June 3, 1924. 1,496,053

S. R. ILLINGWORTH

CARBONIZATION OF COAL

Filed June 11, 1923 3 Sheets-Sheet 1

Fig. 1.

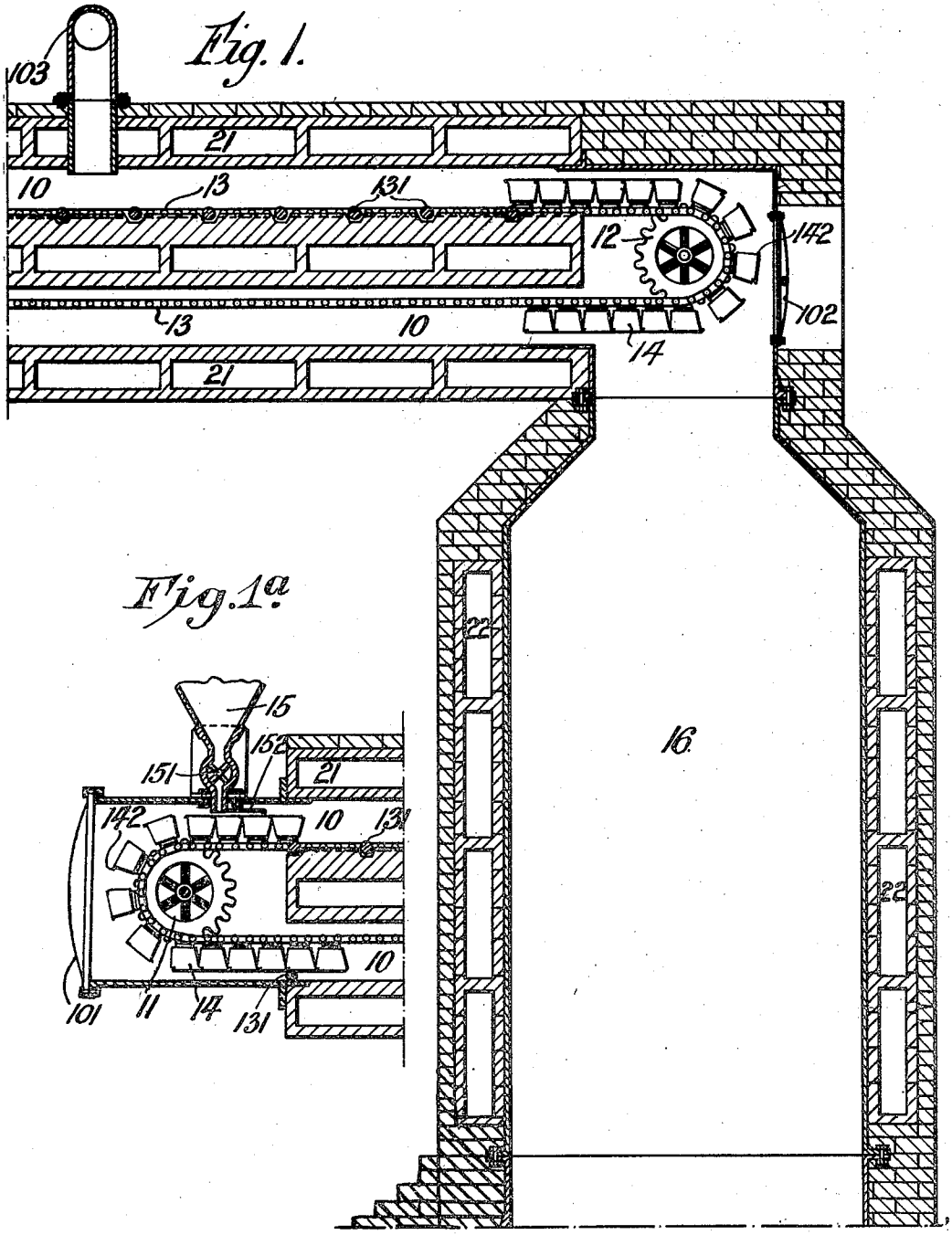


Fig. 1a

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Baldwin Wright

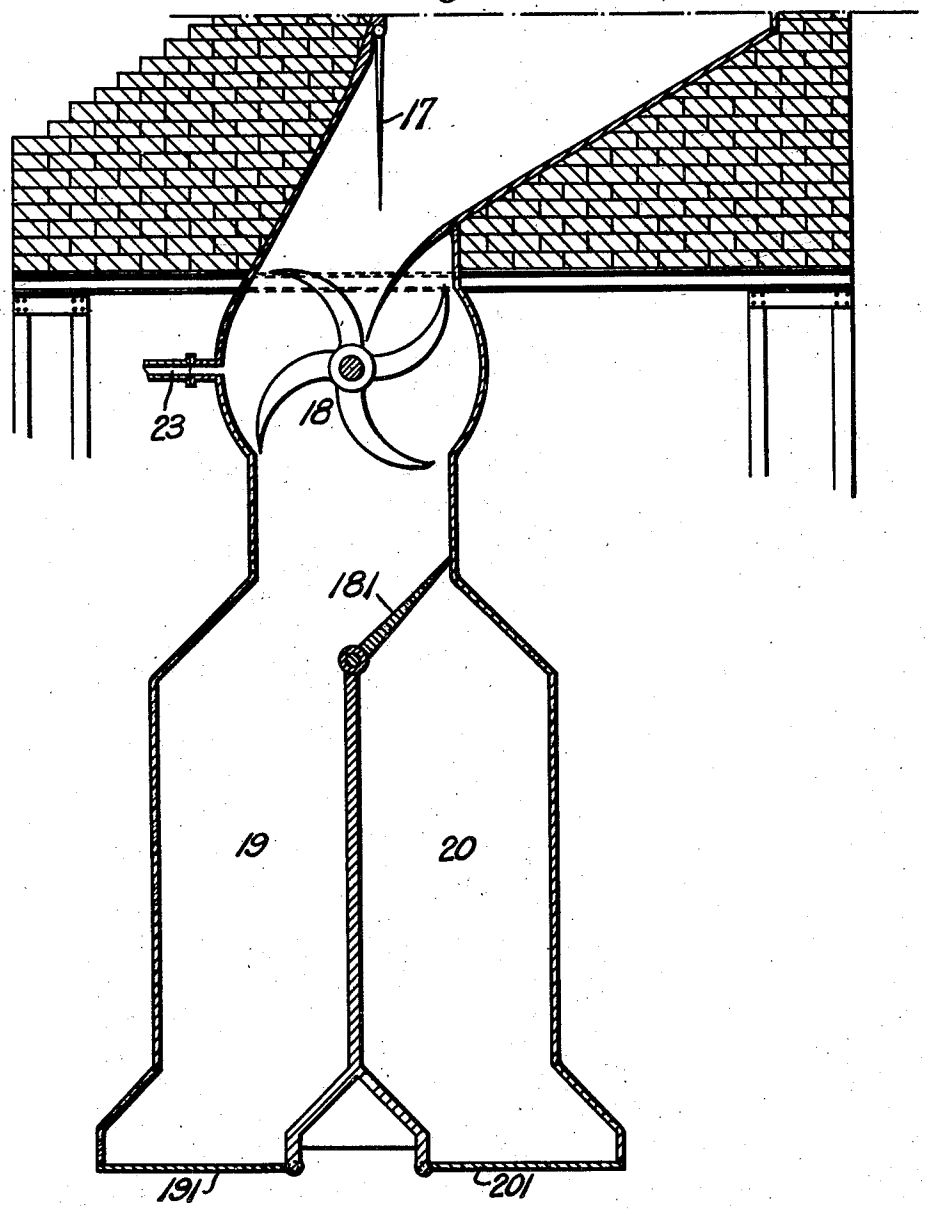
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CARBONIZATION OF COAL

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Fig. 1.b



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CARBONIZATION OF COAL

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Fig. 2.

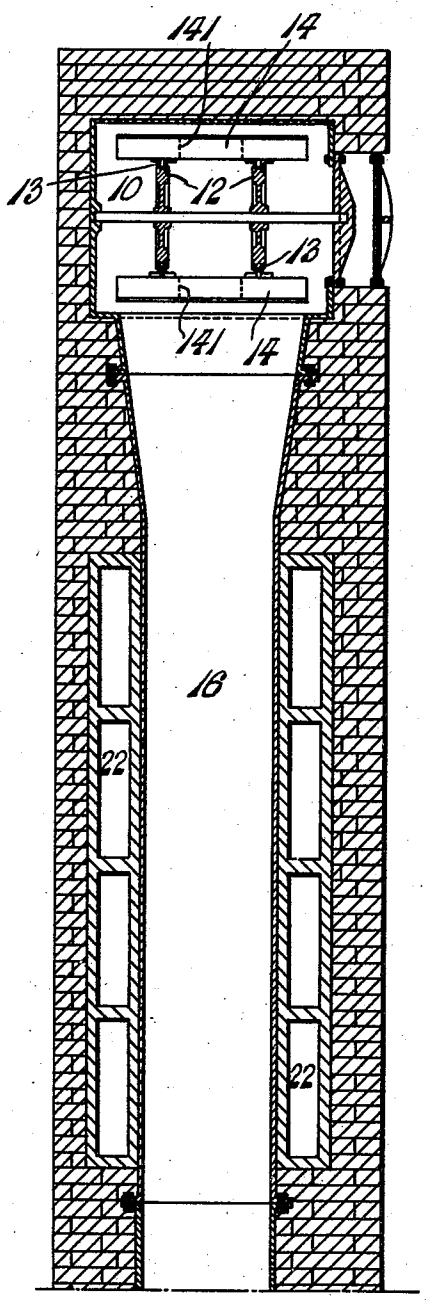
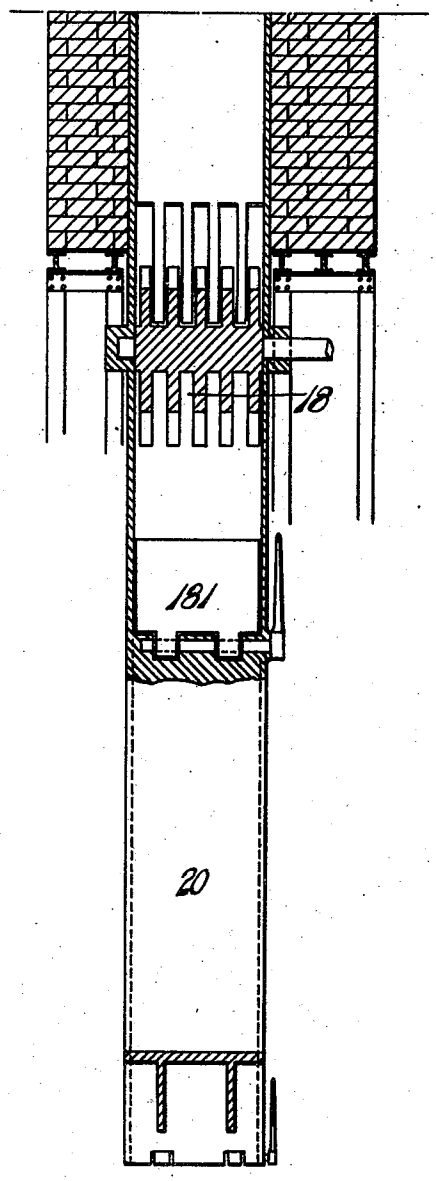


Fig. 2a



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Patented June 3, 1924. 1,496,053

UNITED STATES PATENT OFFICE.

STEWART ROY ILLINGWORTH, OF BRYN FEDWEN, RADYR, WALES, ASSIGNOR TO ILLINGWORTH CARBONIZATION COMPANY, LIMITED, OF MANCHESTER, ENGLAND.

CARBONIZATION OF COAL.

Application filed June 11, 1923. Serial No. 644,749.

To all whom it may concern:

Be it known that I, STEWART ROY ILLINGWORTH, a subject of the King of Great Britain, residing at Bryn Fedwen, Radyr, Glamorganshire, Wales, have invented new and useful Improvements in the Carbonization of Coal, of which the following is a specification.

This invention relates to the formation of briquettes by the carbonization of coal and is particularly applicable to coals which have been subjected to a preliminary treatment as described in the Patent No. 1422269 and in the Patent 1,462,576 and to blended coals as described in the Patent No. 1445954 and to some natural coals, which coals do not expand as they are carbonized.

According to this invention coal which has been subjected to a preliminary treatment or blended or natural coal is fed into a number of moulds in a retort and is heated in the molds so as to form a briquette with a shell, the briquettes being delivered from the moulds into a retort. It is found that the formation of a shell on the briquette occurs in about one fifth of the whole time required for the complete conversion of the coal into smokeless fuel, so that the retort or part of the retort containing the moulds should be about one quarter the size of the second retort or other part of the same retort into which the partially formed briquettes are discharged.

In the manufacture of smokeless fuel the heat of the two parts of the retort or of the two retorts is maintained at about 500° to 600° C., but in the manufacture of metallurgical coke in which a large output of liquid by-products is required, the retort or part thereof containing the moulds is maintained at about 500° to 600° C. whilst the other retort or that part of the first retort into which the briquettes are discharged is maintained at a temperature of 900° to 1000° C. at the delivery or lower end whilst the end communicating with the other retort is maintained at about 600° C.

The accompanying drawings illustrate plant suitable for carrying out this process.

Figures 1, 1ª, and 1ᵇ taken together form a longitudinal section of a carbonizing plant, Figure 1ª being a continuation of the upper left hand portion of Figure 1, and Figure 1ᵇ being a continuation downward of the right hand portion of Figure 1.

Figures 2 and 2ª taken together form a transverse section of the plant, Figure 2ª being a downward continuation of Figure 2.

10 is a horizontal muffle retort in which are mounted pairs of sprocket wheels 11 and 12 over which pass two endless chains 13, rollers 131 being provided to assist in the running of the chains which pass thereover. On the chains 13 are mounted trays 14 which are divided by partitions 141 into a number of compartments forming moulds of the size which the briquettes are to have. At one end of the retort 10 is a hopper 15 provided with a feeding and measuring wheel 151 by which coal is supplied to the moulds, and a scraper 152 is provided to level the top surface of the coal in the trays.

The trays 14 have flanges 142 on their rear ends which overlap the front ends of adjacent trays, so preventing the waste of coal. At the end of the retort 10 remote from the feeding apparatus 15 is a vertical retort 16 provided at its base with a baffle plate 17 and a star wheel 18 by means of which a measured quantity of material is delivered from the furnace 16. On the rotation of the star wheel the material delivered falls into one or other of the cooling chambers 19 or 20 according to the position of the guide 181. The cooling chambers are provided with doors 191 and 201 through which the material is delivered. The retort 10 is heated by gas burners in horizontal passages 21 whilst the retort 16 is heated by burners in vertically arranged passages 22 and at the base of the retort 16 is a pipe 23 for the admission of gas. The retort 10 is provided with inspection doors 101 and 102 and a main 103 through which the gaseous products are extracted.

In operation the trays 13 in the retort 10 are caused to travel through it at such a rate that the outer shell of a briquette is sufficiently hard to prevent fracture when the briquette is dropped by the reversal of the trays 13 into the retort 16. It is found that the formation of the shell occurs about one fifth of the whole time required for complete conversion into smokeless fuel, therefore, the retort 16 is of sufficient size to take four times as great a charge as the retort 10, and the star wheel 18 is driven at such a pace that the charge is extracted from the retort when it is sufficiently carbonized. The charge then falls into one or

other of the cooling vessels 19 or 20. In the manufacture of smokeless fuel the heat of the two retorts 10 and 16 is from 500° to 600° C. but in the manufacture of metallurgical coke in which a large output of liquid by-products is required the retort 10 is maintained at about 500° to 600° C. whilst the top of the retort 16 is maintained at 600° C. and the bottom at 900° to 1000° C. In this case the retort 16 must be of a capacity from 7 to 8 times that of the furnace 10.

The partially formed briquettes are continuously delivered to the retort 16 by the conveyer 13 and the star wheel or valve 18 is continuously revolved.

The apparatus herein shown and described is not herein claimed, such subject matter being claimed in my copending application No. 674,760, filed June 11, 1923 which shows and describes the apparatus more in detail.

The retorts 10 and 16 and the cooling chambers 19 and 20 may be jacketed and may be used for heating gas given off by the coals which may be led to the pipe 23 from which it passes to the retort 16 and then to the retort 10.

It will be observed that the coal while being fed through the retort 10 is divided into discrete masses in the molds 14 and that these masses are continuously passed through a zone maintained at such a temperature that the coal is partially carbonized or partially coked, a hard shell being formed around each mass and that these shell covered masses are then passed into a zone of larger dimensions than that first mentioned in the retort 16 and which is heated to a coking temperature. The shell covered masses are passed through the second zone at a slower rate than the rate at which the masses pass through the first zone. In this way I am able to rapidly carbonize the outsides of the masses and to complete the carbonizing operation more slowly on retort charges of relatively large dimensions.

The term "retort" throughout the specification and claims includes muffles, ovens, or similar devices.

What I claim is:—

1. In the carbonization of coal, arranging coal in discrete masses, passing these masses through a zone maintained at such temperature that a shell of partially coked coal is formed around each mass, then passing these partially coked masses into a zone of larger dimensions than that first mentioned, and which is heated to a coking temperature, and retaining the briquettes formed in the first zone in said second zone until the coking operation is finished.

2. In the carbonization of coal, arranging coal in discrete masses, passing these masses through a zone maintained at such temperature that a shell of partially coked coal is formed around each mass, then passing these partially coked masses into another zone which is heated to a coking temperature and retaining these shell covered masses formed in the first zone in said second zone for a longer period than they were retained in the first zone and until the coking operation is finished.

3. In the carbonization of coal, continuously forming a series of discrete masses of coal, passing these masses through a zone maintained at such temperature that a hard shell is formed around each mass, then passing these shell surrounded masses to another zone of larger dimensions than the first and which is maintained at a coking temperature and retaining the briquettes formed in the first zone in said second zone until the coking operation is finished.

4. In the carbonization of coal, to obtain smokeless fuel, the process herein described which consists in arranging coal in discrete masses, passing these masses into a zone maintained at such temperature that a shell of partially coked coal is formed around each mass, then passing these partially coked masses into a zone of larger dimensions than that first mentioned and which is heated to a coking temperature and retaining the briquette formed in the first zone in said second zone for a longer period than they were retained in the first zone and until the masses are converted into smokeless fuel.

5. In the carbonization of coal, arranging coal in discrete masses, passing them through a zone maintained at 500° to 600° C. at such rate that a shell of partially coked coal is formed around each mass, then passing these partially coked masses into a zone of higher temperature and retaining them therein until they are coked throughout.

In testimony that I claim the foregoing as my invention I have signed my name this twenty-ninth day of May 1923.

STEWART ROY ILLINGWORTH.