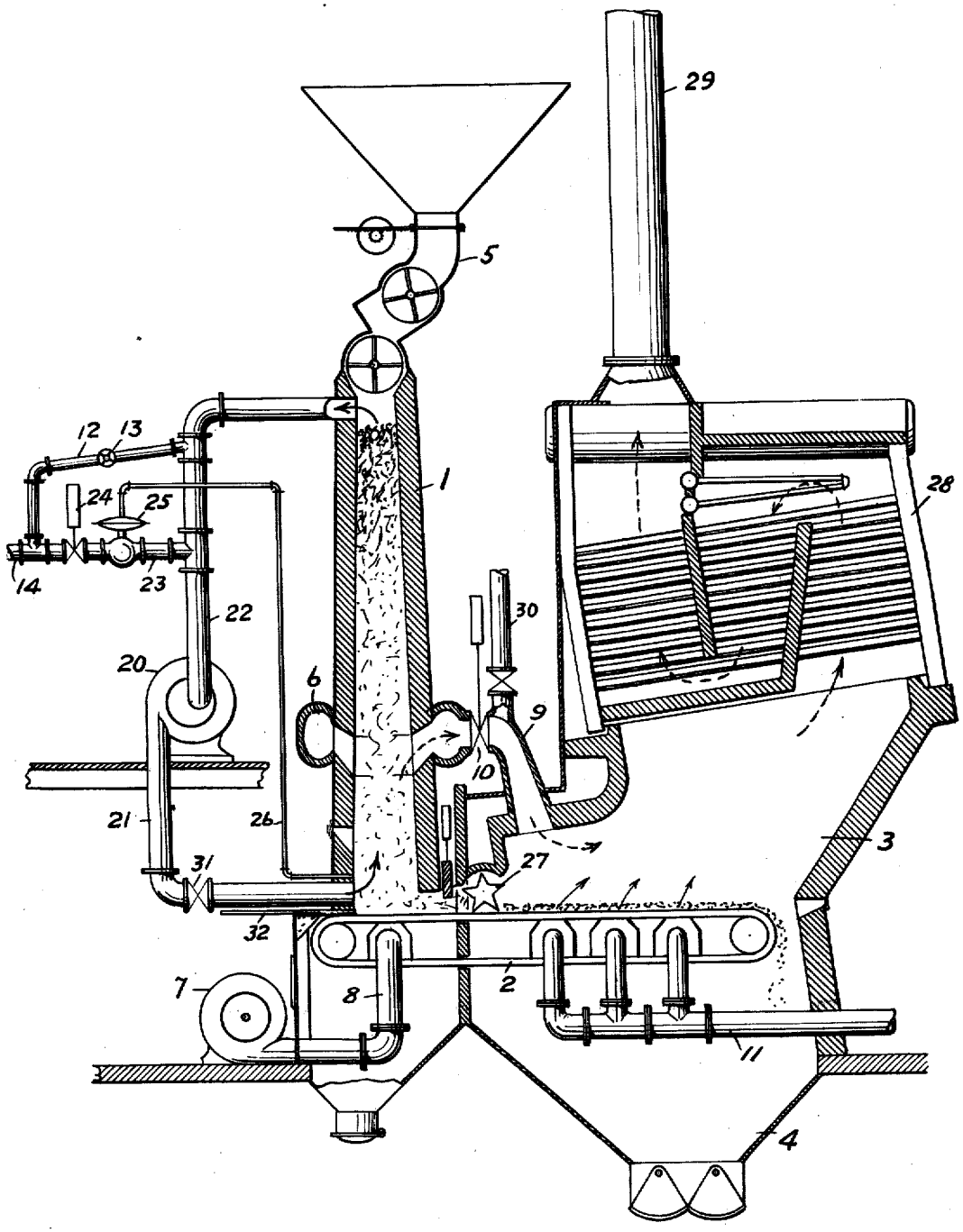
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PROCESS OF PRODUCING COAL GAS

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PROCESS OF PRODUCING COAL GAS

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The present invention relates to the carbonization and combustion of bituminous fuel with recovery of coal gas and utilization of the heat of combustion, for example, in the generation of steam.

Objects of the present invention are to effect a material economy in carbonizing bituminous fuel with the production and recovery of coal gas together with tar and other by-products and with the economical combustion of the resulting coke and the conservation and utilization of heat; and to economically combine in one operation and one apparatus the functions of a gas plant producing gas for distribution, and of a power plant producing steam for utilization.

Other objects of the invention will appear from the following description at the end of which the invention will be claimed. However, the invention, generally stated, may be said to comprise a process of continuously carbonizing and burning bituminous fuel with recovery of coal gas and utilization of heat of combustion which consists in establishing and maintaining a descending column of ignited fuel and a bed of ignited fuel by feeding bituminous fuel to the top of the column and by passing hot carbonized fuel from the bottom of the column to the bed and by discharging ashes from the bed, air blasting the bed and producing utilizable heat, producing a hot zone at the lower part of the column by intermittently air blasting the lower part of the column and burning some of the carbonized fuel and leading off the blast gases from the top of said zone to mix with the combustion gases from the burning bed and collecting coal gas from the top of the column, generating coal gas in the upper part of the column and between the air blasting steps recirculating some of it from the lower part to the upper part of the column to transfer heat from the lower part to the upper part for carbonizing raw fuel, and generating additional coal gas, and leading off and conserving the coal gas generated in excess of that required for recirculation.

The invention further comprises the apparatus to be presently described which is a preferred form with which the process can be practiced.

The invention also comprises the improvements to be presently described and finally claimed.

The invention will be described in connection with the accompanying drawing in which there is a single figure taken principally in transverse sectional elevation.

The descending fuel is provided by the retort 1, and the bed is provided by the traveling grate 2 arranged beneath and to one side of the retort 1 and extending into a combustion chamber 3. In this case the mass of fuel is continuous and comprises a column and a unilaterally spreading bed. From the grate or, more accurately, from the right-hand end of the grate, as shown in the drawing, the ashes fall, in the present instance, into the ash hopper 4. Raw bituminous coal is fed to the top of the retort 1, for example, by means of the feeder 5 which does not permit of the passage of air or gas. A zone at the bottom of the column in the retort 1 and below the offtake 6 is intermittently air blasted by means of the blower 7 and its connection 8, and the blast gases at the top of the zone above referred to are led off through the offtake 6 and by way of the pipe 9 having the valve 10, to the combustion chamber 3, where they add their heat to the heat of combustion of the fuel bed which is air blasted by the connections 11. The result of this is that a small portion of the carbonized fuel is consumed in the zone above referred to with great increase in temperature, approaching incandescence in that zone, while at the same time the utilizable heat of combustion of carbonized fuel in the bed is augmented or supplemented by the heat of the blast gases. This air blasting step is intermittent and during it some coal gas is generated in the upper portions of the column and is led off by the bleeder pipe 12 having valve 13 to the coal gas offtake pipe 14, which is connected with an exhauster, not shown because too well understood to require description or explanation. At the completion of the air blasting step the valve 10 is closed and the valve 31 opened. The fan 20 is operated

with the two-fold result that coal gas is generated in the retort 1 and recirculated by the fan 20 and pipes 21 and 22 from the top to the bottom of the column causing transfer of heat from the zone at the bottom of the column to the fuel above that zone, carbonizing the latter and permitting the carbonized fuel to descend to the bottom of the column where, while hot, it is fed to the fuel bed as described. Excess coal gas generated is led off through the pipe 23 provided with a valve 24 which is now open. The governor 25 in the pipe 23 and its connection 26 to the bottom of the column serve to keep the pressure at that point at or below atmospheric pressure in order to oppose the escape of gas at the point where the carbonized fuel is transferred to the bed. The rotating device 27 serves to level the carbonized fuel on the grate 2 and to permit the passage of the fuel into the combustion chamber, while at the same time preventing the air blast at the bottom of the descending column of fuel, during the blasting period, or the gas, during the re-circulation period, from entering the combustion chamber. As shown the combustion chamber 3 is the combustion chamber of a boiler or steam generator 28, and the heat in the chamber 3 is utilized for generating steam. The cool gases and products of combustion pass off through the stack 29. The valved connection 30 is adapted for the introduction of air into the connection 9 for burning whatever combustibles there may be in the blast gases. 32 indicates a feeder for assisting the grate to carry the carbonized fuel.

It is to be understood that the point of introduction of the recirculated coal gas, with respect to the point of introduction of the air blast to the column, may be varied in order to vary the maximum temperature to which the decomposable coal gas will be exposed during re-circulation. Also, if the carbonized fuel is fed directly from the column to the bed, increasing the distance between the point of introduction of the recirculated gas and the point of transfer of the fuel will lessen the tendency of gas to leak from the column at the latter point.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction, arrangement, procedure and matters of mere form without departing from the spirit of the invention which is not limited to such matters or otherwise than the prior art and the appended claims may require.

We claim:

1. The process of the production of coal gas and utilization of heat of combustion; which consists in establishing and maintaining a continuous mass of ignited fuel comprising as continuous parts thereof a descending column and a unilaterally spreading bed by feeding bituminous fuel to the top of the column and by passing hot carbonized coal from the bottom of the column to the bed and by discharging ashes from the bed, burning the carbonized fuel and producing utilizable heat by air blasting the bed, intermittently air blasting the lower portion of the column and leading off the blast gases from the top of said lower portion to the combustion gases from the burning fuel bed to augment the utilizable heat thereof and collecting coal gas generated in the column above said point, alternately recirculating coal gas through the column to transfer heat from the lower portion to the top thereby carbonizing raw coal and generating coal gas, and leading off the coal gas so generated in excess of that required for recirculation.

2. The process of the production of coal gas and utilization of heat of combustion; which consists in establishing and maintaining a continuous mass of ignited fuel comprising as continuous parts thereof a descending column and a unilaterally spreading bed by feeding bituminous coal to the top of the column and by passing hot carbonized fuel from the bottom of the column to the bed and by discharging ashes from the end of the bed, burning the carbonized fuel and producing utilizable heat by air blasting the bed, generating steam by said heat, intermittently air blasting the lower part of the column and leading off the blast gases from the top of said lower portion to the combustion gases from the burning fuel bed to augment the utilizable heat thereof and collecting coal gas generated in the column above said point, alternately recirculating coal gas through the column to transfer heat from the lower part to the top thereby carbonizing raw coal and generating coal gas, and leading off the coal gas so generated in excess of that required for recirculation.

3. The process of the production of coal gas and utilization of heat of combustion; which consists in establishing and maintaining a descending column of ignited fuel having a top and a bottom and a bed of ignited fuel having a top removed from the bottom of said column by feeding bituminous coal to the top of the column and by passing hot carbonized fuel from the bottom of the column to the bed and by discharging ashes from the bed continuously, air blasting the bed and producing utilizable heat, producing a hot zone at the lower part of the column by intermittently air blasting the lower part of the column and burning some of the carbonized fuel and leading off the blast gases from the top of said zone to the combustion gases from the burning fuel bed and collecting coal gas from the top of the column, generating coal gas in the upper part of the column and between the air blasting steps recirculating some of the coal gas from the lower

part to the upper part of the column to transfer heat from the lower part to the upper part for carbonizing raw fuel and generating additional coal gas, and leading off and conserving the coal gas generated in excess of that required for recirculation.

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