June 24, 1930. E. ROSER 1,765,702

APPARATUS FOR GASIFYING AND DISTILLING SOLID FUEL

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Fig.1

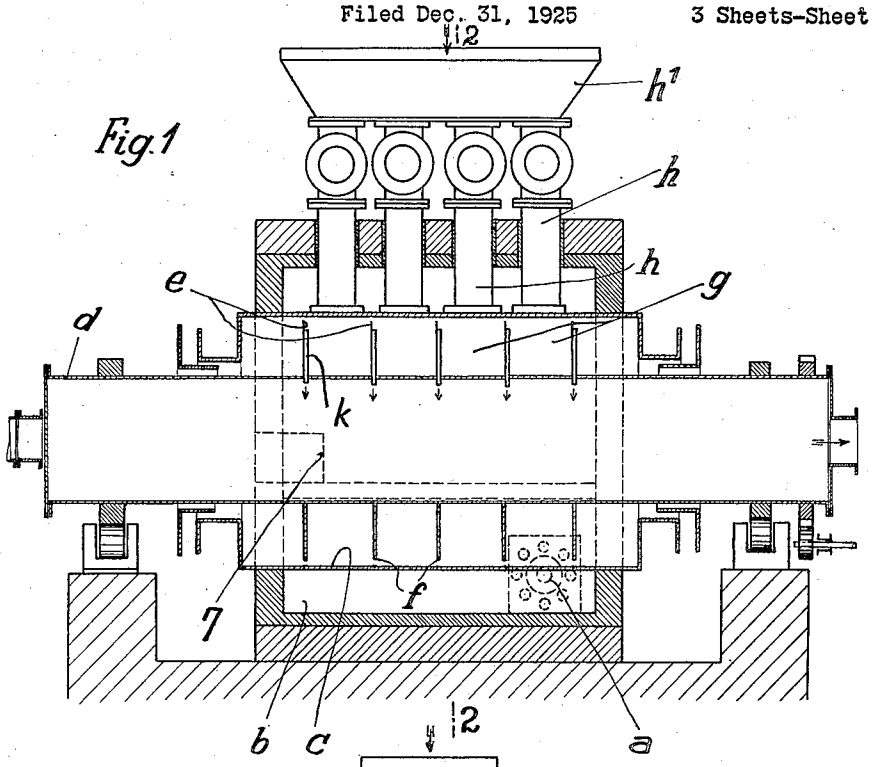
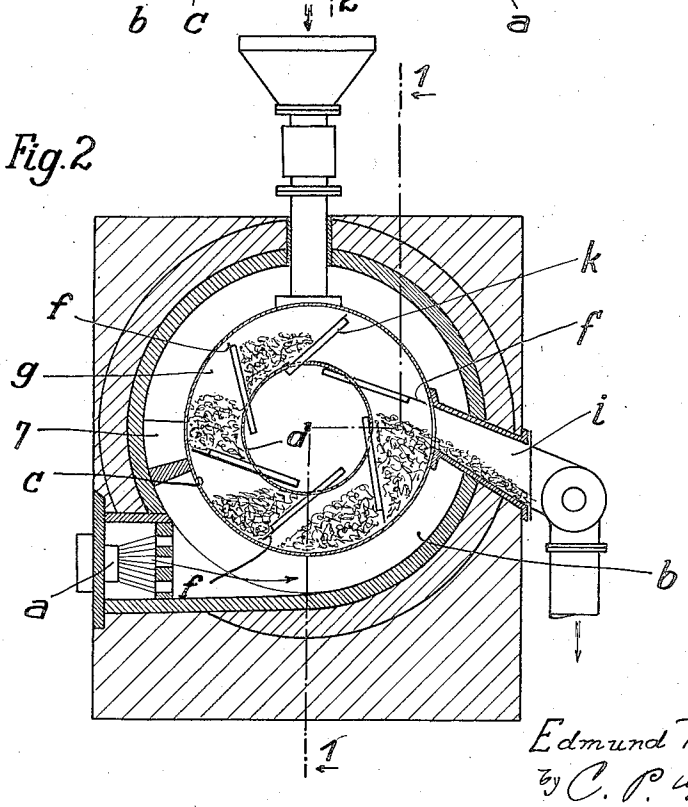


Fig.2



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Fig. 3

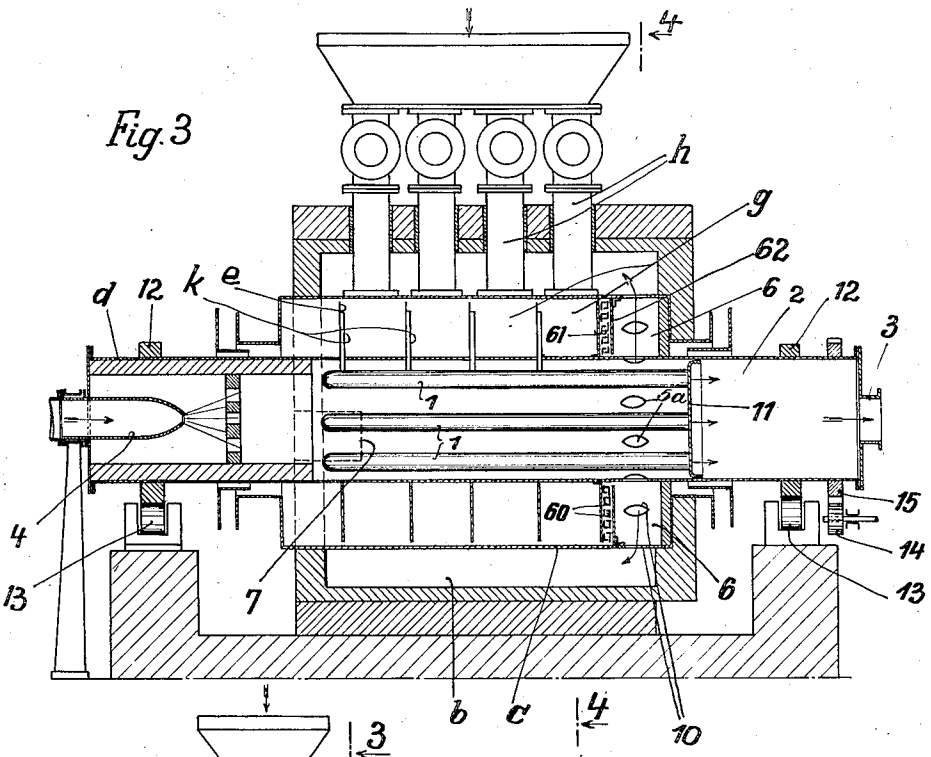


Fig. 4

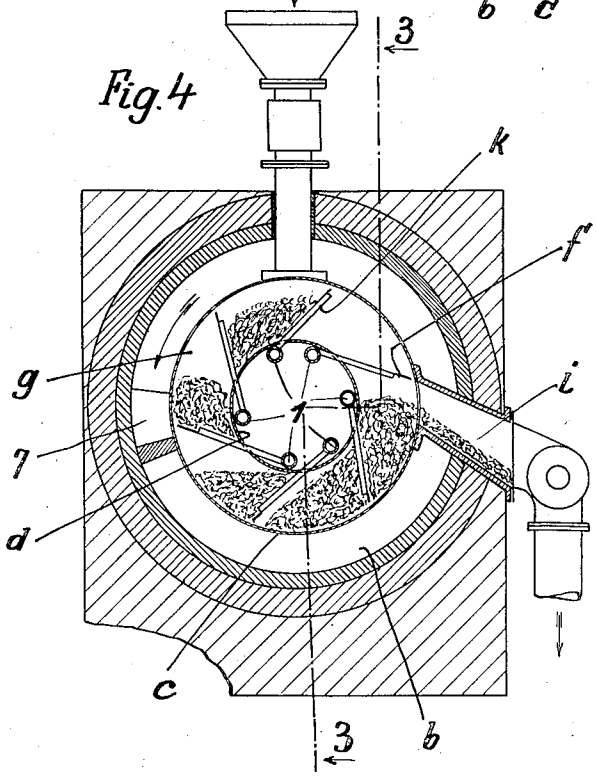
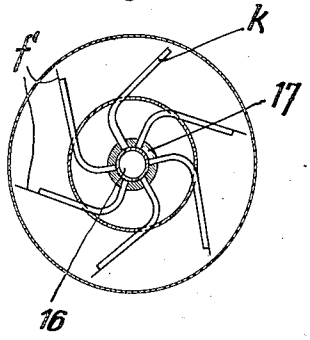


Fig. 5



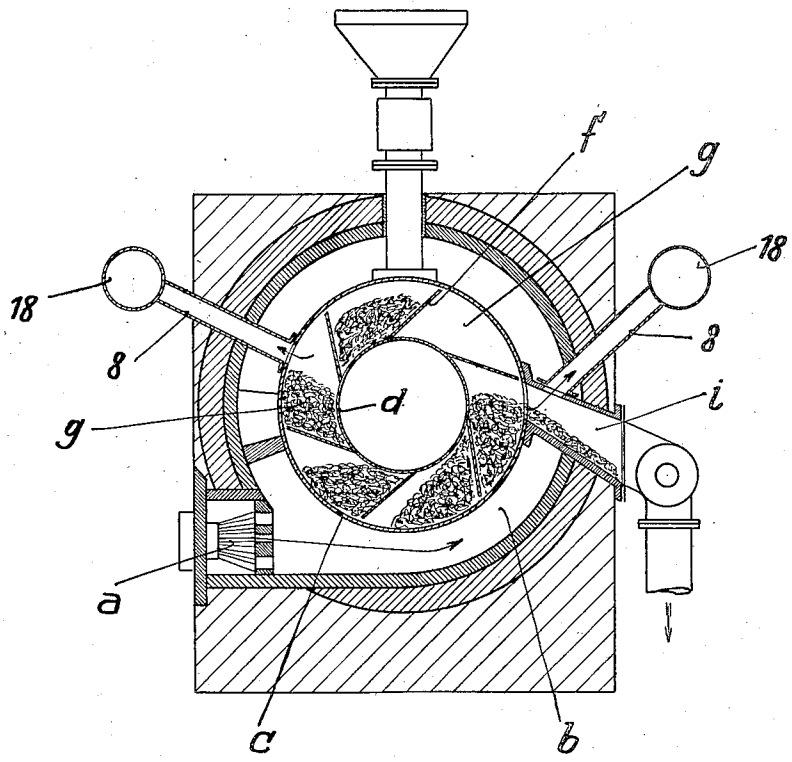
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APPARATUS FOR GASIFYING AND DISTILLING SOLID FUEL

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Fig. 6



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UNITED STATES PATENT OFFICE

EDMUND ROSER, OF BOCHUM, GERMANY

APPARATUS FOR GASIFYING AND DISTILLING SOLID FUEL

Application filed December 31, 1925, Serial No. 78,636, and in Germany July 6, 1925.

My invention relates to improvements in apparatus for gasifying solid fuel, and more particularly in apparatus comprising a rotary drum adapted to receive the fuel and provided with heating means. More particularly my invention has reference to the gasification and destructive distillation of bituminous fuel. One of the objects of the improvements is to provide an apparatus in which the generation of tar and other by-products is not impaired by the formation of dust within the rotary drum, and with this object in view my invention consists in providing chambers within the drum in which the coal is slowly moved so that the larger part thereof is brought into direct contact with the heated wall of the drum. In the practice of the invention the said chambers are provided between two concentric drums and transverse and longitudinal partition walls. In one embodiment of the invention the outer drum is stationary while the inner drum, which has the partition walls secured thereto, is rotatable, and the inner drum provides the passage for removing the gas generated from the fuel.

When thus constructing the apparatus a large amount of fuel can be charged into the same and, when rotating the drum, the fuel is brought into contact with the larger part of the outer drum exposed to the heating gases.

In the preferred construction the gasification is further improved by also heating the inner drum, the heating gases being conducted in parallel or in series through the inner drum and along the outer drum.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawings, in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawings,

Fig. 1, is a diagrammatical elevation partly in section taken on the line 1—1 of Fig. 2,

Fig. 2, is a sectional elevation taken on the line 2—2 of Fig. 1,

Fig. 3, is an elevation partly in section taken on the line 3—3 of Fig. 4 and showing a modification,

Fig. 4, is a sectional elevation taken on the line 4—4 of Fig. 3,

Fig. 5, is a vertical section showing a modified construction of the rotary drum, and

Fig. 6, is a vertical section showing another modification.

In the construction shown in Figs. 1 and 2 my improved apparatus comprises a chamber *b* formed in brick-work or otherwise and having a cylindrical drum *c* of smaller diameter mounted therein. Concentrically within the said drum there is a rotary drum *d*, which carries transverse and longitudinal partition walls *e* and *f* dividing the annular space included between the drums *c* and *d* into chambers *g*. As appears from Fig. 2, the longitudinal partition walls *f* are disposed substantially tangentially of the rotary drum *d*. The fuel, such as bituminous coal or the like, to be gasified is supplied to the said chambers *g* through pipes *h* leading from a hopper *h'*, and it is delivered into the chambers *g* at the top of the drum *c*, whereupon it is carried by the inner drum *d* and the partition walls rotating in anti-clockwise direction to a chute *i* after performing nearly a complete revolution. The material discharged through the chute *i* may be coke, carbonized residue, slags, ashes or the like, according to the particular nature of the fuel used and to the details of carrying through the working process. To the partition walls *f* pipes *k* are secured, which open into the inner drum and conduct the gases generated from the fuel into the said drum from which the gases are removed to a place of further treatment. For heating the fuel a burner *a* is provided, the combustion gases of which flow through the chamber *b* and around the drum *c* and escape through an outlet 7 to a stack or means for drying and preheating the fuel.

I wish it to be understood that I do not limit myself to the construction shown in Figs. 1 and 2 in which the outer drum is

stationary and the inner one rotatable, and that in some cases I construct an apparatus in which the inner drum is stationary while the outer one is rotatable.

The modification shown in Figs. 3 and 4 is similar in construction to the one described with reference to Figs. 1 and 2, and the same reference characters have been used to indicate corresponding parts so that it is not necessary to repeat the description of the said parts. As distinguished from Figs. 1 and 2, the apparatus shown in Figs. 3 and 4 is provided with means for circulating the heating medium successively through the inner drum *d* and the outer chamber *b*. As shown the inner drum *d* is provided at its left hand end with a burner 4, and it communicates through openings 5 with the right hand end 6 of the chamber provided between the inner drum *d* and the outer drum *c*, and the said chamber communicates through openings 10 with the heating chamber *b*, which heating chamber is provided with an outlet 7 connected with a stack or with means for preheating or drying the fuel. The drum *d* is provided at the right of the openings 5^d with a partition 11, and at the left of the said partitions the chamber 6 is separated from the chambers *g* by means of annular disks 61 and 62 secured respectively to the inner and outer drums *d* and *c* and provided respectively with interengaging concentric ribs 60, the said plates and ribs providing a packing medium preventing the flow of the products of combustion from the chamber 6 to the adjacent chamber *g*, and vice versa, preventing the flow of the combusible gas generated from the fuel into the chamber 6. The partition 11 carries pipes 1, which are closed at their left hand ends and open into the chamber 2, and which have the inner ends of the pipes *k* connected thereto.

In the operation of the apparatus the burnt gas circulates through the inner drum *d*, the openings 5 and the chambers 6 and *b*, whereupon it is discharged through the outlet 7. The combustible gas generated or distilled from the fuel in the chamber *g* flows through the pipes *k* and 1 into the chamber 2, from which it is dicharged through the outlet 3.

The drums *d* shown in Figs. 1 and 2, and 3 and 4 are supported by means of rings 12 on rollers 13, and they are adapted to be rotated by means of pinions 14 engaging spur gears 15 fixed to the drums.

The modification shown in Fig. 5 is similar to the one shown in Figs. 3 and 4, but instead of a plurality of pipes 1 a single pipe 16 is provided, and the said pipe is preferably provided with a suitable insulating medium 17. It will be understood that also the pipes 1 shown in Figs 3 and 4 may be provided with a suitable insulating medium.

In the constructions shown in Figs. 3, 4 and 5, the heating gas flows at first through the inner drum *d* and thereafter through the outer chamber *b*, but I wish it to be understood that I do not limit myself to this feature, and that in some cases I pass the gases first through the chamber *b* and thereafter through the drum *d*.

In some cases I provide separate heating means one for the inner drum *d* and constructed in the manner described with reference to Figs. 3 and 4, and the other for the chamber *b* and constructed in the manner described with reference to Figs. 1 and 2.

The modification shown in Fig. 6 is similar to the one described with reference to Figs. 1 and 2. But for removing the combustible gas generated from the fuel, pipes 8, 8, are provided which open into the fuel heating spaces provided between the drums *c* and *d* and connect the same with gas outlet pipes 18.

While in describing the invention reference has been made to particular examples embodying the same I wish it to be understood that my invention is not limited to the constructions shown in the drawings, and that various changes may be made in the general arrangement of the apparatus and the construction of its parts without departing from the invention.

I claim:

1. In an apparatus for producing gas, consisting of an outer drum and an inner drum arranged with an annular space between them, the inner drum being rotatable, longitudinal and transverse partition walls arranged between the drums and subdividing the annular space therebetween into a plurality of independent fuel chambers, said partition walls being secured to one of the drums and having a mere clearance relation to the opposed face of the other drum, means connected to the outer drum for charging the independent chambers with fuel, means for heating the fuel in the chambers whereby to liberate gas therefrom, and pipe connections in communication with said chambers connected to one of the said drums and forming outlet passageways for the gas liberated in the chambers.

2. In an apparatus for producing gas, consisting of an outer drum and an inner drum arranged with an annular space between them, the inner drum being rotatable, longitudinal and transverse partition walls arranged between the drums and subdividing the annular space therebetween into a plurality of independent fuel chambers, said partition walls being secured to the inner drum to rotate therewith and having a mere clearance relation to the opposed face of the outer drum, means connected to the outer

drum for charging the independent chambers with fuel, means for heating the fuel in the chambers whereby to liberate gas therefrom, and pipe connections connected with the inner drum entering into and passing into the chambers for collecting the gas liberated therein, said pipe connections forming outlet passageways for removing the collected gas through the inner drum.

3. In an apparatus for producing gas, consisting of an outer drum and an inner drum arranged with an annular space between them, the inner drum being rotatable, partition walls arranged between the drums subdividing the annular space into a plurality of independent fuel chambers and into at least one heating chamber for the circulation of a heating medium, said partition walls being secured to one of the drums and having a mere clearance relation to the opposed face of the other of the drums, means connected to the outer drum for charging the independent fuel chambers with fuel, means for heating the fuel in the fuel chambers whereby to liberate gas therefrom, and including an exterior heating chamber surrounding the outer drum, said inner drum having circulation openings between its interior and the first-named heating chamber, and said outer drum having circulation openings between its interior and said surrounding heating chamber whereby to permit the heating medium to circulate through the inner drum, the first-named heating chamber and said surrounding heating chamber.

4. In an apparatus for producing gas, consisting of an outer drum and an inner drum arranged with an annular space between them, the inner drum being rotatable, partition walls arranged between the drums subdividing the annular space into a plurality of independent fuel chambers, said partition walls being secured to one of the drums and having a mere clearance relation to the opposed face of the other of the drums, means connected to the outer drum for charging the independent fuel chambers with fuel, means for heating the fuel chambers whereby to liberate gas from the fuel therein, pipes connected with the inner drum entering into and passing into the fuel chambers for collecting the gas liberated therein, and a discharge conduit for the collected gas connected with said pipes and disposed within the outer drum.

5. In an apparatus for producing gas, consisting of an outer drum and an inner drum arranged with an annular space between them, the inner drum being rotatable, partition walls arranged between the drums and subdividing the annular space therebetween into a plurality of independent fuel chambers, said partition walls being secured to the inner drum to rotate therewith and having a mere clearance relation to the opposed face of the outer drum, means connected to the outer drum for charging the independent chambers with fuel, means for heating the fuel in the chambers whereby to liberate gas therefrom, and pipe connections connected to said partitions for collecting the gas liberated in said chambers and discharging the same through the inner drum.

In testimony whereof I hereunto affix my signature.

EDMUND ROSER.