

Aug. 13, 1935.

C. CHILOWSKY

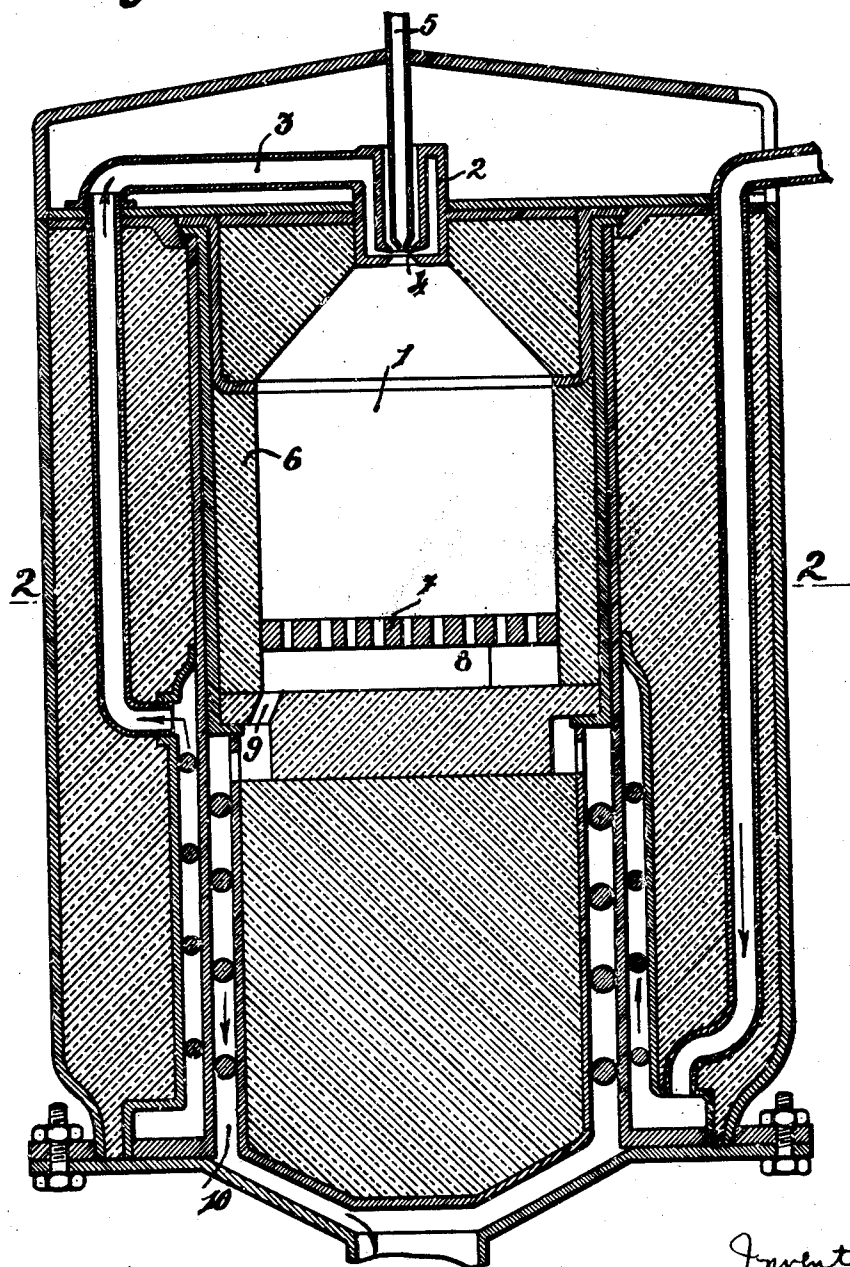
2,011,034

PARTIAL COMBUSTION OIL GAS GENERATOR

Filed April 20, 1932

4 Sheets-Sheet 1

Fig. 1



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4 Sheets-Sheet 2

Fig. 2

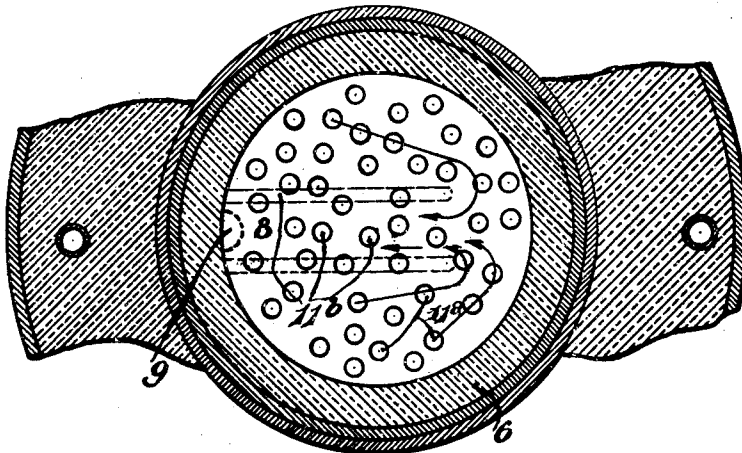
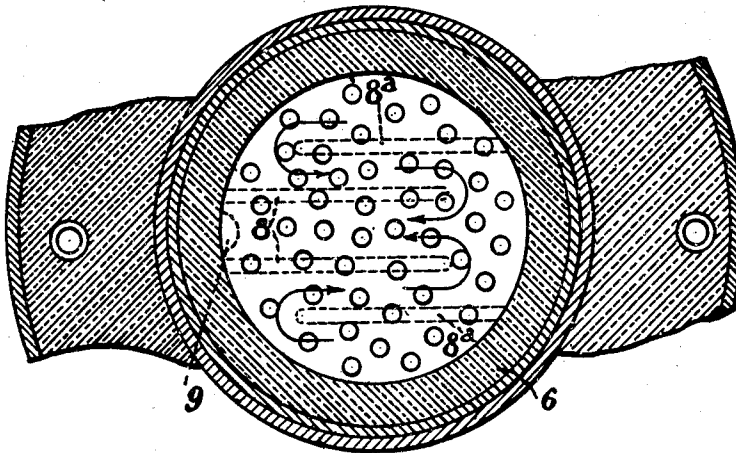


Fig. 3



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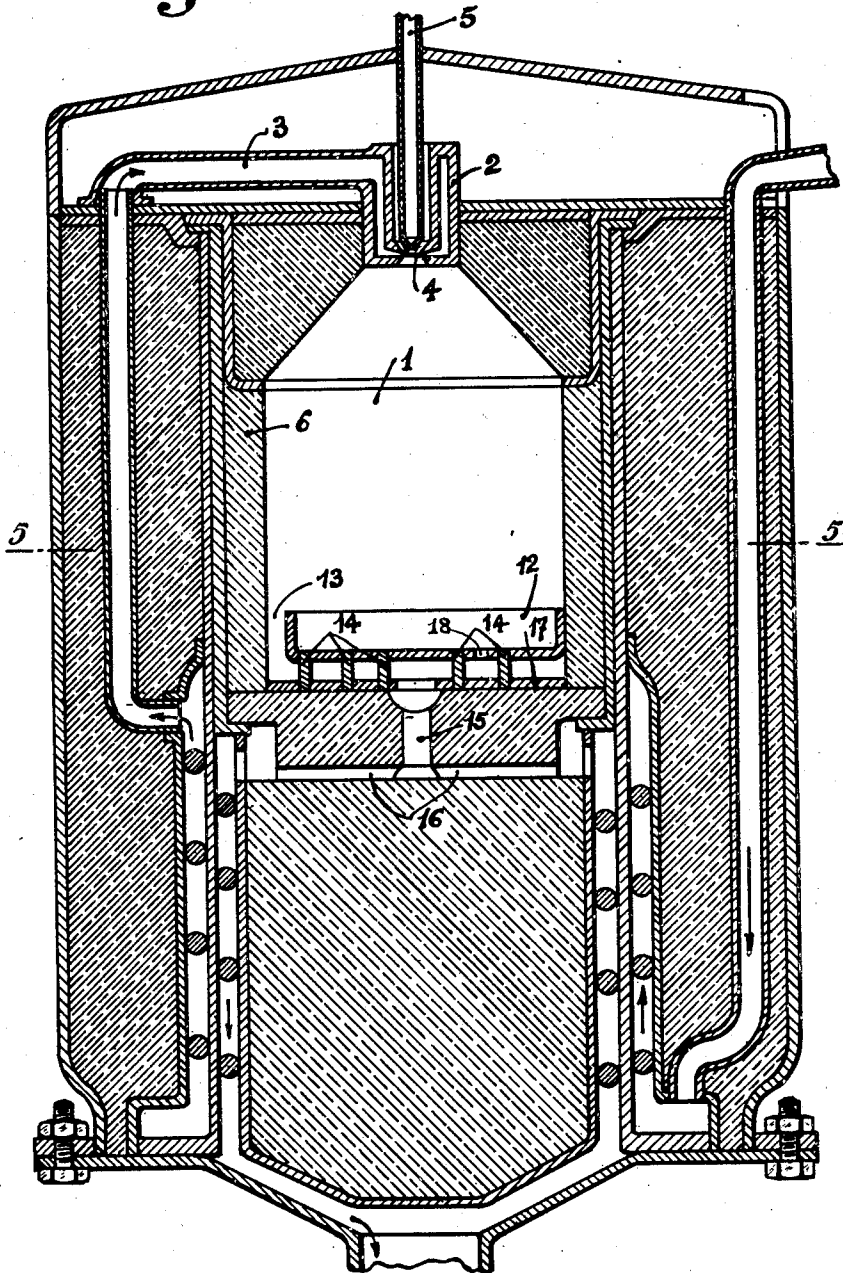
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4 Sheets-Sheet 3

Fig. 4.



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4 Sheets-Sheet 4

Fig. 5.

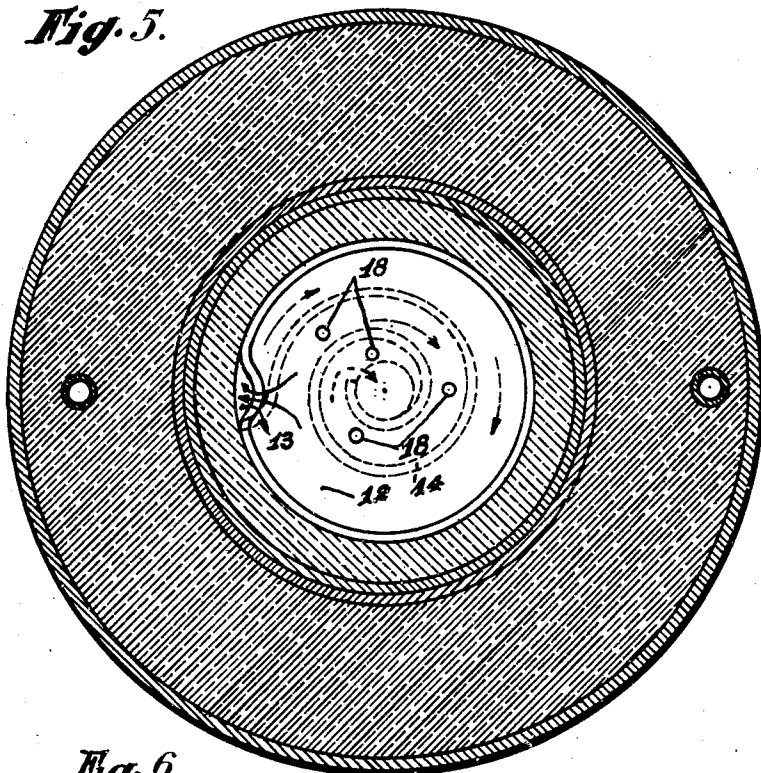


Fig. 6

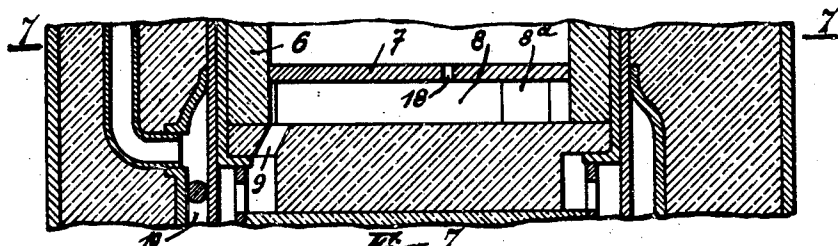
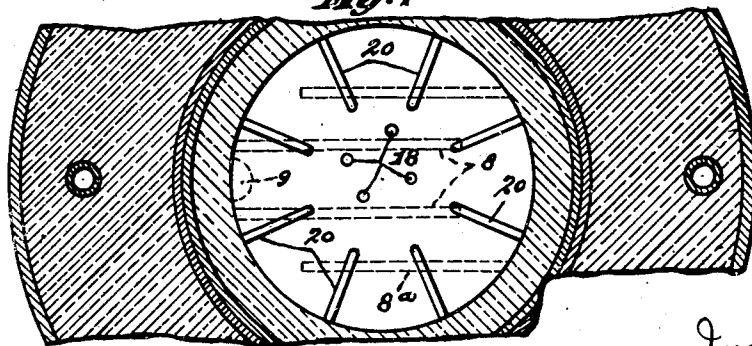


Fig. 7



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UNITED STATES PATENT OFFICE

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PARTIAL COMBUSTION OIL GAS
GENERATOR

Constantin Chilowsky, Paris, France

Application April 20, 1932, Serial No. 606,435
In France April 29, 1931

5 Claims. (Cl. 48—62)

It is already known to gasify heavy oils by partial combustion in such a manner that the oil is atomized by the hot air that serves for that combustion in a thermically insulated chamber.

5 In spite of all the precautions that are taken in order that all the oil molecules may be subjected to the same treatment, it is impossible to avoid the presence in the atomized jet of regions in which the oil is cracked to a lesser degree than in 10 other regions. These differences in the intensity of the reactions that take place may, for instance, result from a lack of homogeneity in the atomized jet. That defect causes the formation of zones in which the proportions of oil and of air are different. These differences may also be due to the 15 presence of the walls of the combustion chamber, which walls are heated to a very high temperature and radiate a portion of their heat toward the peripheral regions of the atomized jet.

20 I have therefore provided, according to my present invention, means for strongly heating a radiating body located opposite the atomizer, in order that it may give off a large amount of heat toward the central region of the jet, which, otherwise, would be deprived from the heat radiated 25 from the lateral walls of the chamber. Said means are so devised as to cause the hot gases that are just about to leave the combustion chamber to circulate under said body, which consists preferably of a plate disposed at a small distance from the bottom of the chamber. Said 30 gases are subjected to strong eddies when moving past said plate and are caused to circulate through long and narrow conduits provided under said plate in which they are given a considerable 35 velocity, the plate being preferably made of a material that is a good conductor of heat.

I have already proposed to produce, through a 40 suitable stirring, an intimate mixture of the different products of the atomization, so as to obtain a substantially homogeneous gas and to avoid that some particles of oil may leave the combustion chamber in an insufficient state of cracking, which would cause the formation of 45 tars.

50 The present invention accordingly comprises means for roughly separating the portions of the atomized jet in which the reactions have been more complete from those in which said reactions have not been so thoroughly effected, means for producing the stirring of the products coming from each of said portions, which has for its effect to still further increase the intensity of the 55 reactions in the products in which said reactions

were already intense, means for subsequently mixing the products that have thus been brought to a very high temperature with those in which the reactions have not been so thoroughly effected, which causes the cracking of the latter 5 products, and finally means for evacuating that mixture from the combustion chamber. Said evacuation will preferably take place through a conduit of small cross section, the circulation of the gases with a great velocity through said conduit having for its effect to improve the stirring 10 and to fully complete the cracking reactions.

As a rule, the portion of the jet in which the reactions are most intense is the peripheral portion thereof, which is directly subjected to the 15 radiation of the walls of the combustion chamber and in which the amount of air is greater, which involves a greater percentage of complete combustion. In that case, according to my invention, I roughly separate the gaseous products 20 from the peripheral region from the products of the central region, I stir them up separately, after which I effect their intimate mixture.

I have also found out that the cracking reactions resulting from partial combustion may lead, 25 when they are too thoroughly effected, to the formation of pulverulent carbon, but that that formation of pulverulent carbon could be avoided by maintaining in the reacting gases a small percentage of free oxygen. My present invention 30 therefore comprises stirring up the greatest portion of the reacting products, and mixing therewith the remainder of the products, which, having reacted only to a limited degree, bring to the mixture a relatively great amount of free 35 oxygen, thus avoiding the formation of pulverulent carbon.

Preferred embodiments of my invention will be hereinafter described with reference to the accompanying drawings, given merely by way of 40 example, and in which:

Fig. 1 is an axial sectional view of a gasifier for carrying out the improved method according to my invention;

Fig. 2 is a partial sectional view on the line 45 2—2 of Fig. 1;

Fig. 3 is a sectional view similar to Fig. 2 showing another arrangement of the partitions 8 that guide the gases along plate 7;

Fig. 4 is a vertical axial view of another generator for carrying out the method according to my invention;

Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a partial sectional view of still another 55

embodiment of the generator according to my invention;

Fig. 7 is a section on the line 7—7 of Fig. 6.

In the embodiment shown in Fig. 1, the generator comprises a combustion chamber 1 into which opens an atomizer 2 in which hot air, fed through pipe 3 expands through slot 4 so as to atomize the oil that is fed through pipe 5.

The walls of the combustion chamber consist of an annular piece 6.

In the vicinity of the bottom of the combustion chamber, I dispose a plate 7 provided with a plurality of holes. Said plate rests upon two partitions 8 of small height so that it is located at a small distance from the bottom of the chamber. The gases that have passed through said plate issue through a conduit 9 of small cross section. The two partitions 8 are so disposed that the central portion of the atomized jet, after passing through the orifices of the plate, arrives directly between the two partitions.

Most of the peripheral portion of the jet passes through the plate through holes such as 11^a, which do not open between the two partitions, and the gases resulting from the intense reactions that take place after the gases have passed through the plate and impinged against the bottom of the combustion chamber are deflected and caused to move along the path shown by the arrows in Fig. 2. During their travel under the plate they strongly heat it, and they finally mix with the gases coming from the central portion of the jet which have passed under the plate through holes such as 11^b and have been strongly heated by the radiation of the plate. The mixing of the gases from the two portions of the jet serves to complete the cracking of the products of the central portion of the jet and also to add to the hot gases that are about to leave the combustion chamber a certain amount of oxygen.

Perforated plate 7 acts as a means for stirring up the gases and also as a means for transferring the heat of the hot gases to the gases that have not been sufficiently cracked. This is due to the fact that the peripheral portion of the jet, which contains a relatively great percentage of air and in which the reactions have been intense, heats the plate by passing through it, and also that the plate, which is made of a sufficiently heat conducting material, such as carborundum heats about evenly and conveys a part of its heat to the gases that pass through its central part, and, above all, radiates a considerable amount of heat toward the central portion of the atomized jet.

The combustion gases leave the combustion chamber through conduit 9 and are brought into the annular space 10 of an air preheater in which they are subjected to a sudden cooling.

According to another embodiment of my invention, which is illustrated in Fig. 3, the baffle partitions 8 may be adapted to cooperate with other partitions 8^a, for instance two in number, which serve to lengthen the travel of the gases.

In the embodiment shown in Figs. 4 and 5, a small metallic deflector 12 is located in combustion chamber 1 opposite atomizer 4.

The products from the atomized jet of oil and air must, after they have been deflected by deflector 12, leave the combustion chamber by passing through slot 13 provided in the deflector. The passing of these products through said slot of relatively small cross section causes a thorough mixing of said products. Under deflector 12 I have provided a metallic spiral piece 14 which limits a spiral conduit of small cross section and

compels the reacting products to move with a great velocity along the path of travel shown by the arrows of Fig. 5. During that travel, the incandescent products heat deflector 12, the central part of which, in particular, radiates a part of its heat toward the central portion of the atomized jet, as it is desirable. The hot gases pass into vertical conduit 15, and then, through conduits 16, into the annular space 10 of the air preheater.

The metallic spiral piece 14, disposed under deflector 12, is also preferably secured to a disk 17 provided with a hole in its central part, in order to avoid any deformation of said spiral piece.

Attention is called to the fact that the upwardly bent edge of the deflector is not absolutely necessary and may be dispensed with.

As it is preferable, in order that the cracking of the heavy oil through partial combustion thereof may not result in the production of carbonaceous deposits, to maintain in the reacting gases a certain amount of oxygen, I provide in the deflector a plurality of small orifices 18 which allow products that have undergone but incomplete reactions and still contain a high percentage of free oxygen to pass directly through said deflector.

In Figs. 6 and 7 I have shown another embodiment which is rather similar to the embodiment of Figs. 1 and 2. According to that embodiment, plate 7, which rests upon partitions 8 and 8^a is provided with peripheral thin radial slots 20. As said slots are provided only in the peripheral portion of the plate, the gaseous products from the central portion of the atomized jet are compelled, in order to leave the combustion chamber, to move toward said peripheral portion of the plate, where they mix with the products from the peripheral portion of the jet. As in the preceding embodiments, I obtain the heating of the central portion of the plate by the whole of the products which must necessarily pass thereunder before reaching outlet 9, and accordingly the central portion of the plate is capable of radiating heat toward the central portion of the atomized jet.

The provision of orifices consisting of narrow slots, although it is not necessary, has the advantage of producing thin gaseous sheets which intersect, with a great velocity, the gaseous products that circulate under the plate, and produce therein a very vigorous stirring.

In order to obtain the admixture of products that have undergone but partial reactions, and therefore contain a relatively high percentage of oxygen, with the remainder of the gases, some small orifices 18 may be provided in the plate.

Attention is called to the fact that the partitions 8, or 8 and 8^a, which have been described in the preceding embodiments, are not absolutely necessary to a good working of the apparatus and may be dispensed with. In that case, the separation of the gaseous and their subsequent mixing are not so thorough, but, if the plate is made of a material that is a sufficiently good conductor of heat, the radiation of the center of the plate toward the central portion of the atomized jet is still obtained to a sufficient degree.

The various features described in the preceding embodiments may be combined, and I may, for instance, provide on deflector 12 a plate such as plate 7 with or without baffles such as 8 and 8^a.

Of course, my invention is not limited to the particular case in which use is made of an air preheater as above described. My invention may be applied to any other form of gasifier in which

partial combustion is obtained, and in particular with other forms of atomizer.

While I have described what I deem to be preferred embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of my invention as comprehended within the scope of the appended claims.

What I claim is:

1. A heavy oil gasifying apparatus adapted to operate through partial combustion of said oil with hot air which comprises in combination, a thermically insulated combustion chamber, a heavy oil atomizer opening into said chamber, an air preheater for feeding hot air to said atomizer for the spraying of the oil, a plate disposed at a small distance from the wall of the combustion chamber that is located opposite the atomizer, so that the atomized jet impinges against said plate, said plate being provided with holes extending throughout its thickness, baffle plates disposed between said plate and the last mentioned wall for causing the gases to move along a long path of travel before they are allowed to leave the combustion chamber.

2. A heavy oil gasifying apparatus according to claim 1 in which said baffle plates are so devised as to cause the gases to move from the peripheral part of the plate toward the central part thereof.

3. A heavy oil gasifying apparatus adapted to operate through partial combustion of said oil with hot air which comprises in combination, a thermically insulated combustion chamber, a heavy oil atomizer opening into said chamber, an air preheater for feeding hot air to said atomizer for the spraying of the oil, a plate disposed at a small distance from the wall of the combustion chamber that is located opposite said atomizer, so that the atomized jet impinges against said plate, said plate being provided with a plurality of slots provided in the peripheral portion thereof for causing the products in the combustion chamber to pass, in the form of thin gaseous sheets, from one side of said plate to the other

side thereof, and means for causing the very hot gases that are about to leave said combustion chamber to circulate between said plate and the wall of the combustion chamber in the vicinity of which said plate is disposed.

4. A heavy oil gasifying apparatus adapted to operate through partial combustion of said oil with hot air, which comprises in combination, a thermically insulated combustion chamber, a heavy oil atomizer opening into said chamber, an air preheater for feeding hot air to said atomizer for the spraying of the oil, a metallic plate disposed at a small distance from the wall of the combustion chamber that is located opposite the atomizer, said plate being provided with a lateral passage for the gases in the combustion chamber so as to allow said gases to pass from one side of said plate to the other side thereof, a metallic spiral disposed between said plate and the last mentioned wall of the combustion chamber so as to form a spiral conduit of small cross section through which the gases are caused to flow, and an outlet for said combustion chamber located opposite the central portion of said plate.

5. A heavy oil gasifying apparatus adapted to operate through partial combustion of said oil with hot air, which comprises in combination, a thermically insulated combustion chamber, a heavy oil atomizer opening into said chamber, an air preheater for feeding hot air to said atomizer for the spraying of the oil, a plate positioned at a small distance from the wall of the combustion chamber located opposite the atomizer, so that the atomized jet impinges against said plate, a plurality of passages for allowing the products from the combustion chamber to pass from one side of said plate to the other side thereof, these passages affording a greater section of flow at the periphery of said plate than at the center thereof, means for causing the hot gases to circulate between said plate and the wall of the combustion chamber in the vicinity of which said plate is positioned, and means for causing said hot gases to pass under the central portion of said plate just before their leaving the combustion chamber.

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