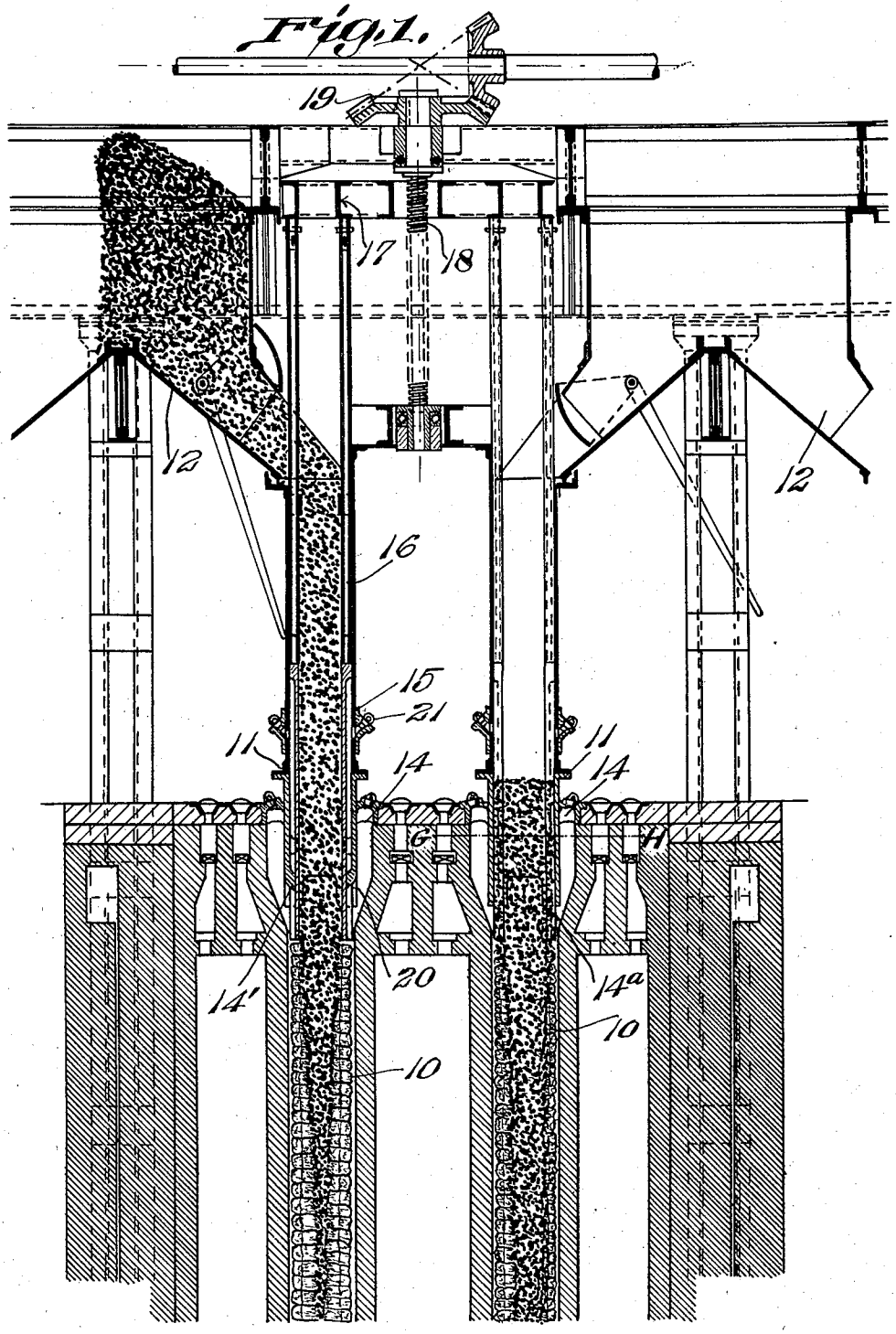
May 13, 1930. H. KOPPERS 1,758,524

PROCESS OF PRODUCING COKE AND APPARATUS THEREFOR

Original Filed June 5, 1922 2 Sheets-Sheet 1

Fig. 1.



Heinrich Koppers
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Original Filed June 5, 1922 2 Sheets-Sheet 2

Fig. 2.

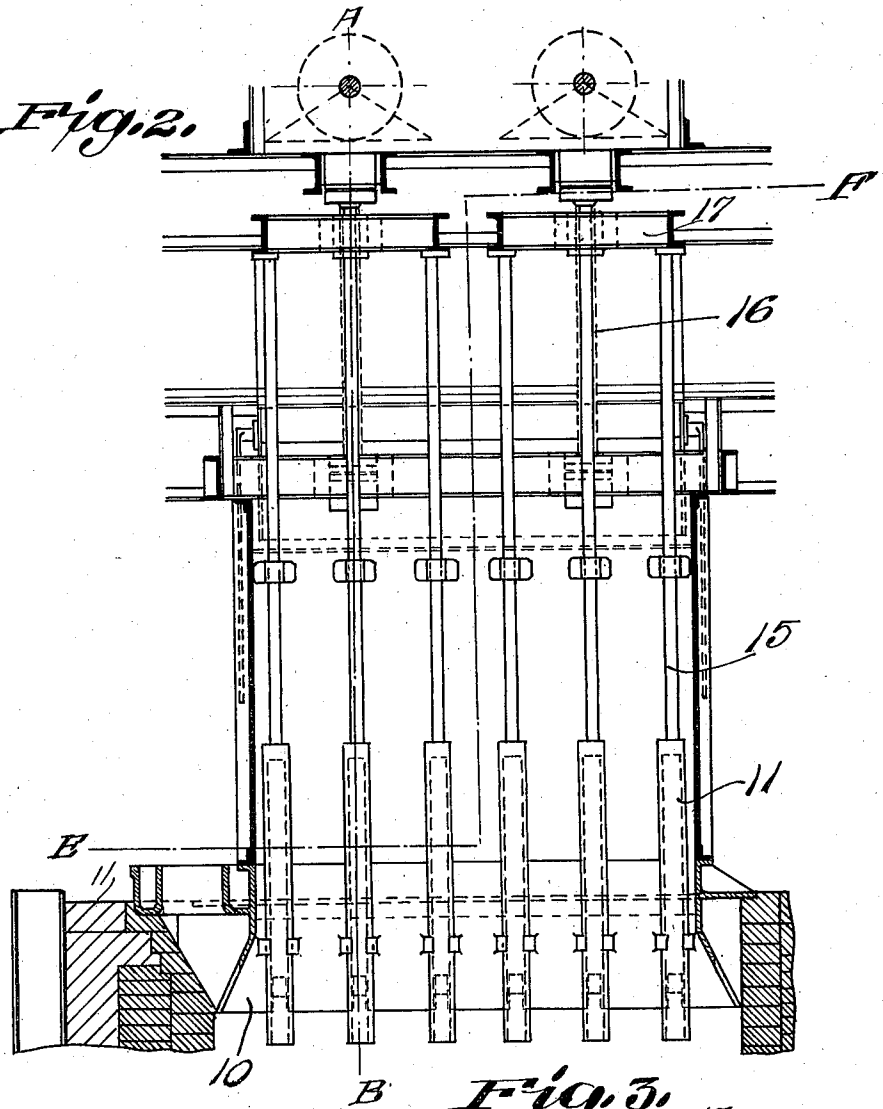
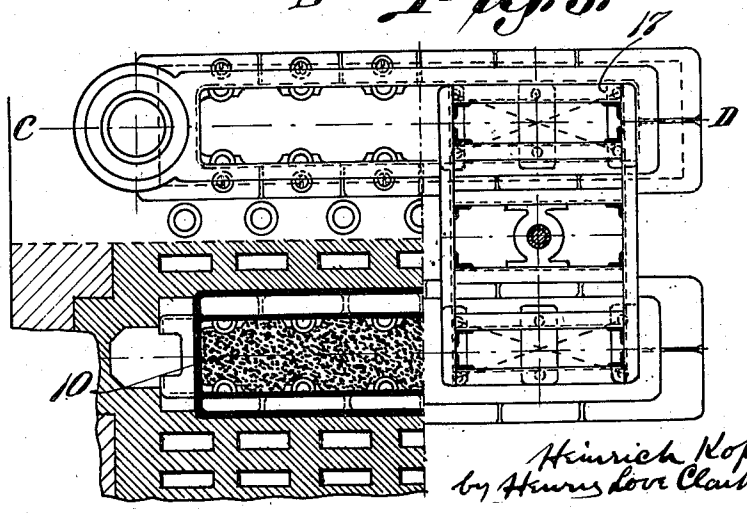


Fig. 3.



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Patented May 13, 1930 1,758,524

UNITED STATES PATENT OFFICE

HEINRICH KOPPERS, OF ESSEN-RUHR, GERMANY

PROCESS OF PRODUCING COKE AND APPARATUS THEREFOR

Application filed June 5, 1922, Serial No. 566,011, and in Germany October 7, 1921. Renewed July 7, 1927.

My invention relates to the distillation of coal with a view to developing gases and to produce coke, and more particularly to a process and the means for carrying it into effect in which the coal is distilled in continuously operated vertical retorts or oven chambers.

Heretofore only large coal could be treated in this manner owing to its interstices providing the necessary passage for the rising gases. As, however, large coal inevitably contains slack, often to a considerable extent, the advantage of using large coal is thereby partly counterbalanced. A further disadvantage is that the slack very soon loses its caking capacity and is not bound to the large coal as it is being distilled. In consequence thereof, a mixture is obtained which comprises coke of good and bad caking capacity. This causes very great losses in the shape of small coke, and the abrasion of the pieces of coke is also considerable.

According to the present invention, these disadvantages are avoided by distilling coal which has previously been ground to uniform size, and forming gas passages through which the gases developed may escape into the gas flues, thus removing the resistances that prevent the escape of the distillation gases. Where the coal is in contact with the heated walls of the retort, it becomes pasty. These pasty layers are comparatively thin from 5 to 25 mm. thick, according to the sort of coal used, but in any case they are practically impermeable to gas. In the layers of coal near the heating walls, but not in the pasty zone, coke is formed which by shrinking forms passages of sufficient area for the gases to escape. In the inner layers the coal remains unchanged until the tar line has migrated as far as the centre and the entire charge has been coked. By grinding the coal an intimate mixture is formed of the well caking coal from the larger lumps and the badly caking, already oxidized slack, such mixture yielding a good, strong and porous coke which is readily combustible.

In order to secure an efficient downward movement of the ground coal and an efficient removal of the gases, and to insure an undisturbed operation of the furnace, I provide each chamber with a superstructure which is open at the top, and I further provide along the walls of said superstructure rods which are intermittently moved up and down. In this manner, passages are formed and maintained open in the upper portion of the heated distillation chambers, where the coking of the lower layers starts, so that the gases can escape upwards. The rods are provided with recesses at their sides facing the walls so that the gases can escape also when the rods have reached the lower end of their stroke. They must not be exposed to the intense heat for a long time, yet they may be safely left within the charge until it has become comparatively solid owing to the starting of the coking process, so that on withdrawing a rod a cavity will be left which forms a gas passage. The rods which have become intensely hot in the charge, further transmit so much heat to the upper layers of the charge on being withdrawn that the coal in these layers is partly distilled and solidified to a certain extent. By thus alternately lifting and lowering the bars the most favorable conditions for the escape of the gases are created. The coal dust owing to its fineness forms a gas-tight closure of the chamber so that special closing devices may be dispensed with altogether.

On the drawings, affixed to this specification and forming a part thereof, there is illustrated diagrammatically a device constructed according to my invention and adapted to perform the novel process of the invention.

In the drawings

Fig. 1 is a longitudinal section on line A—B in Fig. 2.

Fig. 2 is a cross section on line C—D in

Fig. 3, and Fig. 3 is a plan view, partly in section on lines E—F in Fig. 2 and partly in section on line G—H in Fig. 1.

Referring to the drawings, the several chambers 10 of the oven are provided with superstructures 11 connected with lateral coal hoppers 12. The small coal in the hoppers 12 and the superstructures 11 closes the chambers at the top so that no gas can escape here. Gas flues 14 are connected with the chambers 10, the walls of the superstructures 11 being provided with ports 14ª for the escape of gas.

Rods 15, 16 are guided in contact with the lateral walls of the superstructures 11. The lower portions 15 of the rods are channelled so as to form channels whose concave sides are facing the walls. The upper portions 16 of the rods are solid and are connected with one another at the top by yokes 17 to which motion can be imparted by a screw spindle 18 actuated by a pair of bevel gears 19. When the rods 15, 16 are forced downwards into the charge, they form gas passages in the coal. They are guided in such manner as to prevent coal dust from getting into their channelled portions 15. When the rods are forced into the charge, the gases can escape freely so that the presence of the rods does not obstruct the formation of gases. After a period whose duration is determined by the temperature to which the rods may safely be heated, they are withdrawn from the charge. In consequence of the distillation the coal dust surrounding the rods has become so solid that the hollow spaces left by the rods are kept open in the charge. The heat transmitted by the rods to the upper layers of the charge serves to start solidification in these layers. In order to prevent the coal from sticking to the rods, the lower edges of the gas ports 14′ are shaped after the manner of scrapers 20 which remove any small size material sticking to the rods. Inspection openings 21 are provided in order to give access to the inside of the channels 15 of the rods.

The rods 15, 16 might also be disposed on the outside of the superstructures 11 or coal hoppers 12, the width of these parts being reduced correspondingly. In this case, the cast iron covers of the chambers 10 would have to be provided with openings for the rods. The rods might also be arranged in recesses of the heating walls.

Swelling coal may also be treated by my improved process. In this case, the chambers must be wedge-shaped. In the usual ovens, such coal cannot be used as the volume of the coal is increased to such an extent that it cannot be pushed out. In an oven having wedge shaped chambers, and whose walls diverge towards the bottom, the coke is free to swell in the direction toward the heat supply, i, e. toward the two longitudinal walls of the chamber, the section increasing as the coal is moving downwards. In this case, the chamber walls might be partly or wholly cut away at the inclined portions to make room for the rods 15, 16.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:

1. The process of treating coal which comprises: heating a substantially vertically elongated descending mass of small coal laterally inwardly of the mass to at least the carbonization temperature of the same in a closed chamber; continuously discharging the solid residuum from said chamber at the lower portion thereof; continuously charging added coal into said chamber at the upper portion thereof; flowing off distillation gases from said chamber at said upper portion; and forming and maintaining in the outer lateral portions of the newly charged coal in the pasty zone of said coal substantially vertical passages having partially coked walls extending to the outer lateral portions of an adjacent part of the charge in said chamber that has advanced beyond the pasty stage for passage of distillation gases therefrom through the newly charged mass in the pasty zone.

2. The process of treating coal which comprises: heating a mass of small coal laterally inwardly of the mass to at least the carbonization temperature of the same in a closed chamber; continuously discharging the solid residuum from said chamber at one part thereof; continuously charging added coal into said chamber at another part thereof; flowing off distillation gases from said chamber at said another part; and forming and maintaining in the outer lateral portions of the newly charged coal in the pasty zone of said coal passages having partially coked walls extending to the outer lateral portions of an adjacent part of the charge in said chamber that has advanced beyond the pasty stage for passage of distillation gases therefrom through the newly charged mass in the pasty zone.

3. The process of treating coal which comprises: heating a substantially vertically elongated descending mass of small coal laterally inwardly of the mass to at least the carbonization temperature of the same in a closed chamber; continuously discharging the solid residuum from said chamber at the lower portion thereof; continuously charging added coal into said chamber at the upper portion thereof; flowing off distillation gases from said chamber at said upper portion; and alternately pressing into and lifting out of the outer lateral portions of the newly charged coal in the pasty zone of said coal a rod in substantially vertical direction, said rod effecting escape of distillation gases from

the outer lateral portion of an adjacent part of the charge in said chamber that has advanced beyond the pasty stage.

4. In a coke oven, in combination: a substantially vertically extending chamber having lateral heating walls therefor; a superstructure on top of said chamber and forming an extension thereof; means for supplying coal to said chamber through said superstructure; a rod extending from above through said superstructure into said chamber and in close proximity to one of said lateral heating walls and adapted to provide a gas vent in solid material in said chamber in close proximity to said heating wall; and means for vertically moving said rod with relation to said chamber.

5. In a coke oven, in combination: a substantially vertically extending chamber having lateral heating walls therefor; rods extending from above into said chamber in contact with the walls thereof and adapted to move in contact with solid material in said chamber and to form gas vents in said material alongside said walls; and means for vertically moving said rods with relation to said chamber.

6. In a coke oven, in combination: a substantially vertically extending chamber having lateral heating walls therefor; a superstructure on top of said chamber and forming an extension thereof; gas ports in said heating walls and intermediate said superstructure and said chamber and in communication with said chamber; a rod extending from above through said superstructure into said chamber and in close proximity to one of said lateral heating walls and adapted to provide, in solid material in said chamber in close proximity to said heating wall, a gas channel in communication with said gas ports; and means for vertically moving said rod with relation to said chamber.

7. In a coke oven, in combination; a substantially vertically extending chamber having lateral heating walls therefor provided with vertical combustion flues and extending above the tops of the combustion flues and adapted for continuous charging through its top and for continuous discharging through its lower portions and for off-flow of distillate gases through solid material in its upper portions; rods channeled longitudinally thereof at their lower portions for a distance substantially equal to the distance between the top of said chamber and the top of said combustion flues, said rods being arranged to extend from above into said chamber down to the plane of the top of said vertical combustion flues and in close proximity to said lateral heating walls and adapted to move in contact with solid material in the upper portions of said chamber and provide gas vents in said material in close proximity to said walls; and means for vertically moving said rods with relation to said chamber.

8. In a coke oven, in combination: a substantially vertically extending chamber having lateral heating walls therefor provided with vertical combustion flues and extending above the tops of the combustion flues and adapted for continuous charging through its top and for continuous discharging through its lower portions and for off-flow of distillate gases through solid material in its upper portions; rods channeled longitudinally thereof at their lower portions for a distance substantially equal to the distance between the top of said chamber and the top of said combustion flues, said rods being arranged to extend from above into said chamber down to the plane of the top of said vertical combustion flues and in close proximity to said lateral heating walls and adapted to move in contact with solid material in the upper portions of said chamber and provide gas vents in said material in close proximity to said walls; a scraper extending into the channeled portions of said rods; and means for vertically moving said rods with relation to said chamber.

9. In a coke oven, in combination: a substantially vertically extending coking chamber having lateral heating walls therefor each of which is provided with a combustion chamber and extending above the tops of the combustion chambers in the heating walls and adapted for continuous charging through its top and for continuous discharging through its lower portions and for off-flow of distillate gases through solid material in its upper portions; a plurality of rods arranged to extend from above into said coking chamber down to the plane of the tops of the said combustion chambers in said lateral heating walls and in contact with said heating walls and adapted to move in contact with solid material in the upper portions of said chamber and to form gas vents in said material alongside said heating walls; a cross-beam connecting said rods; and a screw spindle for vertically moving said cross-beam and said rods.

10. In a coke oven, in combination; a substantially vertically extending chamber having lateral heating walls therefor provided with vertical combustion flues and extending above the tops of the combustion flues and adapted for continuous charging through its top and for continuous discharging through its lower portions and for off-flow of distillate gases through solid material in its upper portion; a superstructure on top of said chamber; gas ports in said heating walls and intermediate said superstructure and said chamber and in communication with said chamber; rods arranged to extend from above through said superstructure into said chamber down to the plane of the tops of said ver-

tical combustion flues and in close proximity to said lateral heating walls and adapted to move in contact with solid material in the upper portion of said chamber, said rods being adapted to permit escape of gases of distillation alongside said heating walls to said gas ports while in contact with solid material in the upper portion of said chamber and permit partial coking of the material about said rods to provide gas channels upon withdrawal of said rods; and means for vertically moving said rods with relation to said chamber.

In testimony whereof I affix my signature.

HEINRICH KOPPERS.