

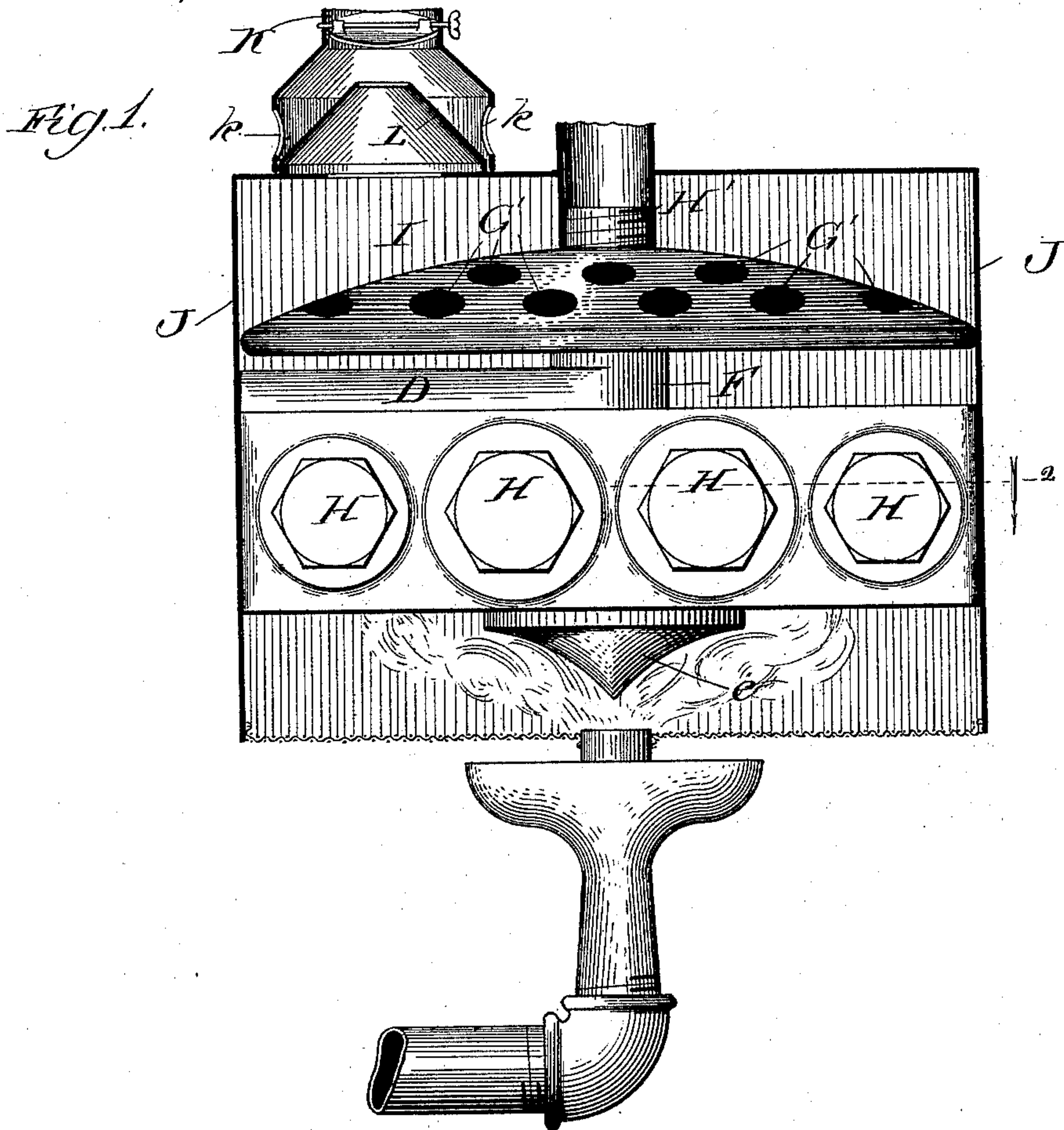
(No Model.)

2 Sheets—Sheet 1.

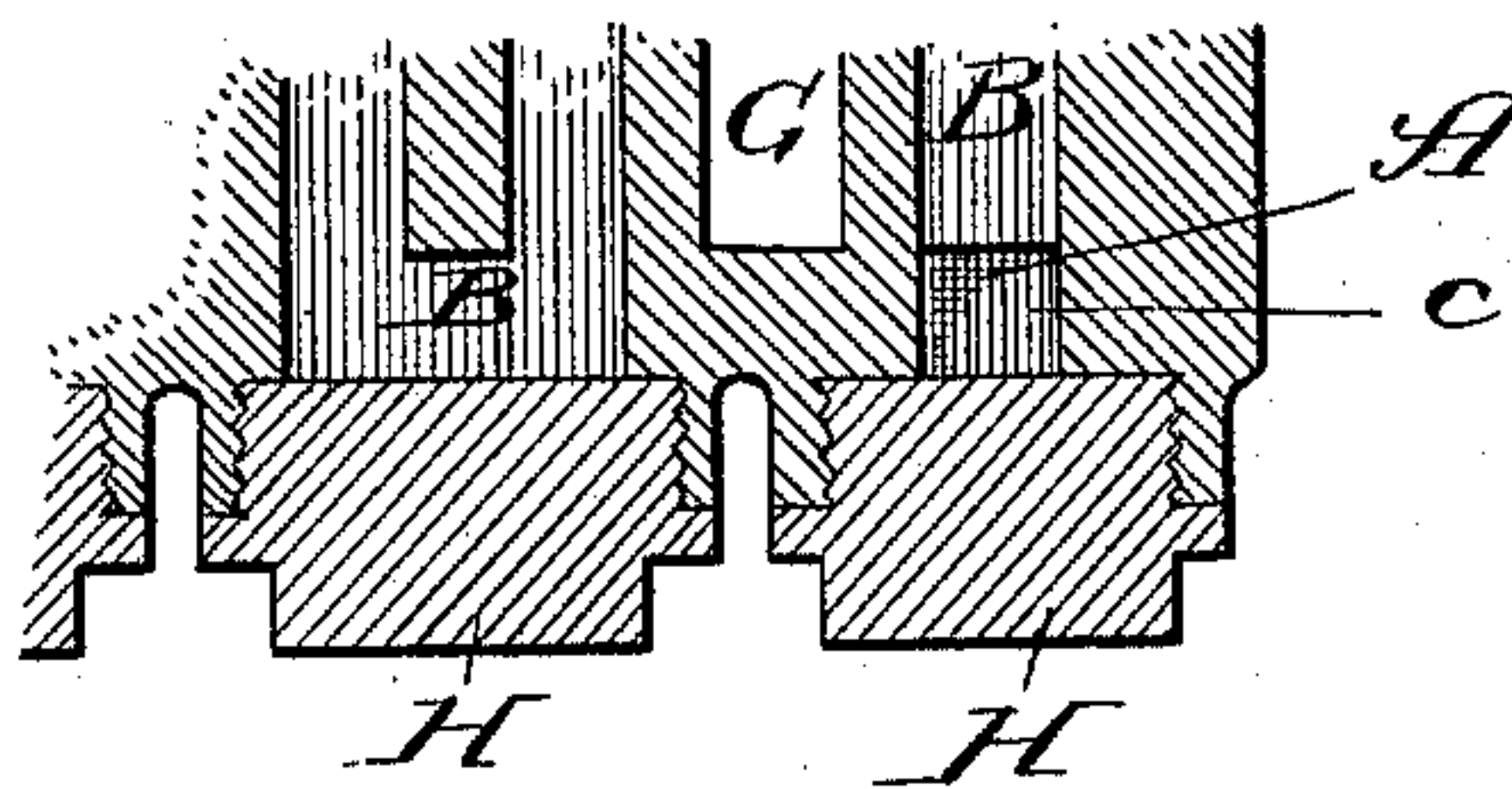
J. M. GOLDSMITH.  
GAS OR STEAM GENERATOR.

No. 476,260.

Patented June 7, 1892.



*Fig. 2.*



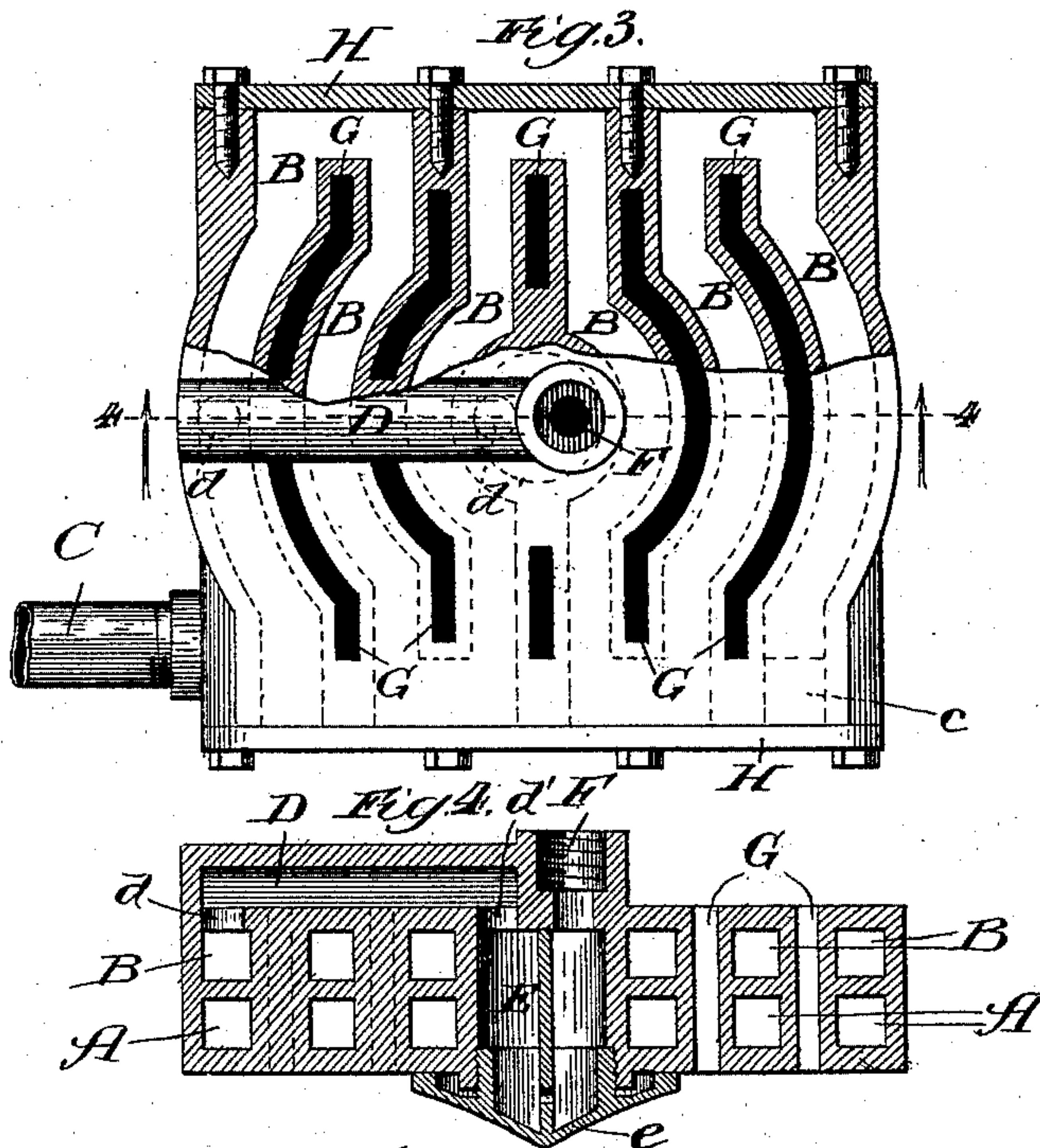
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# UNITED STATES PATENT OFFICE.

JACOB MORTIMER GOLDSMITH, OF CHICAGO, ILLINOIS.

## GAS OR STEAM GENERATOR.

SPECIFICATION forming part of Letters Patent No. 476,260, dated June 7, 1892.

Application filed November 20, 1890. Serial No. 372,815. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB MORTIMER GOLDSMITH, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Gas or Steam Generators, of which the following is a specification.

The object of my invention is to make a generator that can be used for generating gas from crude petroleum or any of its products in which gas is contained or for generating steam or gas from water and other fluids; and it consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of my improved generator with the inclosing case shown in section. Fig. 2 is a plan view of a horizontal section, taken in line 2 of Fig. 1, looking in the direction of the arrow. Fig. 3 is a plan view of my generator with a part of the covering-plate broken away. Fig. 4 is a transverse vertical section taken in the line 4 of Fig. 3, looking in the direction of the arrows. Fig. 5 is a plan view of another form of the generator with a portion of the covering or face plate broken away. Fig. 6 is a transverse vertical section taken through the line 6 of Fig. 5, looking in the direction of the arrows; and Fig. 7 is a transverse vertical section of the superheating and deflecting cap arranged immediately over the generator.

In making my improved gas or steam generator I preferably cast the body of the retort with a series or set of channels arranged back and forth across the body of the retort, as shown in Fig. 3, or spirally throughout the body, as shown in Fig. 5. Whether the channels be arranged back and forth or spirally it is intended that all of the channels of the same set shall communicate with each other, so as to form a continuous or connected passage from the commencement to the end of the sets. In operation it is immaterial whether the channels are made one way or the other, so long as they afford an uninterrupted way or passage for the fluid vaporized or generated into gas or steam, or for the gas or steam arising from the vaporizing of the fluid from the beginning to the end of the series.

In making my generating-retort I preferably make two or more series of continuous

channels, one above the other in the same retort, and prefer to have them cast into the body of the retort while it is being made. In the drawings I have illustrated two sets of channels A and B. I shall designate the one into which the oil is first admitted as the "primary set," and the other set or sets as the "secondary set." The oil or other fluid intended to be vaporized is introduced into the retort from any convenient tank, source, or supply through means of a pipe C, and preferably into the lower series A of the fluid-channels in the retort. I have represented the supply-pipe as thus entering the lower set of channels, although it is obvious that the retort could be arranged so that the oil would be admitted to the upper set of channels if preferred, in which case it would become the primary set. After the oil or other fluid being vaporized has entered the primary set of channels it passes back and forth or round and round through the channels, according to their construction, until it has reached the end of the primary series or set. By this time it has become partially vaporized or converted into gas or steam. At the end of the primary set of channels a hole or opening (indicated by the letter *c* in Figs. 3 and 5) is provided to afford communication between it and the secondary set, so as to effect a continuous and uninterrupted circulation of the fluid or vapor under treatment. By the time the oil or other fluid admitted into the primary channels has reached the opening *c* it has been converted into gas or steam and enters through the passage into the secondary series or set of channels. Where the channels are carried back and forth across the body of the retort, as shown in Fig. 3, the end of the primary set of channels comes at the edge of the retort. The opening *c*, leading therefrom to provide a communication between the series of channels, is therefore arranged near the side of the retort. Where, however, the channels are arranged in spiral form, as shown in Fig. 5, the end of the primary set is near the center of the body of the retort, and the opening *c* into the secondary set of channels is therefore near the center. After passing through the opening *c* into the secondary set of channels the partially-vaporized fluid passes along such channels un-



til it reaches the outer side of the retort near where it entered, where it passes through a hole or opening *d* into a pipe or conduit *D*, along which it passes to near the center of the retort, whence it passes through another hole or opening *d'* into a central chamber *E* of the retort. I may here say that, in view of the expansion that takes place as the oil or water becomes vaporized so that it forms a larger volume, I prefer to make the secondary series of channels of larger size or dimensions than the primary series, so as to accommodate the increased volume passing through them. As this is a feature that will be understood by every one, I have not considered it necessary to show the channels actually enlarged in size, but will simply say that I prefer to so make them in order to prevent undue friction or pressure in the passage of the gas through the channels.

As the gas or steam passes through the channels and approaches and passes into the central chamber *E* of the retort it is desirable that it should be subjected to a constantly-increasing temperature, and I therefore prefer to have the gas or other fuel for heating the retort arranged beneath the central chamber or cap *e* of the retort, as shown in Fig. 1. This directs the heat onto the central downwardly-inclined portion of the retort and causes it to spread out in every direction under it. This causes the central portion of the retort into which the gas is admitted immediately before leaving it to be the hottest portion of the retort, and therefore gives to the vaporized fluid as it leaves the retort through the opening *F* the benefit of the greatest or highest temperature obtainable.

In order to heat the walls of the channels through which the fluid passes and keep them as hot as practicable, I provide the retort with a number of flues *G*, extending up vertically through the retort between the channels. These flues or openings are preferably cast as the body of the retort is made, and they permit the heat and flames to pass up through the body of the retort in as many places as flues are provided. As shown in the drawings, these flues occupy most of the space between the channels, leaving thin walls between them and the channels, through which the heat may readily and easily penetrate. In order to close the channels, I provide caps or covering-plates *H*, which are adapted to be fastened securely to the body of the retort either by screws passing through them and into the screw-holes made in the castings or in any other desirable manner. In Figs. 1 and 2 I have shown a number of such caps or covering-plates screwed directly into the body of the retort, so as to cover the ends of the channels, while in the other figures I have shown the ends of the channels covered by large plates fastened by screws, as above suggested. These covering-plates thus inclose the channels to prevent the escape of gas or steam, as shown in the drawings. The pipe

*D* may be made as a part of the top covering *H*, as shown in Figs. 5 and 6, or otherwise, as may be desired. The covering-plates are of course provided with holes to correspond with the flue-openings cast in the body of the retort, so that the heat and flames may pass up entirely through the retort when in use. By making the caps removable I secure easy access to the channels whenever it may be desirable to clean them should they become in any way clogged or obstructed.

If desired, a deflecting and superheating cap *I* may be arranged immediately over the retort having its pipe *F'*, through which the gas, steam, or vaporized fluid is discharged. When this superheater is used, the gas will pass up through the openings *F* and through the pipe or extension *F'* into the inside of the superheater, which is cast hollow for the purpose. It is also preferably provided with flue-openings *G'*, so that the heat and flames coming up through the flues *G* of the retort will not only strike against the bottom of the superheater *I*, but also pass up through its flue-openings *G'*, so as to make the superheater as hot as possible.

In order to break and turn the volume of gas passing up through the pipe *F'* into the superheater, I provide it with a cap or baffle-plate *f*, with lateral openings in the pipe beneath the cap, so that the gas will be turned to the sides and bottom of the superheater, and thus brought into as perfect contact with as great a heating-surface as possible. After the gas or vaporized fluid has thus been treated it passes off through a pipe or opening *H'*, whence it is conveyed by suitable pipes (not shown) to the place of use. Of course after the gas or steam is generated it may be applied to any useful purpose desired and any form of apparatus for so applying it employed that the user may desire.

In order that the heat employed for generating gas or steam in the retort may be utilized for other purposes as well, I prefer to arrange a case or jacket *J* around the retort. This may be made of any suitable material and provided with a lining of asbestos. The jacket is preferably provided with a perforated bottom that admits of air passing into the same for the purpose of supplying oxygen to support combustion. The air passes up through the flues in the retort and becomes heated to a high temperature. At the top of the jacket or at other convenient place on the same I arrange a pipe *K* of sufficient size to carry the volume of heated air to a drying-room or other place where it may be desired to use the same. To reinforce and measurably purify this volume of air, I provide openings *k* in the pipe, which permit air from the outside of the jacket to be drawn into the pipe and carried through the same to the place of use. To induct air into this pipe the more freely, I arrange a cone-shaped outlet *L*, leading from the jacket into the pipe. This causes the heated air from the jacket to



enter the pipe at its center in a rapid and contracted volume and at a point above the openings *h*. The bottom of the pipe *K* is made, preferably, flaring over the cone-shaped outlet *L*, so that a space is provided between them, through which the outside air is drawn in and up into the pipe by the rapid upward movement of the heated air from the jacket. In this way the heated air rising from the jacket heats the volume of cold air drawn into the pipe from the outside, so as to bring it to the proper temperature for the purpose intended.

I desire it to be understood that I propose to apply my generator to any purpose for the vaporizing of any fluids to which it may be applicable. I may use it to produce fuel or illuminating-gas from crude petroleum or other oils, or to vaporize oil and water in connection with each other, or to generate steam from water, or for the distillation of oils or other fluids, as I may find desirable or expedient. I make this explanation so that, while I have described the use of the generator principally in connection with the production of gas or vapor from oil, it may not be considered that I have contemplated only this application of it in practical use. I will also say that when in the claims I use the term "primary set of channels" I mean the set into which the fluid to be vaporized is first admitted; that when I use the term "secondary set of channels" I mean the succeeding set or sets into which the partially-vaporized fluid passes as it leaves the primary set; that when I speak of "partially-vaporized fluid" I mean the fluid in any state in which it is to be further expanded or treated in the retort, and that when I speak of "vaporized fluid" I mean the fluid when converted into the condition in which it leaves the retort.

What I regard as new, and desire to secure by Letters Patent, is—

1. The combination of a pipe leading from a source of fluid to be vaporized, a cast integral retort into which the pipe leads, provided with a primary set of connected channels in which the fluid is subjected to partial vaporization and with a secondary set of connected channels communicating with the primary set and in which the partially-vaporized fluid is subjected to further vaporization, said retort having a chamber located at the point of

greatest heat and at the exit-passage of the retort, and a delivery-pipe for the gas, substantially as described.

2. The combination of a retort of cast metal containing a multiple series of connected tortuous or winding ducts for detaining a combustible fluid in proximity to a source of heat and having vertical heat tubes or passages extending through the same, and a superheater located above the retort and containing a baffle-plate or other device for breaking up the currents from the retort, substantially as described.

3. The combination of a pipe leading from a source of fluid to be vaporized, a cast integral retort into which the pipe leads, provided with a primary set of connected channels in which the fluid is subjected to partial vaporization and with a secondary set of connected channels communicating with the primary set and in which the partially-vaporized fluid is subjected to further vaporization, said retort having a partitioned chamber with a dished bottom forming a flame-spreader located at the point of greatest heat and at the exit-passage of the retort, and a delivery-pipe for the gas, substantially as described.

4. The combination of a pipe leading from a source of fluid to be vaporized, a cast integral retort into which the pipe leads, provided with a primary set of connected channels in which the fluid is subjected to partial vaporization and with a secondary set of connected channels communicating with the primary set and in which the partially-vaporized fluid is subjected to further vaporization, said retort having a chamber with a dished bottom forming a flame-spreader located at the point of greatest heat and at the exit-passage of the retort, and a delivery-pipe for the gas, substantially as described.

5. The combination of a generator-retort provided with vertical flues extending through the same through which heat and air may pass, a surrounding jacket inclosing the retort, and a pipe leading from the jacket for conveying heated air to the place of use, substantially as described.

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