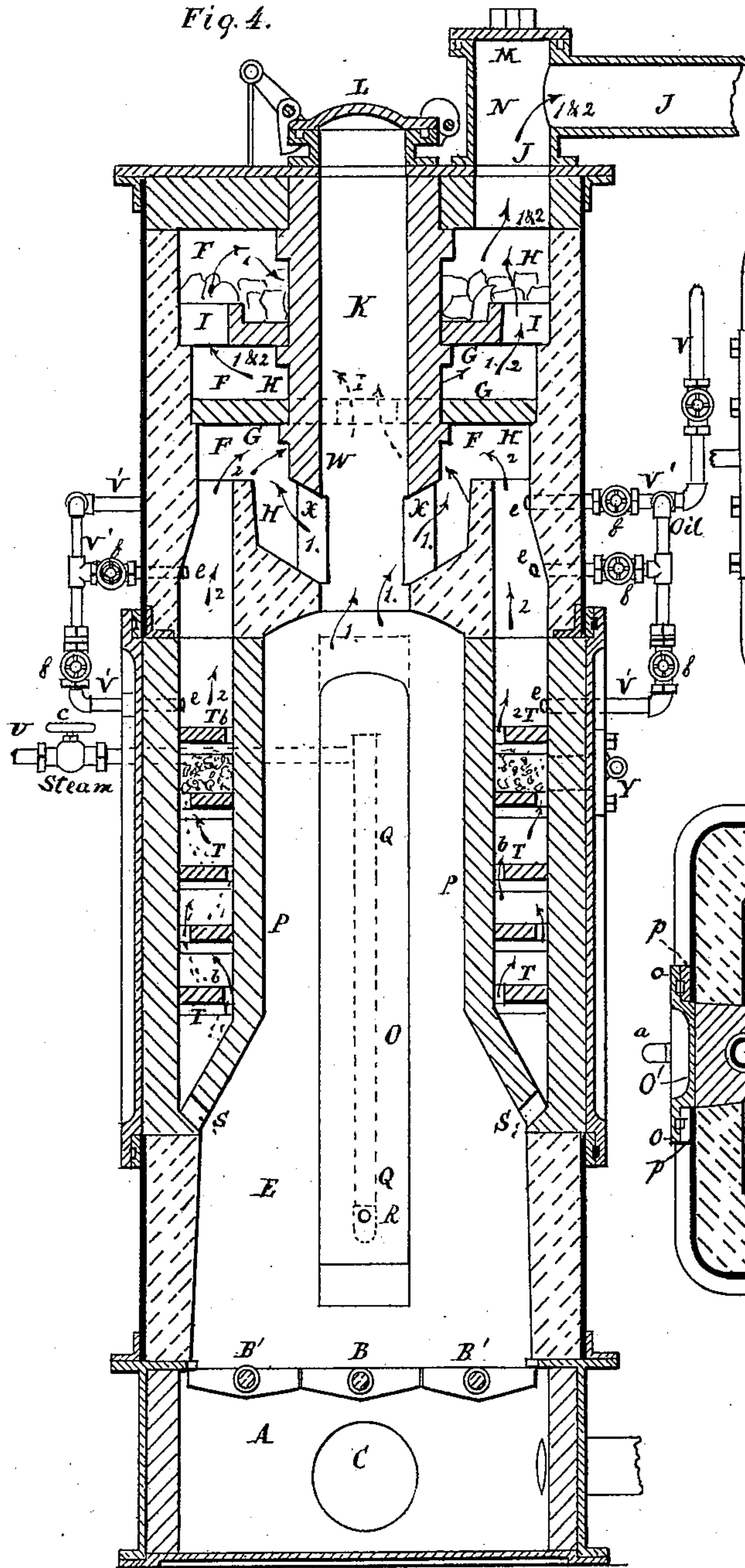


Fig. 5.

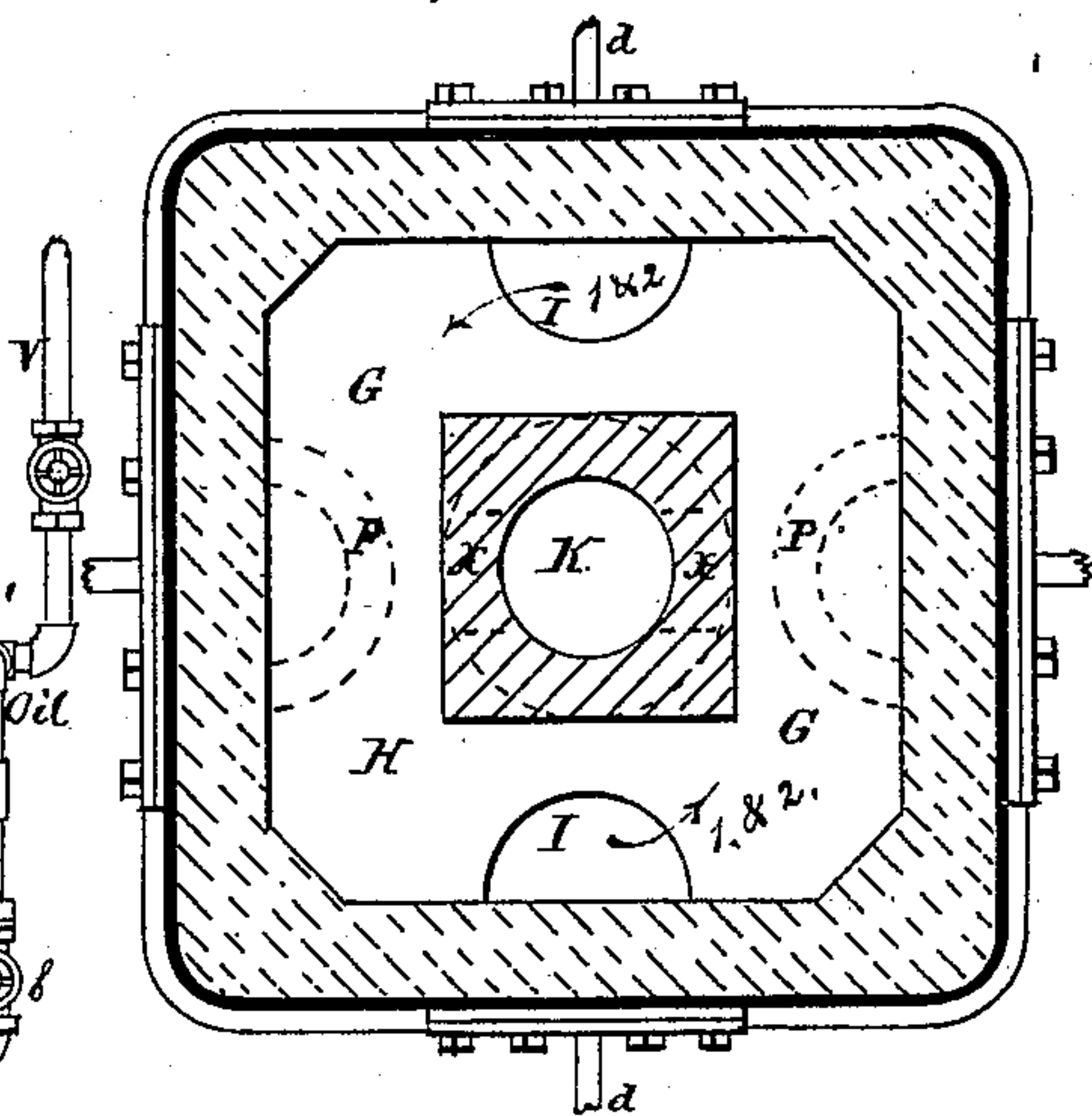
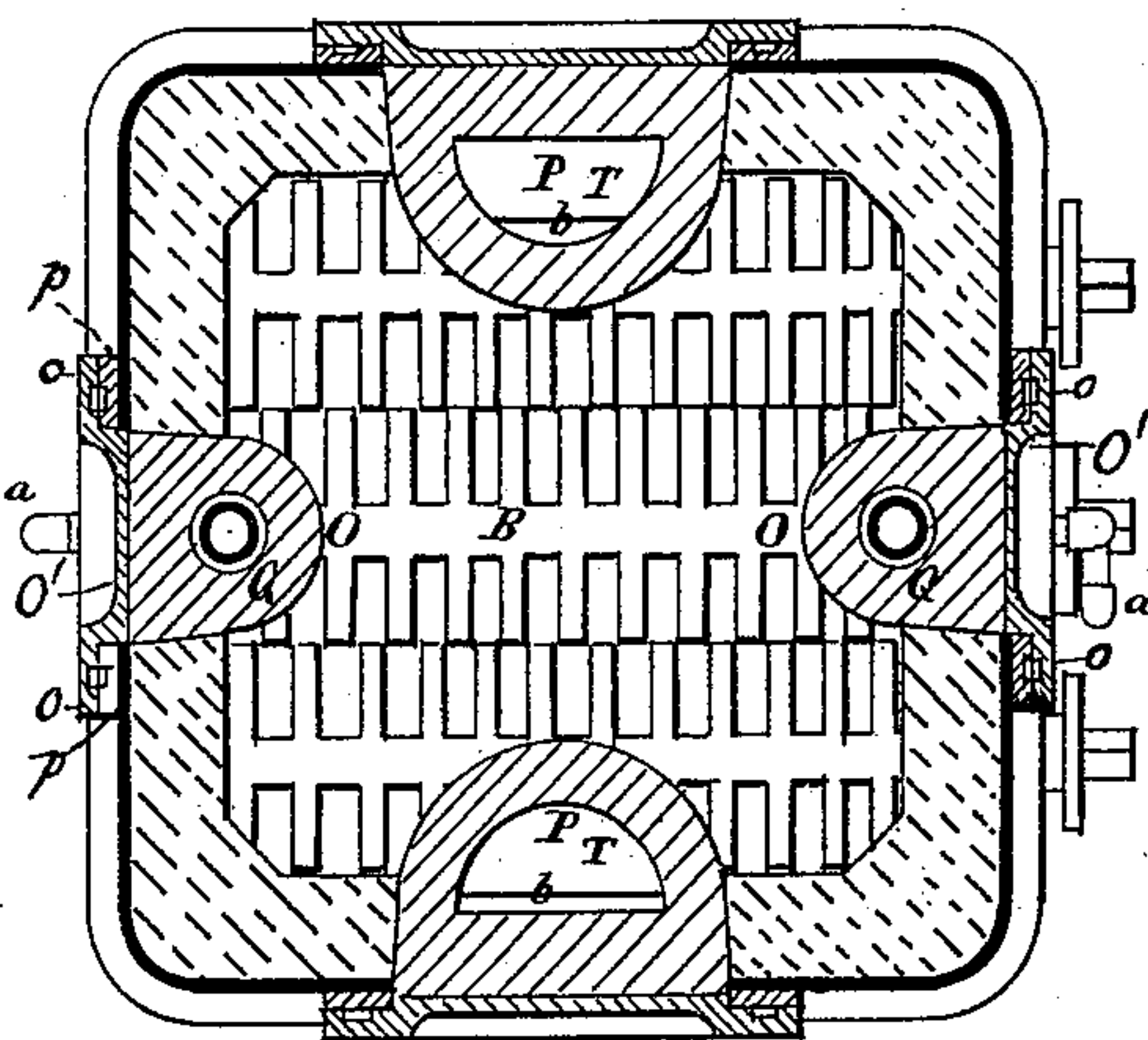


Fig. 6.



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APPARATUS FOR GENERATING ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 363,945, dated May 31, 1887.

Application filed May 1, 1886. Serial No. 200,770. (No model.)

To all whom it may concern:

Be it known that I, REINHOLD BOECKLEN, a citizen of the United States, and a resident of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Apparatus for Generating Illuminating-Gas, of which the following is a specification.

This invention relates to an apparatus for generating illuminating-gas in a single-cupola-generating-furnace, whereby economy in construction and operation is secured.

The object of the invention is to provide suitable means for converting comparatively heavy hydrocarbon oil into rich hydrocarbon or carbureted hydrogen gas by subjecting it in a continuously-flowing stream to successively higher temperatures in separate chambers or retorts of the cupola, so that it is all converted into gas without contact with the fuel, and then combine the hot hydrocarbon gas with hot hydrogen or water gas rising from the fuel, so as to form a fixed homogeneous illuminating-gas of the desired candle-power.

Another object of the invention is to provide the cupola-generator with readily-removable steam-superheaters and oil-gas retorts adapted to be set and secured in the walls of the furnace, so as to admit of convenient removal for cleaning, repair, or renewal, as desired.

In carrying out my invention steam is superheated by passage down through pipe in the superheater-tile placed in the walls of the furnace, and is then injected into the hottest portion of the fuel a short distance above the grate, where it is thoroughly decomposed by passage through the high body of incandescent fuel above, the fuel at the grate being thus left incandescent, so that it may be readily ignited upon admission of the air-blast for reheating the whole body of fuel. A comparatively cheap and heavy grade of hydrocarbon oil is successfully used in my process by admitting such oil at or near the top and less heated portion of a vertical retort set in the wall, and causing it to flow downward over shelves into successively hotter portions of the retort, and then into the highly-heated fuel, so that at first the most volatile and finally the least volatile or heaviest portion of the oil is vaporized and converted into gas. At the lower end of

the retort an opening is provided, so that part of the steam will pass into the retort and fluidize and take up the excess of carbon in the heavy oil, and thus keep the retort clean and utilize all the gas-making material. The main portion of the resultant gases in the fuel-chamber passes up into the lower compartment of a large fixing and mixing chamber in the top of the cupola, and there meets and combines in a heated and nascent state with the oil-gas issuing from the top of the oil-retorts. Said gases together commingle and pass up to compartments or circuitous passages formed of incandescent tiles, to make a fixed homogeneous illuminating-gas before escaping through the gas-outlet from the cupola ready for delivery to the scrubbing and purifying process.

The process constituting part of my invention will be defined in the claims.

The invention includes, besides the process, certain combinations of parts in the apparatus, which will also be pointed out in the claims.

In the drawings hereto annexed, Figure 1 represents a vertical central section of my improved cupola for carrying on the process of generating water-gas according to my invention. Fig. 2 represents a horizontal section through the top part of the fixing-chamber of the same. Fig. 3 represents a similar section through the coal-chamber of the same. Fig. 4 represents a vertical section of a modification of the same. Fig. 5 represents a horizontal section through the central compartment of the fixing-chamber of the same. Fig. 6 represents a horizontal section through the coal-chamber of the same.

A represents the ash-pit of the cupola. Over it is arranged a horizontal grate, B, consisting of the several sections B' B' B', each of which has a trunnion on each end for turning the same to riddle or drop the coal when required. The trunnion of one end is held in a bearing on the inside of the base-casting of the cupola and the trunnion of the other end passes through said casting and is guided in a stuffing-box; and its exterior end is made square for attaching a suitable lever to turn the same. Said ash-pit is furnished with a proper air-tight door, C, to remove the ashes, and the blast-pipe and air-valve D are connected with the said ash-pit. Above the grate is arranged the

cupola coal-chamber E, in which the water-gas is generated, and above said chamber is arranged a fixing-chamber, F, which is divided by lateral partitions G G into several compartments, H, above one another and connected by openings I through said partitions, to conduct the gases upward from one compartment to the other above, and from the top compartment to the main gas-outlet pipe J on the top of the cupola. By means of a central coal-inlet, K, down from the top of the cupola through the chamber F into the chamber E, the coal is charged in the cupola. Said inlet K has a proper sealed door, L, attached to the metal top plate of the cupola to cover and seal air-tight said inlet while generating gas. A similar door, M, is also provided on the vertical portion N of the gas-outlet pipe J. Both doors are open during the time of blowing up the fire to heat all chambers in the cupola. The sides of the cupola are lined with proper fire-brick and tile, and in this lining are placed several vertical inwardly-projecting steam-superheaters, O O, and also several vertical inwardly-projecting oil-retorts, P P.

The superheaters O O are composed of separate tile removably set in the brick lining of the furnace, and each superheater is provided with an outer face-plate, O', of iron, having projecting flanges o, which overlap the edges of the opening in the wall into which the superheater is inserted, and such flanges bear upon a raised rim, p, provided with means for making a tight joint.

The removable oil-retorts are made in one piece and distinct from the walls into which they are set, and are provided with flanged outer iron face-plates, whereby they may be readily secured in place or removed and replaced by new ones when desired. The superheaters and oil-retorts may be secured in place by bolts and nuts, or by yokes and bearing-screws.

By the construction of superheaters and oil-retorts shown and described, such parts may be quickly removed, repaired, and cleaned when required, or be replaced by new ones, with but very little interruption to the operation of the apparatus. The steam is conducted down through said superheaters in iron pipes Q to lateral inclined nozzles R, which discharge the superheated steam into the coal, and the lower ends of the pipes Q have each a connected small drip-pipe, a, which passes through the shell of the cupola to pass off the condensed steam outside of the cupola. The nozzles R are arranged, as shown, a distance above the grate B, in a portion of the superheater projecting most prominently into the coal-chamber, to prevent the coal at the grate from being extinguished and to bring the steam into contact with the central portion of the coal body and prevent its escape along the lining and take the heat from it.

The base of each oil-retort P extends down deeply in the coal-space and projects into that part of the coal or fuel chamber near the steam-

nozzles R in which the steam is in a highly heated but yet undecomposed condition, and the oil-retorts P have each a number of lateral shelves, T, arranged nearly equidistant above one another and projecting alternately from opposite side walls nearly across the diameter of the retort, so as to form passages b to connect the spaces between said shelves in diagonal direction, and form a zigzag passage through the retort. The bottom of each retort is inclined to the cupola-lining and at its lowest portion or base is made with a small opening, S, allowing the least volatile oil to pass into the coal direct, and in said opening S steam enters to soften and fluidize said oil or tar to assist generation of the oil-gas and to prevent caking and clogging said openings S. The top of each retort connects directly into the fixing-chamber F, to pass the vapors and oil-gases generated in the retort directly into said fixing-chamber to combine with the water-gas rising from the bed of fuel. The steam is supplied from a suitable boiler into the top of the superheating-pipes Q by means of the main pipe U and its branches U', which are each furnished with suitable stop and regulating valves, c. The oil is furnished from a suitable elevated oil-tank, and is conducted by a main oil-pipe, V, and the branch pipes V' to the top portions of the retorts, which have nozzles e e, each connected with a branch of said main pipe V, and each of said branches is furnished with a suitable regulating stop valve or cock, f f.

The coal-inlet K is constructed of a vertical tubular clay body, W, which has one or more openings, X, through its side into the bottom compartment of the fixing chamber F.

The operation is as follows: After a charge of gas is delivered from the cupola, the usual main gas-valve Z of the gas-outlet J is closed, and simultaneously the doors M and L are opened. The blast is admitted to the fuel by opening air-valve D. The coal is riddled by rocking or tilting the grate B, and, if needed, fresh coal is charged through the inlet K and the fire allowed to become properly incandescent. After the superheaters O O, the retorts P, and the fixing-chamber F, with its partitions G G, are all properly heated, said valve D is closed, stopping off the air-blast. The doors L and M are closed and the gas-valve Z is opened. The drip-pipes a are allowed to exhaust and the steam is admitted into the pipes Q, which are of a considerably-larger area than their discharge-nozzles R. Said drip-pipes are thereafter nearly closed. The main portion of the steam from the superheaters passes into the coal highly superheated, impregnating the central body of coal, and, passing upward through a large body of incandescent coal, is decomposed and converted into carbonic - oxide hydrogen gases, which pass to the inlet K and the opening W X in the direction of the arrows 1. Simultaneously with the introduction of steam through the nozzles R into the coal the oil valves or cocks

f are opened, admitting oil into the top portion of the retorts, where its most volatile parts are evaporated and pass into the bottom compartment of the fixing-chamber F. The less and less volatile portions of the oil pass from shelf T to shelf T down through the openings b, gradually giving off the volatile portion more and more as the most highly heated shelves are reached, until the least volatile portion descends through the openings S into the coal, and while such oil or tar passes down through the openings S a portion of undecomposed steam passes up through said openings into the retort and assists to fluidize said oil and prevents the clogging of said openings. All vapors and gases generated in the retorts pass upward in the direction of the arrows 2 into the fixing-chamber, and, being deflected by the bottom partition, G, pass, together with the hydrogen gas, through the opening or openings I of said partition up into the compartment above, where they become mingled and fixed, and finally pass off through the outlet J to the wash-box or hydraulic main, and from it to the condensing and purifying apparatus and holder. After the coal in the cupola has lost its proper incandescence, (shown by the sight-holes of the cupola and test-lights of the apparatus,) the supply of oil is stopped. With a strong short flow of steam the remaining gas is driven into the wash-box and the gas-valve Z is closed. The steam is then stopped, and the doors L and M are opened, ready to perform the operation of blowing the fire up, as before described. According to the cost and capacity of generation required, the construction of the apparatus may be varied.

The fixing-chamber F may be of greater or less capacity and have two or more compartments, as shown. The superheaters O may extend through the fixing-chamber F, as shown in Fig. 1; or they are preferably made separate and removable and set into the lining from the side of the cupola, to facilitate their restoration after being burned out, as shown in Figs. 4 and 6. Asbestos fiber or other distributing material may be employed between the shelves T of the retorts and movable caps Y used, as shown in Fig. 4, so that such material may be renewed from time to time.

It will be observed that in this apparatus I so arrange the oil-retorts in the cupola that they terminate in the space of the cupola,

where the undecomposed steam is had among the incandescent fuel. Consequently the steam is introduced into the openings of the bases of the oil-retorts from which the tar flows, thus causing the fluidizing of the heavy oil and tar, and the more thorough and superior decomposition of the oil and tar or residuum.

My present invention is an improvement on Patent No. 324,809, dated August 25, 1885; but in that patent the superheaters are stationary and part of the cupola, which very soon burns out and becomes inoperative, and therefore I do not claim such construction; nor do I claim the process shown and described in Patent No. 235,766, which shows removable horizontal retorts, as the oil residuum remains on them, and thickens or concretes into hard carbon, which soon renders them useless; but

What I claim, and desire to secure as my invention by Letters Patent, is—

1. The combination, in one cupola, of the removable vertical steam-heaters O, the vertical removable oil-decomposing retorts provided with a series of shelves, and at or near their tops with an oil-inlet pipe, and a fuel-chamber connecting with the lower end of such oil-retort, as described.

2. The combination, in one cupola, of a fuel-chamber, a fixing-chamber, a removable steam-superheater connecting with the lower portion of such fuel-chamber, and a vertical removable oil-decomposing retort provided with a series of shelves in said retort, opening at the bottom into the fuel-chamber and at top into the fixing-chamber, for the purpose described.

3. In an apparatus, the combination for generating gas from water and crude oil, a vertical movable oil-retort, an oil-supply pipe, and a series of shelves in said retort, of which the base is perforated to admit undecomposed steam and also allow the residuum to pass in the fuel, its top discharging into a fixing-chamber provided with tortuous passages, all within a single cupola, substantially for the purpose herein set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 30th day of April, 1886.

REINHOLD BOECKLEN.

Witnesses:

THEODORE FELDSTEIN,
ERNST KEMPF.